Affordances of 1:1 Netbooks for Teaching Practice and Student Learning: A Mixed Methods Study

Submitted by
Kristina C Turner
Bachelor of Education with Honours

A thesis submitted in total fulfilment

of the requirements for the degree of

Doctor of Philosophy

School of Education

La Trobe University
Bundoora, Victoria, 3086
Australia

August 2012

Table of Contents

List of Tables 7
Abstract 9
Statement of Authorship 10
Acknowledgements 11
1. Purpose and Organisation 12
1.1 Introduction 12
1.2 The History of ICT in Education 13
1.3 1:1 Laptop Learning 13
1.4 Statement of the Problem 15
1.5 Significance of this Research 17
1.6 The Philosophical Foundation of the Study: Pragmatism 18
1.7 Theoretical Lens 19
1.8 Research Questions 20
1.9 Scope of the Study 20
1.10 Curriculum Framework 21
1.11 Limitations of the Study 21
1.12 Role of the Researcher 22
1.13 Definition of Terms 22
1.14 Outline of the Study 24
2. Review of Literature 25
2.1 Introduction 25
2.2 Limitations of this Review of Literature 25
2.3 Affordance Theory 27
2.3.1 Gibson's theory of affordances. 27
2.3.2 Norman's theory of affordances. 29
2.3.3 Other conceptions of affordance theory. 30
2.3.4 Negative affordances and constraints. 30
2.3.5 The impact of affordances. 31
2.3.6 Criticisms of the theory of affordances. 31
2.3.7 Definition of affordances used in this thesis. 32
2.3.8 Affordance theory in ICT and education. 33
2.3.9 Justification for using affordance theory as the theoretical lens of this study. 35
2.4 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers 36
2.4.1 Lesson planning and preparation. 36
2.4.2 Constructivist teaching. 38
2.4.3 Integration of the 1:1 laptops. 40
2.4.4 Teacher communication. 42
2.4.5 Teacher workload. 43
2.4.6 Classroom management. 43
2.4.7 Teacher energy and enthusiasm. 44
2.4.8 Are the affordances offered by the 1:1 laptops important to teachers? 45
2.4.9 Summary. 46
2.5 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 47
2.5.1 The Internet. 47
2.5.2 Multimedia. 48
2.5.3 Laptop preloaded software. 49
2.5.4 Organising work. 50
2.5.5 Student communication. 50
2.5.6 Relevance of student learning to the real world. 51
2.5.7 Interesting and enjoyable learning. 51
2.5.8 Higher order thinking, problem solving and in-depth learning. 52
2.5.9 Individualisation of student learning. 53
2.5.10 Projects and assignments. 55
2.5.11 Student responsibility. 55
2.5.12 Group, cooperative and collaborative learning. 56
2.5.13 Presentation of student work. 58
2.5.14 Inappropriate use of 1:1 laptops by students. 58
2.5.15 Learning at home. 59
2.5.16 Students' technology skills. 59

2.5.17 Student attitude toward school. 60
2.5.18 Student motivation. 61
2.5.19 Student engagement. 61
2.5.20 Student behaviour. 62
2.5.21 Are the affordances offered by the 1:1 laptops important to students? 62
2.5.22 Summary. 63
3. Methodology 65
3.1 Introduction 65
3.2 Mixed Methods Research 65
3.3 The Triangulation Design: Convergence Model 67
3.4 Challenges in using Mixed Methods Research, Triangulation Design: Convergence Model 69
3.5 Examples of Mixed Methods Research Design in 1:1 Laptop Learning Research 70
3.6 Participants and Setting 71
3.7 Quantitative Data Collection and Analysis 71
3.7.1 Data analysis. 75
3.7.2 Validating of data. 75
3.8 Qualitative Data Collection and Analysis 75
3.8.1 Data analysis. 77
3.8.2 Validation of data. 78
3.9 Mixed Method Data Analysis 79
3.10 Validity in Mixed Methods Research 79
3.11 Conclusion 80
4. Findings Teacher Interviews 81
4.1 Introduction 81
4.2 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers 82
4.2.1 Lesson planning and preparation. 82
4.2.2 Constructivist teaching. 86
4.2.3 Integration of the 1:1 netbooks. 88
4.2.4 Teacher communication. 90
4.2.5 Teacher workload. 90
4.2.6 Classroom management. 91
4.2.7 Teacher energy and enthusiasm. 92
4.2.8 Are the affordances offered by the 1:1 netbooks important to teachers? 92
4.3 Teacher Perspectives on the Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 92
4.3.1 The Internet. 92
4.3.2 Multimedia. 95
4.3.3 Netbook preloaded software. 97
4.3.4 Organising work. 97
4.3.5 Student communication. 98
4.3.6 Relevance of student learning to the real world. 99
4.3.7 Interesting and enjoyable learning. 100
4.3.8 Higher order thinking, in-depth learning and problem solving. 100
4.3.9 Individualisation of student learning. 103
4.3.10 Projects and assignments. 106
4.3.11 Student responsibility. 106
4.3.12 Group, cooperative and collaborative learning. 107
4.3.13 Presentation of student work. 110
4.3.14 Inappropriate use of the 1:1 netbooks by students. 110
4.3.15 Learning at home. 112
4.3.16 Students' technology skills. 113
4.3.17 Student attitude toward school. 115
4.3.18 Student motivation. 116
4.3.19 Student engagement. 117
4.3.20 Student behaviour. 118
5. Findings Teacher Surveys 119
5.1 Introduction 119
5.2 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers 119
5.2.1 Lesson planning and preparation. 120
5.2.2 Constructivist teaching. 120

5.2.3 Integration of the 1:1 netbooks. 120
5.2.4 Teacher communication. 120
5.2.5 Teacher workload. 121
5.2.6 Classroom management. 121
5.2.7 Teacher energy and enthusiasm. 121
5.2.8 Are the affordances offered by 1:1 netbooks important to teachers? 121
5.3 Teacher Perspectives on the Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 122
5.3.1 The Internet. 122
5.3.2 Multimedia. 122
5.3.3 Netbook preloaded software. 123
5.3.4 Organising work. 124
5.3.5 Student communication. 124
5.3.6 Relevance of student learning to the real world. 125
5.3.7 Interesting and enjoyable learning. 125
5.3.8 Higher order thinking, problem solving and in-depth learning. 126
5.3.9 Individualisation of student learning. 126
5.3.10 Projects and assignments. 127
5.3.11 Student responsibility. 128
5.3.12 Group, cooperative and collaborative learning. 128
5.3.13 Presentation of student work. 128
5.3.14 Inappropriate use of the 1:1 netbooks by students. 129
5.3.15 Learning at home. 129
5.3.16 Students' technology skills. 129
5.3.17 Student attitude toward school. 129
5.3.18 Student motivation. 130
5.3.19 Student engagement. 131
5.3.20 Student behaviour. 131
6. Findings Student Interviews 133
6.1 Introduction 133
6.2 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 133
6.2.1 The Internet. 133
6.2.2 Multimedia. 134
6.2.3 Netbook preloaded software. 134
6.2.4 Student communication. 135
6.2.5 Relevance of student learning to the real world. 135
6.2.6 Interesting and enjoyable learning. 136
6.2.7 Higher order thinking, problem solving and in-depth learning. 137
6.2.8 Individualisation of student learning. 137
6.2.9 Student responsibility. 137
6.2.10 Group, cooperative and collaborative learning. 138
6.2.11 Presentation of student work. 138
6.2.12 Inappropriate use of 1:1 netbooks by students. 139
6.2.13 Learning at home. 139
6.2.14 Students' technology skills. 140
6.2.15 Student attitude toward school. 140
6.2.16 Student motivation. 140
6.2.17 Student engagement. 141
6.2.18 Are the affordances offered by the 1:1 netbooks important for student learning? 141
7. Findings Student Surveys 143
7.1 Introduction 143
7.2 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 143
7.2.1 The Internet. 143
7.2.2 Multimedia. 144
7.2.3 Netbook preloaded software. 144
7.2.4 Organising work. 145
7.2.5 Student communication. 145
7.2.6 Relevance of student learning to the real world. 146
7.2.7 Interesting and enjoyable learning. 146
7.2.8 Higher order thinking, problem solving and in-depth learning. 147

7.2.9 Individualisation of student learning. 147
7.2.10 Projects & assignments. 147
7.2.11 Student responsibility. 148
7.2.12 Group, cooperative and collaborative learning. 148
7.2.13 Presentation of student work. 148
7.2.14 Learning at home. 149
7.2.15 Students' technology skills. 149
7.2.16 Student attitude toward school. 149
7.2.17 Student motivation. 150
7.2.18 Are the affordances offered by 1:1 netbooks important to students? 150
8. Discussion 152
8.1 Introduction 152
8.2 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers 152
8.2.1 Lesson planning and preparation. 152
8.2.2 Constructivist teaching. 155
8.2.3 Integration of the affordances offered by 1:1 netbooks. 157
8.2.4 Teacher communication. 159
8.2.5 Teacher workload. 159
8.2.6 Classroom management. 161
8.2.7 Teacher energy and enthusiasm. 162
8.2.8 Are the affordances offered by the 1:1 netbooks important to teachers? 163
8.3 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 163
8.3.1 The Internet. 163
8.3.2 Multimedia. 166
8.3.3 Netbook preloaded software. 167
8.3.4 Organising work. 168
8.3.5 Student communication. 169
8.3.6 Relevance of student learning to the real world. 172
8.3.7 Interesting and enjoyable learning. 172
8.3.8 Higher order thinking, problem solving and in-depth learning. 174
8.3.9 Individualisation of student learning. 177
8.3.10 Projects and assignments. 179
8.3.11 Student responsibility. 180
8.3.12 Group, cooperative and collaborative learning. 181
8.3.13 Presentation of student work. 184
8.3.14 Inappropriate use of the 1:1 netbooks by students. 185
8.3.15 Learning at home. 186
8.3.16 Students' technology skills. 188
8.3.17 Student attitude toward school. 189
8.3.18 Student motivation. 192
8.3.19 Student engagement. 193
8.3.20 Student behaviour. 194
8.3.21 Are the affordances offered by the 1:1 netbooks important to students? 194
9. Conclusions 197
9.1 Introduction 197
9.2 The Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers 197
9.3 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students 200
10. Recommendations 204
10.1 Introduction 204
10.2 Recommendations 204
10.2.1 Teaching practice. 204
10.2.2 Student learning. 205
10.3 Further Research 206
10.4 Conceptual and Methodological Framework Evaluation 206
10.5 Concluding Comments 209
References 211
Appendices 222
Appendix 1: Principal Information Sheet (Teacher & Student Surveys, Teacher Interviews) 222
Appendix 2: Principal Informed Consent (Teacher & Student Surveys, Teacher Interviews) 224
Appendix 3: Principal Information Sheet (Student Interviews) 225

Appendix 4: Principal Informed Consent (Student Interviews) 227
Appendix 5: Teacher Information Sheet (Survey) 228
Appendix 6: Teacher Informed Consent (Survey) 230
Appendix 7: Teacher Information Sheet (Interview) 231
Appendix 8: Teacher Informed Consent (Interview) 233
Appendix 9: Parent and Student Information Sheet (Survey) 234
Appendix 10: Parent and Student Informed Consent (Survey) 236
Appendix 11: Parent and Student Information Sheet (Interview) 237
Appendix 12: Parent and Student Informed Consent (Interview) 239
Appendix 13: Teacher Survey (February) 240
Appendix 14: Teacher Survey (December) 242
Appendix 15: Student Survey (February) 246
Appendix 16: Student Survey (December) 248
Appendix 17: Teacher Interview Schedule 251
Appendix 18: Student Interview Schedule 253
Appendix 19: Table 1 254
Appendix 20: Table 2 255
Appendix 21: Qualitative Results Tables 256

List of Tables

Table 1: "Australian Research Studies Summary" 254
Table 2: "Australian School Evaluation Reports Summary" 255
Table 3: "The introduction of 1:1 netbook learning has renewed my energy, enthusiasm and engagement in teaching?" 257
Table 4: "I use my Laptop for planning and preparation" 256
Table 5 "I use my Laptop to access diverse teaching materials" 256
Table 6: "I use ICT more often to present information to the class since the introduction of 1:1 netbooks" 256
Table7: "Since the introduction of 1:1 netbook learning, I more often facilitate a classroom environment which enables the children to create their own knowledge rather than have it explicitly taught to them by me" 256
Table 8: "I integrate the netbooks into my lessons" 257
Table 9: "1:1 netbooks learning has improved my communication with colleagues" 257
Table 10: "My colleagues have assisted me with 1:1 netbook learning in my classroom" 257
Table 11: "I believe that netbook learning has increased my workload" 257
Table 12: "I believe that 1:1 netbook learning has caused difficulties in classroom management" 257
Table 13: "I like the students having netbooks in my classroom" 258
Table 14: "I believe that 1:1 netbook learning is beneficial for teaching and learning" 258
Table 15: "1:1 netbook learning makes student learning more relevant to the real world" 258
Table 16: "I believe that the students find the work we do in class interesting" 265
Table 17: "I believe that students having their own netbooks has helped them to find the work we do in class interesting" 265
Table 18: "I believe that the students find learning enjoyable" 265
Table 19: "I believe that students having their own netbooks has helped them to find learning more enjoyable" 265
Table 20: "I use higher order thinking activities in class more since the introduction 1:1 netbook learning" 266
Table 21: "I use problem solving activities in class more since the introduction of 1:1 netbook learning " 266
Table 22: "Students are able to explore topics in greater depth when they have their own netbook" 266
Table 23: "I individualise the curriculum to meet individual students needs" 266
Table 24: "Students having their own netbooks has enabled me to more easily individualise the curriculum to meet individual student learning needs" 266
Table 25: "My students have choices in what they learn" 267
Table 26: "Students having their own netbooks has increased the amount of individual choices they have in their learning" 267
Table 27: "How frequently do your students use computers/netbooks for projects/ assignments?" 268
Table 28: "I believe that my students take responsibility for their own learning" 268
Table 29: "Students having their own netbooks has increased the amount of responsibility they take for their own learning" 268
Table 30: "My students participate in group/cooperative work" 269
Table 31: "How frequently do your students use computers/netbooks for group/cooperative work?" 269
Table 32: "Students having their own netbooks has increased the amount of group and cooperative work we do in class" 268
Table 33: "How frequently do your students use computers/netbooks for individual work" 267
Table 34: "Students having their own netbooks has increased the amount of individual work which they do in class" 267
Table 35: "Students having their own netbooks has improved the presentation of their work" 269
Table 36: "I had problems with students using their netbook in an inappropriate manner" 269
Table 37: "How frequently do your students use computers/netbooks for homework" 270
Table 38: "Students having their own netbooks has improved their technology skills" 270
Table 39: "I believe that my students feel positive at school" 270
Table 40: "I believe that netbooks have contributed to my students positive attitude to school this year" 270
Table 41: "I believe that my students try very hard to do their best at school" 271
Table 42: "I believe that netbooks have contributed to my students trying very hard to do their best at school this year" 271
Table 43: "I believe that my students like writing" 271
Table 44: "I believe that netbooks have contributed to my students liking writing this year" 271
Table 45: "I believe that my students like Mathematics" 272
Table 46: "I believe that netbooks have contributed to my students liking Mathematics this year" 272
Table 47: "I believe that doing well in school is important to my students" 272
Table 48: "I believe that students having their own netbooks has made doing well in school important to my students" 272
Table 49: "I believe that my students are motivated to learn" 273
Table 50: "I believe that netbooks have contributed to my student's motivation to learn this year" 273
Table 51: "I believe that my students engaged in learning" 273
Table 52: "I believe that netbooks have contributed to my student's engagement in learning this year" 273
Table 53: "I believe that my students are actively involved in learning" 274
Table 54: "I believe that netbooks have contributed to my students being actively involved in learning this year" 274
Table 55: "My students are generally "on task" 274
Table 56: "netbooks have contributed to my students being generally "on task" this year" 274
Table 57: "My students are generally well behaved" 275
Table 58: "netbooks have contributed to my students being generally well behaved this year" 275
Table 59: "How frequently do you use the internet for teaching and learning activities in the classroom" 258
Table 60: "How frequently do your students use computers/netbooks for researching information?" 259
Table 61: "How frequently do you use interactive web learning activities for teaching and learning in your classroom?" 259
Table 62: "How frequently do you use the digital photo editing software for teaching and learning activities in your classroom?" 259
Table 63: "How frequently do you use digital videos or digital video editing software for teaching and learning activities in your classroom?" 260
Table 64: "How frequently do you use digital music or music editing software for teaching and learning activities?" 260
Table 65: "How frequently do you use Microsoft Word for teaching and learning activities in your classroom?" 260
Table 66: "How frequently do you use Microsoft PowerPoint for teaching and learning activities in your classroom?" 261
Table 67: "How frequently do you use Microsoft Publisher for teaching and learning activities in your classroom?" 261
Table 68: "How frequently do you use animation programs for teaching and learning activities in your classroom?" 261

Table 69: “How frequently do you use Microsoft Paint or drawing software for teaching and learning activities in your classroom?”..... 262
Table 70: “How frequently do your students use computers/netbooks for educational games?”..... 262
Table 71: “How frequently do your students use computers/netbooks for organising their work?”..... 262
Table 72: “Netbooks have helped my students organise their work this year”..... 263
Table 73: “How frequently do you use email for teaching and learning activities in your classroom?”..... 263
Table 74: “How frequently do you use blogs for teaching and learning activities in your classroom?”..... 263
Table 75: “How frequently do your students use computers/netbooks for communication with peers?”..... 264
Table 76: “How frequently do your students use computers/netbooks for communication with teachers?”..... 264
Table 77: “How frequently do your students use computers/netbooks as a visual or audio aid to class presentations of work?”..... 264
Table 78: “1:1 netbooks learning has improved my communication with the students” 263
Table 79: “Netbooks made have our learning more relevant to the real world”..... 282
Table 80: “The work we do in class is interesting”..... 282
Table 81: “Netbooks have helped to make learning more interesting”..... 282
Table 82: “Learning is enjoyable”..... 282
Table 83: “Netbooks have helped to make learning more enjoyable”..... 283
Table 84: “I am able to explore topics in greater depth when I use a netbook”..... 283
Table 85: “Having a netbook has given me greater choices in what I learn”..... 283
Table 86: “How frequently do you use computers/netbook for projects and assignments?”..... 283
Table 87: “I take responsibility for my own learning”..... 284
Table 88: “Having a netbook has helped me to take greater responsibility for my own learning”..... 284
Table 89: “How frequently do you use computers/netbooks for group/cooperative work?”..... 284
Table 90: “I participate in group/ cooperative work more often since getting a netbook”..... 284
Table 91: “I get help with my learning from my classmates more often since getting a netbook “..... 285
Table 92: “How frequently do you use computers/netbooks for individual work?”..... 285
Table 93: “I work individually more often since getting a netbook”..... 283
Table 94: “My netbook has improved the presentation of my work”..... 285
Table 95: “How frequently do you use computers/netbooks for homework?”..... 285
Table 96: “I get help with my learning at home more often since getting a netbook”..... 286
Table 97: “I am confident using a computer/netbook”..... 286
Table 98: “I am able to help others on a computer/netbook”..... 286
Table 99: “I am good at my school work”..... 289
Table 100: “Netbooks have helped me to be good at school work this year”..... 289
Table 101: “I find it easy to learn new things”..... 289
Table 102: “Netbook have made it easy for me to learn new things this year”..... 289
Table 103: “I am a very good student”..... 290
Table 104: “Netbooks have helped me to be a very good student this year”..... 290
Table 105: “I am generally successful at school”..... 290
Table 106: “Netbooks have helped me to be generally successful at school this year”..... 290
Table 107: “I use a computer/netbook at school”..... 291
Table 108: “I like having a netbook”..... 291
Table 109: “Having a netbook is important to my learning”..... 291
Table 110: “I feel positive about my school work”..... 287
Table 111: “Netbooks have helped with my positive attitude to school this year”..... 286
Table 112: “I try very hard to do my best at school”..... 287
Table 113: “Netbooks have helped me to try very hard to do my best at school this year”..... 287
Table 114: “I like writing”..... 288
Table 115: “Netbooks have helped me to like writing this year”..... 287
Table 116: “I like Mathematics”..... 288
Table 117: “Netbooks have helped me to like Mathematics this year”..... 288
Table 118: “Doing well in school is more important to me since getting a netbook”..... 288
Table 119: “How frequently do you use the internet?”..... 275
Table 120: “How frequently do you use computers/netbooks for researching information?”..... 276
Table 121: “How frequently do you use computers/netbooks for interactive web learning activities?”..... 276
Table 122: “How frequently do you use photo editing/publishing software?”..... 276
Table 123: “How frequently do you use video editing/ publishing software?”..... 277
Table 124: “How frequently do you use music editing software?”..... 277
Table 125: “How frequently do you use Microsoft Word?”..... 277
Table 126: “How frequently do you use Microsoft PowerPoint?”..... 278
Table 127: “How frequently do you use Microsoft Publisher?”..... 278
Table 128: “How frequently do you use animation software?”..... 278
Table 129: “How frequently do you use Microsoft Paint or drawing software?”..... 279
Table 130: “How frequently do you use computers/netbooks for educational games?”..... 279
Table 131: “How frequently to you use computers/netbooks for organising work?”..... 279
Table 132: “My netbook has been helpful in organising my work”..... 280
Table 133: “How frequently do you use computers/netbooks for email?”..... 280
Table 134: “How frequently do you use computers/netbooks for blogging?”..... 280
Table 135: “How frequently do you use computers/netbooks for communication with teachers?”..... 281
Table 136: “How frequently do you use computers/netbooks for communication with peers?”..... 281
Table 137: “How frequently do you use a computer/netbook as a visual / audio aid in class presentations of work?”..... 281

Abstract

In 2009 more than 340 schools from rural and regional Victoria and from Melbourne's northern suburbs took part in a Victorian Department of Education and Early Childhood Development project titled "The Netbook Project". The netbook is a wireless-enabled mini notebook (laptop), and is equipped with more than 28 educational software programs. There has been large amount of research from the United States of America, the United Kingdom and Canada around 1:1 laptop learning; however, extensive review has revealed that there are very few research studies about 1:1 laptop learning programs in Australia. This Australian study examines the affordances of 1:1 netbooks for teaching practice and student learning in grade 6 classrooms through the theoretical lens of "Affordance Theory". This mixed methods research study uses a triangulation design convergence model, with equal weighting given to the quantitative and qualitative data. Data were concurrently collected and separately analysed prior to the researcher integrating them by comparing and contrasting each data set during the discussion phase of the research. This research project includes 16 rural schools participating in "The Netbook Project". Research findings show that the affordances offered by the 1:1 netbooks enable teachers to better cater for individual students' learning styles and abilities, facilitate the implementation of higher order thinking activities in the classroom, and enable students to reach a deeper understanding of the curriculum. The affordances of the1:1 netbooks offer teachers the opportunities to incorporate more ICT into their lesson planning and preparation, access broader and more in-depth diverse teaching materials on the Internet, use ICT more often to present information to their class and use a more flexible, reactive style of lesson planning. In addition, the affordances of the 1:1 netbooks offer students access to the unlimited activities, information and resources available on the Internet, the use of multimedia applications to support and enhance learning, and the use of web 2.0 applications for communication with each other and their teachers.

Statement of Authorship

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis submitted for the award of any other degree or diploma.

No other person's work has been used without due acknowledgement in the main text of the thesis.

The thesis has not been submitted for the award of any degree of diploma in any other tertiary institution.

Signed.....

Kristina Turner

Date.....

Acknowledgements

I am enormously grateful for the love and encouragement of these people.

Their support and belief in me has made this thesis possible.

My family Leigh, Jasmine, and Kahil Turner,

Noel and Nevis Lowe,

Merrilee, Dean, Nick and Livinia Edwards.

My supervisors, Dona Martin and Penelope Collet.

I am also extremely grateful to the teachers and students

who so generously gave of their time and expertise in participating in this study.

A bouquet of gratitude to you all xx

1. Purpose and Organisation

1.1 Introduction

Historically, an education system reflects the values of the society to which it belongs. For example, in the 1800s, instruction was largely aimed at giving children the capacity to closely imitate very simple text forms; no original thinking was required (Centre for Digital Education, 2008). In the early 1900s children were regarded as raw materials to be efficiently processed, in a factory-like model. In contrast, society today envisions graduates of school systems as graduates who can identify and solve problems and make contributions to society throughout their lifetime (Centre for Digital Education, 2008). In following the shift from a labour-intensive industrial economy to a knowledge-based economy, we now require an education system which offers learners opportunities to develop original, innovative and creative thinking and problem solving skills (Partnership for 21st Century Skills, 2008; Yelland, 2007).

The twenty-first century skills which future graduates will require are identified in broad general terms as information and communication skills. Future graduates will require thinking and problem-solving skills, interpersonal and self-directional skills (Barrios et al., 2004), the ability to learn independently, to collaborate with peers to accomplish work and to communicate the conclusions of this work. These twenty-first century skills are a highly valued set of competencies (Rockman, 2003) which the Task Force on Maine's Learning Technology Endowment (2001) observed will challenge schools to prepare young people to be ready to navigate and prosper in a world with technology as an ally rather than an obstacle.

To facilitate a relevant and real world education, twenty-first century information and communication technology (ICT) related skills such as thinking and problem-solving, interpersonal and self-directional, and information and communication skills must be successfully integrated within the curriculum (Barrios et al., 2004). Partnership for 21st Century Skills (2008) finds that ICT skills must be immersed into the curriculum in order to produce graduates who can think critically, make judgments, solve complex, multidisciplinary open-ended problems, use creative and entrepreneurial thinking, communicate and collaborate, make innovative use of knowledge, information and opportunities, and take charge of financial, health and civic responsibilities.

The globalisation of information and communication will impact on what we teach, how we teach, and where we teach (Queensland Government Department of Education, Training and the Arts, 2008). Friedman (2005) describes the twenty-first century world as being flat. He is referring to the globalisation of information, communication and services largely brought about by the Internet and other recent ICT advances levelling the

economic and educational playing field for all people of all nations with access to ICT. The internet therefore provides a powerful tool for twenty-first century learners and is an essential educational resource for our children. ICT will enable our students to connect with the rest of the world, and will continually test their ability to find and evaluate information and to construct new knowledge.

1.2 The History of ICT in Education

The impact of ICT on education is not new. For example, Rosenberg (2001) discusses how in 1436 the invention of the printing press had a major impact on education as it enabled mass duplication and distribution of information. However, it was television which really got educators excited, as with television educators could bring almost any form of learning into the classroom. The children's show Sesame Street mixed entertainment and education in a television format (Walker, 2009). But television lacked a very essential quality of teaching, the ability to 'interact' with the learner to provide feedback or to alter the presentation to meet the learner's needs (Rosenberg, 2001).

In 1944 the U.S.A. military invented the world's first modern-day computer. In 1950 computers were first introduced into educational practice, with the Massachusetts Institute of Technology using a computer flight simulator to train pilots (Rosenberg 2001; Sharp, 2009). The use of early mainframe computers in education was limited by their size, cost and availability; however, the invention of the personal computer in 1977 enabled personal users ready access to computer technology (Molnar, 1997). By the early beginnings of the twenty-first century, the internet, together with email, web 2.0 technology and the development of ever more sophisticated software, saw the increasing prevalence of computers in classrooms (Rosenberg, 2001; Sharp, 2009).

Believing that increased use of computers will lead to improved teaching and learning opportunities, educational leaders have made multi-billion dollar investments in educational technologies (Russell, Bebell, & Higgins, 2004). Subsequently the ratio of students to computers in the U.S.A. had dropped from 125:1 in 1983 to 4:1 in 2002 (Russell, Bebell, & Higgins, 2004). Rapid ICT advances have sparked interest in utilizing laptops as an instructional tool to improve student learning (Gulek & Demirtas, 2005).

1.3 1:1 Laptop Learning

Recently we have seen the development of an ICT-rich environment in hundreds of classrooms where technology is not a shared resource; instead, all teachers and students have access to educational technology

through a 1:1 student to computer ratio (Bebell, 2005). The founding 1:1 laptop program was at the Australian Methodist Ladies' College Junior School, which in 1989 became the birthplace of the world's first 1:1 laptop program (Bebell, 2005; Methodist Ladies College, n.d.). Twenty years on, their website states "The Junior School's wireless network gives each student access to the College internet and its extensive library and research facilities, as well as a portal to the world wide web and email facilities. Students experience using their notebooks as powerful anytime, anywhere learning tools" (Methodist Ladies College, n.d.). Nowadays 1:1 laptop programs exist across Europe, including France, Spain and Germany, and in the U.S.A., Great Britain, Asia, the Middle East, New Zealand and Australia. They are present throughout these locations in a variety of settings, including primary and secondary, public and private schools (Bebell, 2005).

It is the aim of 1:1 programs to embed technology within the curriculum. True ICT integration requires 1:1 access to technology that most students take for granted outside of school (Livingston, 2006). Helping students to absorb facts more efficiently and encouraging higher-order thinking in the classroom is assisted with access to 1:1 computers (Livingston, 2006). Livingston (2006) offers the following example:

> If it takes 40 minutes for an environmental science class to gather weather data from atlases and almanacs and turn it into pencil and paper charts, how much time is left to think about what the chart is saying? How much time is there to consider 'what if' scenarios, such as, 'What if the mean temperature rose by 10 degrees?' Equipped with a laptop computer, access to the Internet, and a spreadsheet or graphing program, however, students can quickly find and analyse current data. They can plug that data into spreadsheet templates, and prepare charts for a half a dozen different 'what if' scenarios in the same amount of time it would take to make a pencil and paper chart. (Laptops) Allow students to get to the thinking faster (p.5).

1:1 laptops help the student to become more productive, providing extra time for students to develop higher-order thinking skills crucial to success in higher education and beyond (Livingston, 2006; Task Force on Maine's Learning Technology Endowment, 2001).

An important aspect of a 1:1 laptop program is that the children are able to take the laptops home in the evenings, which makes the computer a more personal device. This strategy enables learners to have immediate and continuous access to infinite resources (Buckenmeyer, Freitas, & Hixon, 2008). In recognising the 24/7

availability of the laptop as a learning resource, 1:1 laptop programs are also known as "Anywhere, Anytime" programs (Queensland Department of Education and Training, 2009).

1.4 Statement of the Problem

In 2009 more than 340 schools from rural and regional Victoria and from Melbourne's northern suburbs took part in a Victorian Department of Education and Early Childhood Development project titled "The Netbook Project". The netbook is a wireless-enabled mini computer, and is equipped with more than 28 educational software programs. The Department of Education and Early Childhood Development (2009) states in its brochure titled "The Netbook Project: Anywhere, Anytime Access to Learning" that:

> The Netbook Project is part of a global movement towards a 1:1 ratio of students to wireless-enabled computers. Research shows students are more motivated and engaged in learning when they have their own computer. Computer use has also been linked to better organisational skills, improved Literacy and Numeracy, better collaboration and analytical thinking. Netbooks promote better learning in and out of school by encouraging: anywhere, anytime access to learning, independent, self-initiated learning, more family involvement in education, and collaboration between students in different schools, states and even countries.

The cost of the netbooks was subsidised by the Victorian government and parents of grade 6 children paid AUD$52 per year to lease the netbooks for use at home and school. The government also provided all participating schools with wireless access points for the netbooks, and in-school technical support personnel.

Change or innovation within classrooms always necessitates change in teaching practice and student learning. Although the use of ICT in classrooms has become commonplace, 1:1 netbook learning is still far from commonplace in Australian classrooms. It is expected that the introduction of individual student netbooks into grade 6 classrooms would produce affordances that will impact on teaching practice and student learning. Thus the problem for this research study is: what are the affordances of 1:1 netbook learning for teaching practice and student learning, and how do these affordances impact teachers and students? There has been a large amount of research from the U.S.A. relating to 1:1 laptop learning programs, and similarly, but to a lesser degree, there is also research from the United Kingdom (U.K.) and Canada. Findings from these studies are reviewed in Chapter 2.

However, extensive research has revealed that there are very few research studies about 1:1 laptop learning programs in Australia. Searches for Australian research on 1:1 laptop learning included searches of databases such as: Libexplore, Informit, Proquest, and Australian Digital Thesis. Web searches were undertaken such as Google Scholar and Google, with specific web sites also searched, for example Association for Active Educational Researchers Conference Papers, Anywhere Anytime Learning Federation, Australian Centre for Educational Research, Australian Council for Computers in Education, the Victorian Department of Education and Early Childhood Development, the Queensland Department of Education, and the Western Australia Department of Education and Training.

Table 1 (Appendix 19) shows summaries of Australian research studies in 1:1 laptop learning. The studies by Allitt (1995), Calnin (1998) and Owen, Lambert and Hurworth (1993) (all as cited in Whitefield, 2004), McDonald (1993), Newhouse (1994, 1997), Rowe (1993), and Stolarchuk (1997) are now over 10 years old. The current relevance of these studies is limited due to rapid changes and advancements in ICT such as web 2.0, wireless internet, advances in multimedia and animation software, student email, the proliferation of high quality, interactive educational websites on the internet, podcasting, vodcasting, blogs, wikis and video conferencing. Newhouse and Rennie (2001) and Newhouse (2001) conducted studies in Western Australian secondary schools, whilst Kessell's (2001) (as cited in Whitefield, 2004) research was conducted in a Western Australian school and studied years 5, 6, 7, 8, 9 and 10, and Gaynor and Fraser (2003) studied year 5 students. Tierney and Hunt (2009) conducted their study in Queensland primary schools and studied years 1, 2 and 3. Ainley, Bourke, Chatfield, Hillman and Watkins (2000) conducted a qualitative study in one Victorian secondary school, whilst Whitefield (2004) conducted a qualitative study in four Victorian secondary schools that were operating mature (of three or more years standing) 1:1 laptop learning programs. Bateman and Oakley's (2009) qualitative study, commissioned by Intel Australia Pty Ltd. was conducted in six primary schools, two in Victoria, two in New South Wales and two in Queensland. Whilst Larkin (2010) conducted his mixed method study of year 7 students in a Queensland Catholic school. The Victorian schools studied in past Australian 1:1 laptop learning research were all within the Melbourne metropolitan area, and were studied using either a qualitative or a quantitative approach. There appear to be at this stage no mixed methods studies conducted in Victorian schools, and no studies which have been approached through the lens of affordance theory as is done in this study.

Seventeen school evaluation reports on 1:1 laptop learning programs were also located and are summarised in Table 2 (Appendix 20). These school evaluation reports were between two and 16 pages in length and summarised that particular school's 1:1 laptop learning program.

There are no 1:1 netbook learning studies of the rural Victorian population and no mixed methods studies of Victorian Schools. In addition, no other research study that this researcher has been able to locate from Australia or overseas has approached this topic through the theoretical lens of affordance theory (as discussed in Section 1.6 of this study). Therefore this study with its target population, mixed methods approach, affordance theory theoretical lens, and focus on netbooks as opposed to laptops makes a unique contribution to current knowledge surrounding 1:1 netbook learning programs.

It is significant that, in an article in the *Australian Educational Computing* journal, Larkin and Finger (2011) note that they too were unable to locate any research around the use of 1:1 netbooks in education. It is their recommendation that research is required around educationally appropriate models of netbook usage and that the research should consider the educational affordances of the netbook. Furthermore, Larkin (2010) in his Australian doctoral dissertation recommends that research into 1:1 learning in contexts such as government primary schools in regional areas be required to study the potential benefits of 1:1 computing.

1.5 Significance of this Research

In keeping with the recommendations of Larkin (2010) and Larkin and Finger (2011) this study offers an examination of the affordances of 1:1 netbook learning on teaching practice and student learning in rural Victorian primary schools. Using a mixed methods approach and an affordance theory lens this study is unique and is designed to demonstrate better understandings of the affordances and impacts which 1:1 netbook learning has on teaching practice and student learning in Australian classrooms. This study will directly inform 1:1 practice in Australia. The outcomes will enable administrators and educators to use this information to plan and implement 1:1 laptop policy and programs into schools. This study will assist teachers in recognising the affordances offered by 1:1 netbooks and how they can best manipulate the learning environment to maximise the potential benefits and minimise the potential difficulties of 1:1 netbook learning in their classrooms. Students will benefit from this study as teachers and policy makers equipped with information on the affordances of 1:1 netbook learning are able to implement an efficient and effective program, designed to maximize the affordances offered by 1:1 netbook learning and to facilitate the best possible student learning outcomes. The use of the "Affordance Theory" theoretical lens to guide this research will enable this study to

provide a unique contribution to the current knowledge around 1:1 netbook learning as to date no other research study that the researcher has been able to find has used "Affordance Theory" as a theoretical lens to frame their research into 1:1 netbook (or laptop) learning. Further, the use of the Affordance Theory lens also facilitates the advancement of new knowledge in Affordance Theory.

1.6 The Philosophical Foundation of the Study: Pragmatism

According to *A Short Annotated Bibliography on Pragmatism* (2001), the founders of pragmatism are Peirce (1839–1914), James (1842–1910), and Dewey (1859-1952). It was Peirce who laid out the basic pragmatist tenet that the meaning of a statement lies in its consequences. Then, in 1907 after a series of discussions with Peirce, James described pragmatism as a technique for clarifying concepts and hypotheses, and defusing apparently insoluble disputes (Hookway, 2008). James asserted that pragmatism is a method for becoming reflectively clear about the contents of concepts and hypotheses by identifying their practical consequences (Hookway, 2008). James described pragmatists as mediators between extremes with scientific loyalty to facts, but also having confidence in human values and the resultant spontaneity (Goodman, 2009). Later, Dewey became a leading proponent of pragmatism (Field, 2005). He viewed knowledge as arising from humans' active adaptation and inquiry rather than from the human mind observing the world passively (Field, 2005). Dewey described a pattern of inquiry in which humans first begin by understanding a problem, describing its elements and identifying relationships, and then, through practical problem solving, common sense investigations and scientific inquiry resolve the problem, at which point the inquiry thus comes to an end (Hookway, 2008). James (1906) emphasizes that pragmatism has no dogmas, and no doctrines save its method, and stands for no particular result only an attitude of orientation, which is what the pragmatic method means. Pragmatism holds that any thought or inquiry has its own course of action which necessarily follows from it. Further, pragmatists reject absolute truths, viewing truths as holding only as long as they remain practical (James,1906).

Whilst the influence of pragmatism declined during the first two-thirds of the twentieth century, since the 1970s it has undergone a revival (Hookway, 2008), and in the 1990s many researchers started advocating a pragmatic worldview (Johnson & Christensen, 2008). According to pragmatic philosophy, what is important is that the research design is one in which the research questions will be best answered (Johnson & Christensen, 2008). Pragmatism acknowledges that both qualitative and quantitative research is very important and often should be mixed in a single research study, that is, a mixed methods approach (Johnson & Christensen, 2008).

In pragmatism the researcher provides multiple perspectives of reality (ontology), collects data according to what works (epistemology), includes both biased and unbiased perspectives (axiology), collects both quantitative and qualitative data (methodology), and employs both formal and informal styles of writing (Creswell & Plano Clark, 2007).

As reported in Johnson and Christensen (2008, p. 443), the world view of pragmatism has the following characteristics: firstly, it recognises the existence and importance of the natural and physical world as well as the emergent social and psychological world that includes language, culture, human institutions and subjective thought. Secondly, it places high regard for the reality and influence of the inner world of human experience in action, as knowledge is viewed as being both constructed and based on the reality of the world we experience and live in. Different, even conflicting, theories and perspectives are seen as useful in pragmatism with observation, experience and experiments all being valid ways to gain understanding of people and the world. Human inquiry i.e. what we do in our day-to-day lives as we interact with our environments, is viewed as being analogous to experimental and scientific inquiry. Finally, pragmatism views current truth, meaning and knowledge as tentative and changing over time, what we obtain on a daily basis is viewed as provisional truth.

Mixed methods research is a research design with philosophical assumptions as well as methods of enquiry. Pragmatism is the worldview typically associated with mixed methods research (Creswell & Plano Clark, 2007). Pragmatism provides a foundation for mixed methods research because the research question is of primary importance in pragmatism and therefore the choice of research methods should logically follow what will work to best answer the research questions with the possibility of both quantitative and qualitative methods being used in a single study (Tashakkori & Teddie, 2003). Pragmatism employs what works, using diverse approaches, and values both objective and subjective knowledge (Creswell & Plano Clark, 2007). In accordance with the pragmatic worldview held by this researcher, a mixed methods research design has been deemed most appropriate for this study in order to best answer the research questions. Chapter 3 provides an in-depth discussion of the research design for this study.

1.7 Theoretical Lens

The pragmatic worldview holds that research always occurs within context; therefore, mixed methods research studies which are underpinned by a pragmatic worldview may include a theoretical lens to set the context of the study (Creswell, 2008). Cherryholmes (1992) asserts that pragmatists choose the theoretical lens which they perceive will best produce their anticipated or desired outcomes. This lens provides the guiding

perspective that gives structure to a mixed methods research study (Creswell, 2005, 2009), by assisting the researcher to integrate key pieces of information in a logical manner, thereby conceptualising the study (Radhakrishna, Yoder & Ewing, 2007). The use of a theoretical lens to guide a research study provides an essential tool to stimulate the advancement of new knowledge (Verma & Mallick, 1999).

This researcher has chosen the theoretical lens of affordance theory for this study. The history of affordance theory and its development in the fields of education and ICT is discussed in Chapter 2. Throughout this thesis, the term affordance refers to the concept as used by Norman (1999). That is, the term affordance refers to both the properties of an object which determine how the object could be used to serve a goal. Affordances result from the individual's mental interpretation of things, based on their past knowledge, experience and goals (Norman, 1999). This thesis discusses positive, negative and sequential affordances offered by 1:1 netbook learning in Grade 6 classrooms. In this study, the object is the student's netbook, and the individuals are the grade 6 students and teachers involved in this study.

1.8 Research Questions

The theoretical lens of affordance theory has provided the framework for developing the research problem and research questions in this study. The research problem for this study is: "What are the affordances of 1:1 netbook learning for teaching practice and student learning and how do these affordances impact teachers and students?" The following research questions have been developed to, firstly, discover the affordances of 1:1 netbook learning and secondly, how these affordances impact teaching practice and student learning in grade 6 classrooms. The research questions for this study are:

1. What are the affordances of 1:1 netbook learning for teaching practice and how do these affordances impact on teachers?
2. What are the affordances of 1:1 netbook learning for student learning and how do these affordances impact on students?

1.9 Scope of the Study

The philosophical assumptions of pragmatism underpin this research project and, as such, a mixed methods research design was deemed the most appropriate approach to answer the research questions. This mixed methods research study uses a triangulation design, convergence model, whereby the quantitative and

qualitative data were given equal weighting, concurrently collected and separately analysed prior to the researcher integrating the data by comparing and contrasting the two data sets during the discussion phase of the research. Chapter 3 discusses the research methodology and participants in detail.

1.10 Curriculum Framework

As all schools and teachers participating in this study were from Victoria they were all working within the Victorian Essential Learning Standards (VELS) curriculum framework. VELS outlines what is essential for all Victorian students to learn during their time at school from preparatory to year 10, providing a set of common state-wide standards which schools use to plan student learning programs, assess student progress and report to parents (Victorian Curriculum and Assessment Authority, 2007). VELS is organised into three connected areas of learning called strands. The first strand is "Physical, Personal and Social Learning", in which students learn about themselves and their place in society, including health and physical education, interpersonal development, personal learning and civics and citizenship (Victorian Curriculum and Assessment Authority, 2007). The second strand is "Discipline-Based Learning," in which students learn the knowledge, skills and behaviours in the Arts, English, Humanities (Economics, Geography, History), Mathematics, Science and languages other than English (Victorian Curriculum and Assessment Authority, 2007). The third strand is "Interdisciplinary Learning", in which students explore different ways of thinking, solving problems and communicating. This includes communication, design creativity and technology, information and communications, technology, and thinking processes (Victorian Curriculum and Assessment Authority, 2007). This framework guides all curriculum planning, implementation and assessment in Victorian schools.

1.11 Limitations of the Study

This research study was conducted in 2009 during the DEECD grade 6 1:1 netbook trial. This was the first time grade 6 teachers and students in this research population had experienced 1:1 laptop learning. This situation offered a research advantage as participants could easily make comparisons between a 1:1 laptop learning environment and a non-1:1 laptop learning environment. However, this also posed a limitation on this study as the ways in which 1:1 laptop learning impact on teaching practice and student learning in a grade 6 class would continue to change and evolve over time as grade 6 teachers and students become more accustomed

to teaching and learning in a 1:1 laptop learning environment. To address this limitation, this research study therefore pertains only to the first year of implementation of a 1:1 laptop learning program.

This study was conducted in a Victorian regional city with a population of 100 000 people. The findings from this study may therefore not transfer to schools in other settings with different population types. For example, schools in urban settings, schools with a different socioeconomic makeup, schools with a different cultural makeup, or schools in different countries may not find the results of this study applicable to them.

There are also limitations with mixed methods research, qualitative research and quantitative research. However, the measures which the researcher took to overcome these limitations and to maintain the validity and integrity of this study are discussed in the methodology chapter of this thesis.

1.12 Role of the Researcher

As it is not possible to eliminate biases in research it is important that the researcher articulates her perspective, frames of reference toward the topic, and personal biases (Chamberlain, 2004). For this reason it is helpful to gain some insights about the researcher (Chamberlain, 2004). The researcher is employed as a classroom teacher in a school which participated in the "Netbook Trial"; however, no teaching staff or students from that school were involved in this research study. The grade 6 students in the researcher's class received and actively used the netbooks throughout the trial period and, in addition, the researcher attended many professional development activities around 1:1 netbook learning during this time. Through this first-hand experience the researcher gained valuable insight and perspective into the affordances of 1:1 netbook learning for teaching practice and student learning. This experience produced in the researcher some bias toward 1:1 netbook learning, although every attempt has been made to minimise the effect of this bias from all aspects of this research study.

1.13 Definition of Terms

1:1 Netbook (Laptop) Learning: Conceptually defined as an instructional environment where students have a computer and relevant software available to them 24 hours a day, seven days a week. This strategy enables learners to have immediate and continuous access to infinite resources (Buckenmeyer et al., 2008).

Affordance: Throughout this thesis, the term affordance refers to the concept as used by Norman (1999). That is, the term affordance refers to the perceived properties of an object that determine how the object could be used to serve a goal, and which result from the individual's mental interpretation of things, based on their past knowledge, experience and goals (Norman, 1999). This thesis discusses both positive and negative affordances. Positive affordances are defined as those affordances which produce benefit to the student (Gibson, 1979) and negative affordances are defined as those affordances which preclude the student from learning or engaging in particular kinds of interactions (Akhras & Self, 2002). In addition, this thesis discusses sequential affordances, defined by Gaver (1991) as the process in which the individual acting on a perceptual affordance is led to information indicating new affordances.

Blog: A method of expressing oneself using a personal online diary on a website (Sharp, 2009).

Impact: Norman (1988) stated that affordances have resultant impacts. The word impact is defined in the The Macquarie Dictionary as the influence or effect exerted by a concept (Delbridge, Bernard, Blair, Peters, & Butler, 1992). Thus this researcher defines an impact as the influence or effect exerted as a result of acting on a perceived affordance.

Index of Community Socio Educational Advantage (ICSEA) A special measure that enables meaningful and fair comparisons to be made across schools. The variables that make up ICSEA include socio-economic characteristics of the small areas where students live (in this case an ABS census collection district), as well as whether a school is in a regional or remote area, and the proportion of Indigenous students enrolled at the school. It has been developed specifically for the My School website for the purpose of identifying schools serving similar student populations. The average ICSEA value is 1000 (Australian Curriculum Assessment and Reporting Authority, 2010).

Multimedia: Typically defined as an electronic document that can include text, sound, graphics, animation, video, and interaction (Barrios et al., 2004).

Netbook: A portable computer which weighs just over one kilogram. In this context, it was pre-loaded with 28 educational software programs, and had full wireless capacity for access to internet and email (Department of Education and Early Childhood Development, 2009).

Podcast: A podcast is an audio and/or video file that can be listened to live from the internet or downloaded to a personal computer (Department of Education and Early Childhood Development, 2010).

Web 2:0: A term used to refer to the second generation of the web which contains blogs, social networks and wikis (Sharp, 2009).

Wiki: A website where individuals can view, edit and add to information (Sharp, 2009).

1.14 Outline of the Study

The remaining chapters of this thesis take the following format. Chapter 2 of this thesis reviews the current literatures surrounding 1:1 netbook learning programs, and Chapter 3 discusses the methodology for this study. Chapters 4 and 5 discuss the findings from the teacher interviews and teacher surveys. Likewise Chapters 6 and 7 discuss the findings from the student interviews and student surveys. Chapter 8 is a discussion of these findings, with Chapter 9 stating the conclusions of this study. Chapter 10 puts forward the recommendations from this study, addresses the suitability of the research methodology for answering the research questions, and raises further questions for research. The references and appendices can be found at the end of this thesis.

2. Review of Literature

2.1 Introduction

This review of literature involved extensive research around 1:1 laptop learning programs. Searches included education and ICT databases, web searches such as Google Scholar and Google, with education and ICT specific web sites searched individually. Emails were sent to schools that are leaders in 1:1 laptop learning and to educators and leaders in 1:1 laptop learning requesting if they knew of, or had participated in any research on 1:1 laptop learning. An extensive search of ICT and educational journals, and a detailed examination of the reference lists of all research reports used in this review were also conducted. Section 2.2 discusses the difficulties and limitations of this review of literature. The theoretical lens of this study is addressed in detail in Section 2.3.

Saldana (2009) recommends that in organising the written thesis the category and thematic tags used in the qualitative coding also be used as the headings in the written report. Thus, the headings, *Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers* and *Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students,* used throughout this thesis represent the two major themes of this study, and also the research questions used for this study. The subheadings used throughout this thesis represent the tags used in the secondary cycle of data coding, which served to unpack the major themes of the study into categories.

2.2 Limitations of this Review of Literature

As discussed in Section 1.4 extensive research revealed that there are very few research studies about 1:1 laptop learning programs in Australia. The majority of the studies reviewed in this "Review of Literature" are from the United States of America, e.g. Bebell (2005; 2008), Chamberlain (2004), Davies (2004), Fairman (2004), Great Maine Schools Project [herein GMSP] (2004), and Zucker et al. (2005). The few available Australian studies such as Bateman and Oakley (2009), Newhouse (2001), Newhouse and Rennie (2001), Tierney and Hunt (2009) and Whitefield (2004) have been included in this review. The studies from the U.S.A. are set within the differing contexts of the various U.S.A. state educational departments, and different cultural backgrounds which may mean limited transferability of these findings to Australian schools.

Whilst some of the studies reviewed here are PhD theses, for example, Chamberlain (2004), Dinnocenti (2001), and Niles (2006), many of the other studies were externally funded. For example, Intel Australia Pty Ltd

commissioned Bateman and Oakley (2009), Bill Gates Foundation commissioned GMSP (2004), and Jeroski (2003) was commissioned jointly by Apple Canada and Horizon Research. Other studies were commissioned by the relevant state education departments both from U.S.A. and Australia, or funded by the schools involved in the study, for example, Bebell (2005, 2008), Florida Department of Education (2006-7), Texas Center for Educational Research [herein TCER] (2006) and Tierney and Hunt (2009). Meanwhile other studies have been commissioned by various ICT related organisations, such as Davies (2004) commissioned by the Maine Learning Technology Initiative and Grimes and Warschauer (2008) commissioned by the Ada Byron Research Centre for Diversity in Computing Information and Technology. Whilst these studies have sound methodology, stakeholders have commissioned them and invested large amounts of money into the 1:1 laptop learning program, this is acknowledged as a limitation. Indeed most of these studies report 1:1 laptop learning in an extremely positive manner and few of them have discussed the drawbacks and potential difficulties of 1:1 laptop learning in detail. This thesis integrates all potential difficulties and/or drawbacks as evident throughout the review of literature.

Also, many of the studies reviewed here focus at least in part on aspects of 1:1 laptop learning which are not consistent with the affordance theory lens with which this study is being conducted. For example, studies such as Bebell (2005), Florida Department of Education (2006-7), GMSP (2004) and Gulek and Demirtas (2005) focus on the students' learning outcomes as measured by standardised testing. Other studies such as Barrios et al. (2004), Dinnocenti (2001), Livingston (2006) and Silvernail and Lane (2004) focus on the technological requirements of implementing a 1:1 laptop learning program. Others still such as Barrios et al. (2004), Maine Education Policy Research Institute [herein MEPRI] (2003), focus on policy development. Some studies, such as Barrios et al. (2004), also focus on the funding issues around the implementation of 1:1 laptop learning. Aspects of these studies which are relevant to this study have been included in this review of literature.

The use of ICT in education from an affordance perspective as covered by authors such as Davis (2004), Kennewell (2001), Siemens and Tittenberger (2009), Volet and Wosnitza (2004), Wijekumar, Meyer, Wagoner and Ferguson (2006), and Zhang (2008) do not examine 1:1 learning. This researcher has been unable to locate any 1:1 netbook learning research study which has been written from an affordance theory perspective. Instances where authors and researchers have discussed the affordances of ICT, specifically computers or laptops in education, have been included in this review. However it should be acknowledged as a limitation that an affordance theory lens underpins none of the 1:1 laptop learning studies included in this review.

The literature included in this 'Review of Literature' has been carefully selected by the researcher and the less credible sources of literature were discarded during this process. The literature presented is predominately research based and has been drawn from researchers whose methodology was deemed to be sound and their findings credible and relevant to this study. Some non-research based literature from authors who are experts in their field has also been included where relevant.

2.3 Affordance Theory

As discussed earlier, the theoretical lens for this study is affordance theory. To date, this researcher has not been able to find any other studies on 1:1 netbook (or laptop) learning which have been approached from an affordance theory perspective, thus this research study provides new information in relation to this topic.

This section follows on from Section 1.6 in discussing affordance theory, beginning with Gibson, who first coined the term affordance theory in 1979, and continuing with a discussion of Norman, who further developed the theory of affordances in 1988 by including the human – machine interaction. This section also includes the writings of other theorists who have contributed to the development of this theory; the construct of negative affordances; the definition of affordances used in this thesis; criticisms of the theory of affordances; and the use of affordance theory in the fields of ICT and education.

2.3.1 Gibson's theory of affordances.

Ecologist James J. Gibson was the first scientist to introduce the theory of affordances. In 1979 he defined affordances as the individual's perceived possibilities for action within their environment, stating that affordances entail a complementarity between the human and the environment, where any substance, surface, environment or object has an affordance for benefit or injury to someone (Gibson, 1979). Gibson proposed that while different environments have different affordances which always exist, or are real, these affordances may not always be perceived by individuals (1979). Thus, affordances do not change as the actor's needs change (Brown, Stillman & Herbert, 2004).

Gibson believed that affordances exist independently of the individual's ability to perceive them. Gibson viewed affordances as relying on direct perception of the actor to pick up the information that specifies the affordance (McGrenere & Ho, 2000). The existence of the affordance itself is independent of the actor's experiences and culture, but the ability to perceive the affordance may be dependent on these (McGrenere & Ho, 2000). The individual's perceptions and capabilities will characterise the affordances which they perceive to be

offered by particular environments and the perception of affordances will vary depending on the individual's prior experiences and perceptual abilities (Gibson, 1979). The affordance is there, it has always been there, but it needs to be perceived to be realised (Hammond, 2010).

Gibson believed that when looking at an object, the first thing that people will notice is its affordances. Gibson (1979) suggested that what we see are an object's affordances, not its qualities. He explained that when required to do so, people can discriminate and analyse the dimensions and qualities of an object; however, what we normally pay attention to are the affordances which the object offers. Further, Gibson (1979) states that infants and young children begin by noticing the affordances of an object, thus meaning is observed by the child before the object's particular qualities are seen. Gibson (1979) goes on to explain that man changes his environment to alter what it affords him. Over the millennia man has changed his environment to make it more beneficial to himself, that is, making it easier for him to survive and to educate his offspring (Gibson, 1979). Thus it could be argued that right from its conception, affordance theory has had an important contribution to make to educational thinking, as man manipulates his environment specifically to improve the educational opportunities available to his children.

Objects can have both positive and negative affordances. Gibson (1979) clarifies that the perceiving of an affordance is not a process of perceiving a value-free object to which meaning is somehow added, but that it is a process of perceiving a value-rich ecological object. He discusses both positive and negative affordances stating that any substance, surface, environment or object has an affordance for benefit or injury to someone (Gibson, 1979). Positive and negative affordances are the properties of things taken with reference to an observer but not properties of the experiences of the observer, thus they are not subjective values (Gibson, 1979). In Gibson's theory affordances are neither in the world of mind or in the world of matter, but rather exist in the environment with limitless opportunities for observers or actors (Gibson, 1979).

Gibson's work on developing affordance theory was underpinned by the work of the Gestalt psychologist Koffka. Koffka recognised that the meaning or value of a thing is perceived just as immediately as its colour (Gibson, 1979). Koffka (1935) asserts that the value of something changes as the need of the observer changes. The crucial difference between this and Gibson's affordance theory is that for Gibson the affordance of something does not change as the needs of the observer changes (Gibson, 1979). The observer may or may not perceive the affordance, but the affordance is always there to be perceived (Gibson, 1979).

2.3.2 Norman's theory of affordances.

In 1988 Norman further developed Gibson's theory of affordances by including human-machine interaction in the theory. Norman (1988) stated that affordances are dependent on an interplay between the design aspects of an object (or machine), the physical capabilities of the individual, and the individual's goals, plans, values, beliefs and past experiences. Thus, Norman determined that affordance is a relationship between the object and the organism that is acting on the object (Norman 1999).

In addition, individual perceptions played a large part in Norman's theory of affordances. According to Norman (1999) the term affordance refers to both the perceived and actual properties of an object. He emphasises that real affordances are not nearly as important as perceived affordances, as it is the perceived affordances which determine the object's usability. Affordances result from the mental interpretation of things, based on our past knowledge and experience applied to our perception of the things about us (Norman, 1999).

Norman's view of affordances is different from Gibson's view of affordances in several ways. The most fundamental difference between the two is that for Gibson an affordance is the action possibility itself whereas according to Norman it is both the action possibility and the way that that action possibility is conveyed or made visible to the actor (McGrenere & Ho, 2000). Norman argues that perception by an individual may be involved in characterizing the existence of an affordance; he refers to both perceived and actual properties, implying that a perceived property may or may not be an actual property, but regardless, it is an affordance (McGrenere & Ho, 2000). In Norman's theory affordances result from mental interpretation of things, based on the individual's past knowledge and experience (McGrenere & Ho, 2000).

This is in contrast to Gibson for whom affordances are independent of the actor's experience, knowledge, culture, or ability to perceive (McGrenere & Ho, 2000). Gibson's affordances require direct perception by the actor which is only possible when there is an affordance and there is information in the environment that uniquely specifies that affordance (McGrenere & Ho, 2000). For Gibson an affordance exists or it does not independently of the perceptions of the actor (McGrenere & Ho, 2000). Gibson's affordances offer action possibilities in the environment in relation to the action capabilities of an actor, whereas Norman's affordances imply perceived properties that may or may not actually exist (McGrenere & Ho, 2000).

As this research study is examining teachers' and students' perceptions of the affordances of 1:1 netbooks, this researcher contends that Norman's theory which includes individuals' perceptions, prior experiences, knowledge and goals in the recognition of affordances is the more suitable conceptualisation of the theory of affordances for use in this study.

2.3.3 Other conceptions of affordance theory.

A study of affordance theory literature reveals other authors have also contributed to the discussion surrounding the defining of affordances. For example Vera and Simon (1993) describe affordances as internal representations of complex configurations of external objects. These internal representations are acquired as individuals carry out a complex encoding of sensory stimuli (Vera and Simon, 1993). Therefore, Vera and Simon (1993) assert that affordances are carefully encoded internal representations of complex configurations of external objects.

However, Gaver (1991) affirms, similarly to Gibson, that affordances exist whether they are perceived or not. Gaver (1991) states that common examples of affordances refer to perceived affordances in which there is perceptual information available for an existing affordance. He then introduces the concept of sequential affordances in which acting on a perceptual affordance leads to information indicating new affordances. Thus the notion of affordances may be extended to include exploration, and that such exploration may then lead to information indicating new affordances, and thus affordances can be revealed over time (Gaver, 1991).

This notion of sequential affordances leading to new affordances will be discussed further in Chapter 8 and Chapter 9.

2.3.4 Negative affordances and constraints.

Affordances can be either positive or negative. Gibson (1979) describes negative affordances not as being subjective values, but rather as affordances which are offered or provided by the environment which may be injurious, dangerous or as producing ill to an observer. Gibson (1979) takes care to specify that negative affordances are not the properties of the experience of the observer such as pain, but rather the properties of things when taken in reference to an observer, thus they are not subjective values. Akhras and Self (2002) in their work on affordances in education describe negative affordances as being affordances of the environment which preclude a student from learning or engaging in particular kinds of interactions, or from constructing her or his own solution to the problem at particular times.

Complementary to affordances, but fundamentally different from affordances are constraints. Whilst Norman (1988) describes how constraints such as the physical properties of objects or socially and culturally acceptable conventions may restrict human behaviour, it was Greeno (1998) who introduced the term constraints into affordance theory, building on its original use in situation theory. Subsequently Kennewell (2001) described constraints as being complementary to affordances, not the opposite of affordances, providing structure and

guidance for the course of actions (Kennewell, 2001). Similarly, Tanner and Jones (2000) in their paper on the use of ICT to support interactive secondary Mathematics teaching, define constraints as being the properties of the environment, problem, situation or social context which limit possible actions.

In keeping with the work of Gibson (1979) and Akhras and Self (2002), this thesis will discuss both the positive and negative affordances of 1:1 netbook learning. However, constraints as described by Greeno (1998), Kennewell (2001) and Tanner and Jones (2000), are conceptually different from affordances and will not be included in this discussion as they do not fall under the scope of this research project which specifically addresses the affordances of 1:1 learning.

2.3.5 The impact of affordances.

Norman (1988) stated that affordances have resultant impacts. The word impact is defined in *The Macquarie Dictionary* as the influence or effect exerted by a concept (Delbridge et al., 1992). Thus this researcher defines an impact as the influence or effect exerted as a result of acting on a perceived affordance.

2.3.6 Criticisms of the theory of affordances.

Gibson's theory of affordances has received much criticism from theorists and authors who were challenged by Gibson's rejection of cognitive science's view of indirect perception. For example, Ullman (1980) stated that Gibson's rejection of the combination of sensations by the mind does not by itself justify the conclusion that processes such as inference, interpretation, computation, categorization, assimilation, or stabilization have no place in the theory of perception. Similarly, Michaels and Carello (1981) argue that in both cognitive and behaviourist theories, perception is indirect, that is the data we pick up in the world is inadequate or impoverished, and needs to be processed, or reordered internally for the perceiver to make sense of it. Likewise, Fodor and Pylyshyn (1981) also had difficulty with Gibson's affordance theory, asserting that what makes Gibson's position seem outrageous from the scientific community's perspective is that it is presented as an outright denial of the current view of the time and not merely a reformulation of parts of it. Meanwhile, Bickhard and Richie (1983) criticise Gibson for rejecting memory, inference and enhancement in his theory of direct perception, and Vera and Simon (1993) argue against direct perception by stating that in order to acquire an internal representation of an affordance a person must carry out a complex encoding of sensory stimuli.

However, Greeno (1994), in support of Gibson, counters these arguments and concludes that Gibson's view of perception is a system that picks up information that supports coordination of the agent's actions with the systems that the environment provides. Also in support of Gibson, Hutchby (2001) states that while uses and definitions of tools are socially constructed they do nonetheless have material properties, and some objects and environments have affordances which enable a particular activity, while others do not. In addition Hammond (2010) asserts that the strength of Gibson's affordance theory is that it offers an alternative to the realist perspective that the world exists independently of the perceiver.

Whilst acknowledging that objects and environments offer specific affordances that are not offered by other objects and environments, this researcher contends that perception of affordances is an internal process dependant largely on the individual's mental interpretation, past knowledge, experience and goals, and therefore affordances are both the perceived and actual properties of an object. This fits most closely with Norman's (1999) position.

2.3.7 Definition of affordances used in this thesis.

This researcher contends that Norman's theory which includes individuals' perceptions, prior experiences, knowledge and goals in the recognition of affordances is the more suitable conceptualisation of the theory of affordances for use in this study. Therefore throughout this thesis, the term affordance refers to the concept as used by Norman (1999). That is: the term affordance refers to the perceived properties of an object that determine how the object could be used to serve a goal, and result from the individual's mental interpretation of things, based on their past knowledge, experience and goals (Norman, 1999).

In this case, the object is the student's netbook, and the individuals are the grade 6 students and teachers involved in this study.

This thesis discusses both the positive and negative affordances offered by 1:1 netbook learning in Grade 6 classrooms. Positive affordances are defined as those affordances which produce benefit to the student (Gibson, 1979) and negative affordances are defined as those affordances which preclude the student from learning or engaging in particular kinds of interactions (Akhras & Self, 2002). For example a positive affordance may be a student using the internet to engage in productive research for a project, whilst a negative affordance may be a student becoming distracted from the task by using the internet to search for pictures of their favourite pop star.

In addition, this thesis discusses sequential affordances, defined by Gaver (1991) as the process in which the individual acting on a perceptual affordance is led to information indicating new affordances. This enables this researcher to include exploration as the action on an affordance, and the recognition that such exploration may then lead to information indicating new affordances.

This thesis also discusses the impacts of affordances. As discussed in Section 2.3.5 this researcher defines an impact as the influence or effect exerted as a result of acting on a perceived affordance.

2.3.8 Affordance theory in ICT and education.

Affordance theory has been widely used in the fields of ICT and education. In 1988 Norman appropriated the term affordances in the context of the human – machine interaction and subsequently in 1991 Gaver used the notion of affordances as a way of focussing on the strengths and weaknesses of technologies with respect to the possibilities they offer the people that use them. Gaver (1991) asserted that the concept of affordances allows us to consider technologies in terms of the actions they make possible and obvious, and to focus on the interaction between the user and the technology.

Then in 1993 Pea suggested that the notion of affordances be used in exploring the interrelationship between computers and educational practice, recommending that research into affordances in education is essential. Affordances in educational practice were also discussed by Greeno (1998), and Tanner and Jones (2000) who further developed the use of affordance theory within educational settings by defining an affordance as a potential for action, and the capacity of an environment or object to enable the intentions of the student within a particular problem situation. This idea of affordances as potentials has since become the more common use of the term affordance (Brown et al., 2004).

However, the use of affordance theory in ICT and educational research has caused some confusion and controversy. John and Sutherland (2005) observe that although affordance theory has become ubiquitous in ICT literature, definitional and deployment problems persist and a number of conceptions or perspectives have emerged within the literature. Similarly, Jones, Dirckinck-Holmfeld and Lindström (2006) in their article pertaining to computer-supported collaborative learning suggest that a rethink of the theoretical concept of affordances was important. Meanwhile Dohn (2009) posits that the ambiguities and inherent tensions in the ways in which the concept of affordance is used within the field of computer supported learning, combined with

the influence which this lack of clarity has on concrete, empirical analyses and design, warrants discussion of the topic.

In coming from a pragmatic philosophical foundation this researcher believes that affordance theory is the theoretical lens which provides the best guiding perspective and structure for this study into the affordances of 1:1 netbook learning. This researcher has avoided the problems in defining and conceptualising affordance theory as cited by John and Sutherland (2005), Jones et al. (2006) and Dohn (2009) by providing a detailed explanation of the development of affordance theory and a clear definition of the term affordance to be used in thus study. In this way ambiguities, confusion and misconception around the researcher's use of the terms affordance and affordance theory have been avoided.

Webb and Cox (2004) developed a framework (Figure 1) in which the relationship between classroom pedagogical practices, the presence of ICT in the classroom and the affordances perceived by the teachers and the students is illustrated. This framework illustrates how teachers identify ICT affordances for exploring and developing the ideas and skills that are to be taught (Webb & Cox, 2004). Teachers then need to build into lesson plans practices that involve activities in which they and the students also have roles in engaging with affordances of ICT. Teachers can facilitate their students' learning by alerting them to the presence of an affordance, by increasing access to an affordance provided by ICT, or by giving students additional information about an affordance (Webb & Cox, 2004). This framework includes students' knowledge, beliefs and values as these inform their behaviours and the affordances which they perceive (Webb & Cox, 2004).

Figure 1 illustrates what occurs when 1:1 netbook learning is introduced to the classroom. The teachers' perception of the affordances offered by 1:1 netbook learning is informed by their knowledge, beliefs, values and pedagogical goals and reasoning. Teachers then use this perception of affordances to develop lessons which take advantage of the 1:1 netbooks in order to meet their pedagogical goals (teacher behaviour). Meanwhile, the students also bring to the classroom their perceptions of the affordances offered by 1:1 netbook learning. Student perceptions are informed by their knowledge, beliefs, values, goals and behaviours. These factors determine the perception of the affordances offered by the 1:1 netbooks in meeting the classroom pedagogical goals. The learning activities in the classroom result from the affordances as perceived by the teacher and the students; these learning activities lead the students to new knowledge, understanding and skills. It could be argued that this final step in actual fact leads back to the beginning of the framework in a cyclical fashion, with the students' new knowledge understanding and skills allowing them and their teachers to

potentially perceive further possible affordances as offered by the 1:1 netbooks. This utilises what is termed sequential affordances by Gaver (1991).

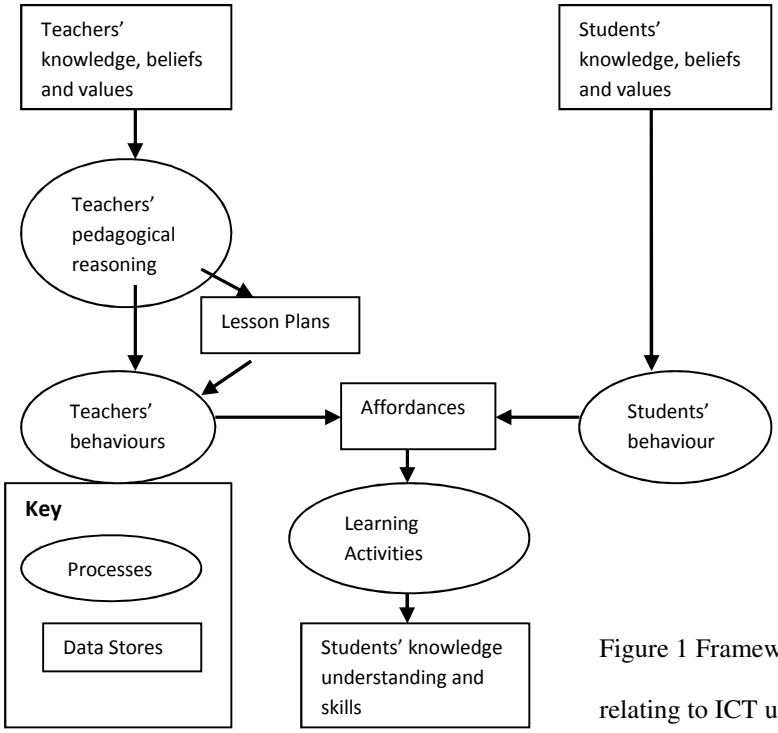

Figure 1 Framework for pedagogical practices relating to ICT use (Webb & Cox, 2004).

2.3.9 Justification for using affordance theory as the theoretical lens of this study.

This researcher in coming from a pragmatic worldview has chosen the theory of affordances to conceptualise this study as being the theoretical lens which will best produce the desired outcomes. Affordance theory enables this researcher to study teachers' and students' perceptions of the affordances offered by 1:1 netbooks, taking into account that the affordances which they perceive are shaped by their prior knowledge, experiences, and goals. Affordance theory provides a foundation for establishing positive affordances of 1:1 netbooks as being those affordances which produce benefit to the student, and negative affordances as being those affordances which preclude the student from learning or engaging in particular kinds of interactions. In addition, affordance theory allows this researcher to study exploration as acting upon an affordance, and the recognition that such exploration may then lead to information indicating new affordances (sequential affordances).

Researchers and authors in the fields of education and ICT have used affordance theory previously. For example: Gaver (1991), Pea (1993), Greeno (1998), Tanner and Jones (2000) and Webb and Cox (2004). However, the use of the affordance theory as a theoretical lens to guide a 1:1 netbook research study is uncommon. Whilst Craig (2002) focussed on the affordances of laptops and how they are used in K-12 learning environments, her paper is not specifically focussed on 1:1 laptop learning, and is not a research study. Additionally, Gaved et al. (2010) in their research study of how netbooks have been used in various learning settings, use the term affordances interchangeably with functionalities. However, they do not discuss affordance theory as the lens for their study, nor is affordance theory discussed in any other context throughout their report. Also they do not make any links between their findings and affordance theory. Further, their study was conducted in secondary schools in England, and does not specify that the netbooks were being used exclusively in a 1:1 learning environment.

This researcher suggests that this Australian study of 1:1 netbook learning in grade 6 classrooms utilising an affordance theory lens, may be unique, and as discussed by Verma and Mallick (1999), the selection of affordance theory lens for this study will enable the advancement of new knowledge in the field of ICT in education. Research into the affordances of 1:1 netbook learning environments is also important. Wijekumar et al. (2006) state that it is important as it enables us to determine the affordances of educational technologies in order to understand how students perceive the affordances of technologies, and to maximise the learning potential of these technologies. The affordances of ICT in education more generally, as written about by authors and affordance theorists, are discussed further in this chapter.

2.4 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers

2.4.1 Lesson planning and preparation.

When working in a 1:1 learning environment, teachers more frequently use ICT to plan and prepare their lessons. Research studies into pedagogical changes after the implementation of a 1:1 laptop learning program reveal that teachers working in this environment use ICT more often in their lesson planning and preparation than their counterparts in non-1:1 laptop learning environments (Ashmore, 2001; Bebell, 2008; Bebell & Kay, 2010; Newhouse, 2008; TCER, 2006). Bebell (2005), in his investigation of the first year of 1:1 computing in New Hampshire middle schools, reports that when such a program is introduced teachers

demonstrate a significant increase in their use of ICT to plan lessons and to create assignments, tests and quizzes.

Additionally, teachers in this environment include more ICT into their lessons than teachers working in a non-1:1 laptop learning environment. For example, in their Australian qualitative study of grades 3, 4, 5 and 6 classes, Bateman and Oakley (2009) found that teachers allowed students to use their computing devices to publish their work. Further, Bebell (2005) found that teachers more often use ICT and the internet to present information and instruction to the class, and to model relationships or functions. Likewise, Bebell (2008), Bebell and Kay (2010), Davies (2004), Donovan (2006), Jeroski (2003), and Silvernail and Lane (2004), in their research studies found that teachers in 1:1 learning environments are more likely than their non 1:1 laptop learning counterparts to use the internet to access broader and more in-depth information sources for their lessons. Further, they are more likely to take advantage of the interactive resources and lesson plans available on the internet, and use ICT to produce handouts, activity sheets, tests and quizzes. Whilst Lowther, Ross and Morrison (2003) observe that this may be due to the fact that 1:1 laptop learning students have access every day to their own laptops, thus lessons can span across several days without the teacher worrying about the availability of the computer laboratory. However, in his study of Mathematics and Science instruction in 1:1 learning secondary schools in Henrico County in Virginia, Zucker et al. (2005) found that teacher planning time is often being crowded out by the demands of the new technology, and that teachers who are less technologically competent are finding that integrating laptops into their lesson plans requires more preparation time. Changes to teachers' workloads which occur in a 1:1 learning environment are discussed in Section 2.4.5.

Teachers also report changes in the way they plan their lessons from a proactive model to a reactive model. Although he does not discuss 1:1 learning, Kennewell (2001), in his paper on using affordances and constraints to evaluate ICT in teaching and learning, uses the terms proactive planning to mean lesson planning which is conducted in advance, and reactive planning to mean lesson planning which is contingent on the continuous stream of events in the classroom. Angelo, Conners and Helkowski (2009) report that when teachers embrace ICT in their classroom Literacy program, a cultural shift from traditional instructor (proactive) approach to planning to a more facilitator (reactive) approach to planning occurs. Similarly, Gaynor and Fraser (2003) in their Australian research study of grade 5 classroom report changes from directive proactive program planning to facilitative reactive program planning occurs in a 1:1 netbook learning environment. They observed teachers reflecting that previously they would have their program planned in a particular way and that is the only direction in which classroom learning would happen. However, they find that in a 1:1 laptop learning

environment, teachers start with a base plan for a program and the students are able to take it in an individual direction.

Studies into the affordances of ICT in education indicate that having computers in the classroom introduces many affordances for teachers to provide variety in how they plan and prepare their lessons. For example, Wijekumar et al. (2006) found that computers allow teachers choices in how they present their lessons to the class. Also, Anderson (2004) in his discussion of the affordances of the world wide web finds that computers enable teachers to incorporate digital content and learning activities into their lessons. In addition Dori and Barak (2001) in their research on the use of virtual models in teaching organic chemistry found that computers enable teachers to plan for rapid simulation of what would previously have been time consuming experiments.

There are several gaps in the current literature which need to be addressed. These include: students' ability to recognise affordances which the teacher has not recognised, the possibility of sequential affordances in a 1:1 environment and the resultant changes to teachers' lesson planning and preparation.

2.4.2 Constructivist teaching.

This study proposes that fundamental to effective 1:1 laptop learning is a constructivist approach to education. Constructivism is a philosophy that views knowledge as a subjective process that is shaped and structured by one's experiences (Pelech & Pieper, 2010). That is, humans learn best when they are engaged and actively constructing meaning from the world around them (McInerney & McInerney, 2002; Woolfolk & Margetts, 2007; Yelland, 2007). Therefore, a constructivist teacher views his role as one of managing the learning environment and acting as a guide, facilitator and coach, and not the transmitter of all knowledge in the classroom (Pelech & Pieper, 2010).

Many educational theorists view knowledge as something which is constructed by the learner. For example, Piaget's theory was that students learn by interpreting the results of their interactions with the environment (Piaget, 1967). Piaget (1967) states that the source of thought is interaction with the environment, and that through physical manipulation of the environment the learner forms schemata. The learner's schemata are not static, but continue to grow and evolve one out of the other through successive interactions with the environment (Piaget, 1967). Intelligence is constructed as all previous schemata become embedded in the present schemata (Piaget, 1967).

Vygotsky believed that the construction of knowledge is often a shared process within a social context (1981). He asserted that conceptual thinking develops as older children face the challenges of the cultural, professional and civic worlds of adults. If the environment makes no new demands on an individual then that individual fails to reach the highest stages of thinking (Vygotsky, 1981). Vygotsky (1981) states that the relationship between thought to word is a continual movement back and forth and that words are used by the individual to direct their mental operations in concept formation. Every thought connects something with something else and establishes relationships and solves problems (Vygotsky, 1981). Once a new concept is incorporated into a child's thinking, it gradually spreads to older concepts and the child becomes capable of higher intellectual operations (Vygotsky, 1981).

In addition, Dewey believed that when children play, that is manipulate physical things, they develop meanings and concepts which are fundamental to intellectual achievement (Dewey, 1997). Thus Dewey believed that schools must present to the child problems to be solved by physical activity, experimentation and personal reflection, thereby helping the child to construct meaning and acquire knowledge (Dewey, 1997). Whilst educational theorists such as Piaget, Vygotsky, and Dewey are seen as constructivists, the word constructivism was not officially recognised by the education world until Magoon (1977) wrote that behaviours like learning might be best understood as being constructed by the learners.

In their article on the affordances offered by computer supported learning environments, Kreijns and Kirschner (2001) discuss how computers support constructivist learning. McInerney and McInerney (2002) also state that the potential for interactivity between the learner and the computer enables learning opportunities to be individually customised. The computer can clearly provide the means by which students can construct their own knowledge and in this context the computer is considered a vehicle for personal constructivism.

Researchers in 1:1 learning such as Katz and Kratcoski (2005), Dunleavy, Dexter and Heinecke (2007), Newhouse (1999), REA (2004), and Windschitl and Sahl (2002) find that 1:1 laptop learning can be a catalyst for teachers to develop a more constructivist pedagogy. Ashmore (2001) in her doctoral dissertation on the relationship between various models of laptop use and teacher instructional behaviour found that when students had full access to laptops the students were more likely to take greater responsibility for their own learning in the classroom, and that the teachers more frequently scaffolded learning tasks and assignments to encourage their learners to accept this responsibility. Moreover, Donovan (2006), Fairman (2004) and Niles (2006) in their studies on 1:1 laptop learning conclude that these environments enable teachers to move away from teacher-

directed teaching to student-centred teaching, changing the teacher's role from being the supplier of knowledge, to a constructivist role of support and facilitation of the active construction of knowledge by the learner.

There are several gaps in the current literature which need to be addressed. These include: the affordances of 1:1 learning programs in negotiated learning, and teachers' requirements for support when changing to a constructivist pedagogical approach.

2.4.3 Integration of the 1:1 laptops.

Introducing ICT into the classroom creates new tensions for teachers in terms of curriculum implementation. However, in order for change to occur teachers must first recognise the affordances offered by the ICT and then manipulate the learning environment to help the students see the affordances (Day & Lloyd, 2007; Webb & Cox, 2004). Teachers cannot just assume that the affordances provided by ICT will be realised by the students (Day & Lloyd, 2007). Therefore, teachers must plan to intensify student perception of the ICT affordances (Webb & Cox, 2004). Proper integration of ICT presents students with rich, varied learning. However, if the affordances are mismatched to the intended learning tasks it can be a frustrating experience for the learner (Siemens & Tittenberger, 2009).

Research in 1:1 learning reveals that the integration of 1:1 laptops into the existing curriculum can be problematic for teachers. TCER (2006) state that a major challenge for teachers in the first year of a 1:1 laptop learning program is simultaneously learning how to use technology and finding time to integrate laptops and digital resources into existing lessons. This study found that levels of laptop integration into the curriculum varied from school to school, but no school achieved full immersion in the first year of the program. The teachers' varying abilities and attitudes, coupled with perceived pressures to improve students' scores on standardised tests, made many teachers reluctant to try new and untested instructional methods and materials (TCER, 2006). Other studies have found different difficulties which hamper teachers. For example, Bernard, Bethel, Abrami and Wade (2007), in their research study on the integration of laptops into grade 3 classrooms, found that teachers were concerned that the implementation should complement rather than replace existing work. Further, some teachers expressed concern that technology integration should not be implemented at the cost of instruction on basic literacy and numeracy skills.

Integration is not equal across all areas of the curriculum. Students most frequently use laptops in English, Language Arts, Social Studies, History, Geography, Science, and French (Bebell, 2008; Davis et al., 2005; Fox, Greenlaw & MacPherson, 2007; Grimes & Warschauer, 2008; Hill & Reeves, 2004; Lowther et al.,

2003; MEPRI, 2003). Researchers Newhouse and Rennie (2001) report that 1:1 laptops are more likely to be used in classes where students are required to produce a substantial amount of documents. Similarly, Rockman ET AL (1998) in their study conducted for Microsoft Corporation found that laptops are used most frequently for research and for writing, while Zucker et al. (2005) found that they are also used for virtual activities, making and presenting movies and the creation of databases, spread sheets and web pages.

In some areas of the curriculum integration is less frequent. These include Mathematics, Physical Education, Art and Music (Bebell, 2005, 2008; Christensen & Knezek, 2006; Donovan, 2006; Grimes & Warschauer, 2008; Zucker et al., 2005). One reason for this is that teachers report that available internet resources in Mathematics are neither as extensive nor as rich as in other subject areas (Fox et al., 2007; MEPRI, 2003). However not all studies indicate that 1:1 laptops are used less often in Mathematics. For example, Oliver and Holcomb (2008) found increased level of laptop use in Mathematics after the implementation of a 1:1 program. Newhouse and Rennie (2001) found that students were using a CD ROM as their Mathematics text so, they concluded that students were therefore using computers more often in Mathematics classes. In his research from the United States of America on 1:1 computer use in Mathematics and Science classes, Zucker et al. (2005) specifies that an important factor in determining how students and teachers use the laptops in class is the availability of appropriate computer software. However, Webb and Cox (2004) state that teacher beliefs about teaching and learning as well as their understandings of the affordances provided by different types of software are the most important factors in how well teachers integrate ICT into the curriculum.

Interestingly, Newhouse (2001) found that use of 1:1 laptops to support learning in school diminishes across all areas of the curriculum during years 9 to 12. Newhouse attributed this decline to the organisation of courses in these years becoming progressively more teacher-centred with a greater focus on lower level cognitive skills such as factual recall. Furthermore, these later years are more greatly dominated by the requirements of external tertiary entrance exams which preclude the support of computer applications (Newhouse, 2001; Newhouse, & Rennie, 2001). This can be contrasted with the more learner-centred and integrated programmes in primary school and year 8 that place a greater range of cognitive demands on students and facilitate greater use of 1:1 laptop learning (Newhouse, 2001).

The literature highlights that teachers must make pedagogical changes in order to integrate 1:1 learning into their classrooms. Research demonstrates that teachers do this by using more problem-based and project-based learning, as well as using more independent inquiry and collaborative hands-on activities (Bebell, 2008; Miller, 2008; TCER, 2006). In their study of 61 schools in Florida, Lowther, Strahl, Franceschini and

Zoblotsky (2008a) observed that teachers integrated the laptops into the curriculum in meaningful ways, and that the laptops were used as learning tools. Likewise, in his review of the literature around the impact of ICT on learning and teaching, Newhouse (2002) states that teachers change their approach to teaching to ensure that the use of the laptops is meaningful for the students by carefully determining the situations in which the laptop is best able to support their programme of instruction.

In summary, in order to integrate the affordances offered by the 1:1 laptops into the curriculum. Teachers must first recognise the affordances offered by the 1:1 laptops and then make these affordances recognisable to their students. Use of laptops is more readily integrated into curriculum areas that require the students to conduct research and produce written documents such as English and Social Studies. However, the availability of appropriate digital resources makes it easier for teachers to integrate 1:1 learning into other curriculum areas as well.

2.4.4 Teacher communication.

This section discusses teacher-to-teacher communication in a 1:1 laptop learning environment. A discussion of the teacher-to-student communication can be found later in the review.

Many studies demonstrate that 1:1 laptop learning environments enable greater teacher-teacher interaction and communication. For example Ashmore (2001) in her Doctor of Philosophy research on the relationship between models of student laptop computer use and teacher instructional behaviour finds that teachers are more collegial and communicate with their colleagues more often. Burns and Polman (2006) in their research study conducted at a private boy's middle school in the United States of America found a dramatic increase in teacher-to-teacher communication occurs when such a program is introduced. They found that teachers share new ideas and discuss experiences with their colleagues as they implement and integrate 1:1 learning into their curriculum. Further, not only did teachers' face to face communication increase, but also their email communication with teaching colleagues from within their school and from other schools increased (Burns & Polman, 2006).

Other research also reveals that teachers in 1:1 laptop schools become more collegial and communicate with each other more often as they work collaboratively to plan, share knowledge and resources and solve problems together (Bebell, 2005, 2008; CRF and Associates Inc., 2004; Davies, 2004; Donovan, 2006; Fairman, 2004; Gaynor & Fraser, 2003; GMSP, 2004; Sclater, Sicoly, Abrami & Wade, 2006; Silvernail & Lane, 2004; Zucker et al., 2005). However, increased teacher-to-teacher communication and collegial support is not always

the case. This was demonstrated in research conducted by the TCER (2006) in 44 middle schools in Texas. They found the level of collegial support in one of these schools was minimal and that teachers in that school never or almost never interacted with their colleagues regarding 1:1 learning.

2.4.5 Teacher workload.

There are many aspects of 1:1 laptop learning programs which increase teachers' workloads. For instance both Silvernail and Lane (2004) and TCER (2006) in their studies in the United States of America found that teachers must spend time becoming more skilled technically in using the laptops, and more skilled pedagogically in integrating the laptops into their instruction. In addition Dinnocenti (2001) and Gaynor and Fraser (2003) in their research in primary schools found that teachers need to find time to understand the various software applications loaded onto the student computers, search the internet to find appropriate resource sites for classroom instruction, and upgrade existing lessons to a format compatible with student centred 1:1 laptop learning. Larkin (2010) states in his Australian study the teachers' lack of technological knowledge resulted in the netbooks being used as productivity tools, rather than as tools of innovative change. In order for teachers to take advantage of the potential of 1:1 learning, the technological knowledge component of the teaching practice of many teachers needs to be enhanced (Larkin, 2010). Teachers must also overcome the challenges of planning and designing effective computer-based lessons that address state-mandated content and standards (GMSP, 2004; Zucker et al., 2005) and manage increased marking duties due to increased student work output (Jeroski, 2003). Whilst most teachers agree that laptop initiatives have had a positive impact on their teaching, they also agree that it has added additional duties to their workload (Davis et al., 2005; Sclater et al., 2006). Dinnocenti (2001) finds that teachers express conflicted feelings between spending time with their own families on weekends, and spending time searching the internet for sites to use in class.

2.4.6 Classroom management.

When 1:1 laptops are introduced, classroom management issues may arise for teachers. Researchers Donovan (2006), Dunleavy et al. (2007) and Zucker et al. (2005) find that classroom management in this environment can become problematic as the laptops can become a distraction to student learning. Teachers need to quickly learn how to maintain the attention of students who have open laptops, how to deal with dead batteries and damaged screens, and how to help students learn about what is appropriate to do in school (Rockman, 2003). Students looking at the web sites of singers, movie and television stars, sports teams,

clothing manufacturers and playing computer games are more likely to be the problem than students accessing sites on pornography and weapons (Rockman, 2003).

For some teachers classroom management problems can become overwhelming in a 1:1 laptop learning environment. If the teacher does not have strong class management skills the computers simply add another layer of management complexity that is possibly overwhelming (Dunleavy et al., 2007). Bateman and Oakley (2009) in their Australian study on 1:1 laptop learning in primary schools cite instances where it became too much for some teachers and the devices were withdrawn from classroom practice. These teachers had become frustrated by having laptops in the classroom and felt that they could not waste time out of the curriculum in dealing with computer issues (Bateman & Oakley, 2009). Zucker et al. (2005) describe how teachers can find being the "ibook police" hard work.

However many of these classroom management issues can be overcome. Zucker et al. (2005) report that the teachers in their study introduced new classroom management strategies to manage 1:1 laptop learning. Teachers had to learn appropriate management strategies, such as checking computers to see whether students had visited inappropriate web sites, looking for students who quickly closed their computers when adults passed by because they were engaged in inappropriate activities, or requiring all students to put the computer screens down to listen to the teacher (Zucker et al., 2005). Another teacher said that she arranged the desks in the classroom so that she could monitor computer screens from different places in the classroom (Zucker et al., 2005).

2.4.7 Teacher energy and enthusiasm.

Many teachers find that the introduction of a 1:1 learning program is a catalyst which enables them to experience a renewed enthusiasm for teaching and to embrace the opportunity to reform their teaching practice. Research studies of elementary, middle and high schools in the United States of America such as Bebell (2005), Burns and Polman (2006), Dinnocenti (2001), Fairman (2004), GMSP (2004), and TCER (2006) state that teachers report renewed energy, enthusiasm and engagement in teaching practice and become excited about their opportunities to reform their lesson planning and teach in new and different ways. However in her doctoral study Niles (2006) finds that some teachers feel scared and powerless when a 1:1 laptop learning program is introduced because they do not know how to teach in this environment. Similarly Bateman and Oakley (2009) in their qualitative Australian research study find that teachers who are not confident in their own ICT skills are the most vulnerable to feeling powerless and losing confidence in 1:1 classroom situations.

2.4.8 Are the affordances offered by the 1:1 laptops important to teachers?

After working in a 1:1 laptop learning environment teachers describe the computers as being important to their teaching practise. Jeroski (2003) and REA (1998) found that the teachers they studied were highly enthusiastic about 1:1 laptop learning's positive effect on students and helpful impact on teaching. Dinnocenti (2001) states that teachers indicated that laptops have added a great dimension to their teaching and to student learning, as well as lifting staff unity, pride and morale. As well, Silvernail and Lane (2004) describe how teachers in Maine middle schools believe that the 1:1 learning program has benefited their teaching practice in areas such as accessing up to date information, exploring topics in greater depth, creating instructional materials, individualising the curriculum, meeting curriculum goals, accessing diverse teaching materials, and covering more material in class. They quote one teacher in their study as stating: "The laptops have been an incredible teaching and learning tool. It's like having an interactive textbook that never becomes obsolete. Students have produced quality work that taps into higher level thinking, such as analysing, comparing, contrasting, evaluating, and integrating" (p. 15).

Teachers stress the advantages of laptops over classroom desktops or school computer laboratories with greater access being the major benefit mentioned (REA, 1998). Teachers felt that 1:1 laptop access led to more immediate learning, greater efficiency, increased work time, increased work quality, an extended school day, a sense of ownership and independence, and greater equity for all classroom students (REA, 1998).

Other research into 1:1 laptop learning reveals more about teachers' beliefs that 1:1 laptops are important. Bebell (2005) finds that teachers believe the 1:1 laptops help students to grasp difficult curricular concepts and develop a deeper understanding of the subject material. Bebell (2005) also finds that teachers believe students are more willing to write second drafts when using a computer and work harder at their assignments. Likewise, Zucker et al. (2005) find that teachers believe the ability to visualize and manipulate data on the laptops kept the students more interested in the school work and consequently led to better student retention of the material.

However, the GMSP (2004) 1:1 learning study funded by the Bill and Melinda Gates Foundation reports that in response to an open ended question about the negative impacts of 1:1 laptops, three-quarters of the teachers indicated that the 3 most common negative impacts are: laptops provide an additional distraction in the classroom for some students, some students use laptops for non-educational purposes, and technology failure can have a negative impact on classes. Other negative influences raised by Dinnocenti (2001) are that teachers have to create back-up lessons in case of technical difficulties, take extra preparation time at home to learn how

to use the laptops, and have to act as technological trouble-shooters in the classroom. In spite of this, researchers such as Dinnocenti (2001), Donovan (2006), Grimes & Warschauer (2008) and MEPRI (2003) find that many teachers commit to continue with 1:1 laptop learning programs.

2.4.9 Summary.

When working in a 1:1 learning environment, teachers more frequently use ICT to plan and prepare their lessons, additionally, they include more ICT into their lessons. Teachers also report changes in the way they plan their lessons from a proactive model to a reactive model, starting with a base plan for a program and allowing the students to take it in an individual direction. Fundamental to 1:1 laptop learning is a constructivist approach to education and often the introduction of laptop programs can be a catalyst for teachers to develop a more constructivist approach to pedagogy.

Introducing ICT into the classroom creates new tensions for teachers in terms of curriculum implementation and pedagogy. A major challenge for teachers in the first year of a 1:1 laptop learning program is simultaneously learning how to use technology and finding time to integrate laptops and digital resources into existing practices. Some teachers report that planning time is often being crowded out by the demands of the new technology, and that teachers who are less technologically competent are finding that integrating laptops into their lesson plans requires more preparation time. Further, in order for teachers to integrate ICT affordances into the curriculum they must first recognise the affordances offered by the ICT and then manipulate the learning environment to help the students see the affordances. In addition, classroom management issues may arise for teachers as the laptops can become a distraction from student learning.

Teachers find they must make pedagogical changes in order to integrate 1:1 learning into their classrooms. Teachers use more problem-based and project-based learning, as well as using more independent inquiry and collaborative hands-on activities. In spite of this, 1:1 laptops are not integrated equally across all area of the curriculum. Students most frequently use laptops in English, Language Arts, Social Studies, History, Geography, Science, and French. Laptops are used less frequently in Mathematics, Physical Education, Art and Music. Use of 1:1 laptops diminishes across all areas of the curriculum during years 9 to 12.

Greater teacher-teacher interaction and communication is achieved through the introduction of laptops. Teachers become more collegial and communicate with their colleagues more often in a 1:1 learning environment. Many teachers find that the program is a catalyst which enables them to experience a renewed

enthusiasm for teaching and to embrace the opportunity to reform their teaching practice. After working in this environment teachers describe the 1:1 laptops as being important to their teaching practice.

2.5 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

2.5.1 The Internet.

The literature supports the statement that access to the internet can assist students with their learning. In a research study commissioned by Pew Internet and American Life Project on American middle school students' internet use, Levin and Arafeh (2002) found that students describe dozens of different education-related uses of the internet. For example: as virtual textbook and reference library, as virtual tutor, as virtual study group enabling them to collaborate on project work with classmates, to study for tests and quizzes, trade class notes and observations, as virtual guidance counsellor, as a virtual locker, backpack, and notebook, a place to store their important school-related materials, with online tools allowing them to keep track of their class schedule, syllabi, assignments, notes and papers. Research into 1:1 laptop learning programs demonstrates that nearly all students who have a 1:1 laptop use it to access the internet (Bebell, 2005; 2008; Chamberlain, 2004; Christensen & Knezek, 2006; CRF and Associates Inc., 2004; Davis et al., 2005; Donovan, 2006; Dunleavy et al., 2007; GMSP, 2004; Grimes & Warschauer, 2008; Jeroski, 2003; MEPRI, 2003; Silvernail & Lane, 2004; TCER, 2006; Zucker et al., 2005).

In research studies, teachers report that students' having easy access to the internet provides a valuable addition to classroom programs. For example, Dinnocenti (2001) finds that the internet provides stimulus to various senses during learning and students can zoom in and out on pictures and hear information in an audio format. Teachers also note that the use of the internet increases classroom efficiency: for instance, students are able to consult reference material or conduct research without leaving their desks, they are able to get information that used to take them a lot longer to retrieve, projects are quicker, and consequently teachers are able to cover more curriculum (Jeroski, 2003; Silvernail & Lane, 2004). REA (1998) state that 80% of teachers claim that 1:1 laptop use increases the number of sources which students use in research projects. However, Webb and Cox (2004), in their affordance theory study of information and communications technology pedagogy, note that as the nature and availability of the internet for schools develops, teachers need to identify

the wide range of affordances that this technology provides and to evaluate those in relation to their teaching objectives.

Students with 1:1 laptops also use web 2.0 applications on the internet. Research conducted by Dunleavy et al. (2007) finds that web 2.0 activities provide added value to 1:1 laptop learning by: an increased ability to formatively assess, an increased ability to individualize instruction and pacing, an increased ability to provide timely feedback, an increase in student interaction and collaboration, and an increase in student engagement. However in their affordance theory study of web 2.0 collaborative learning, Kuswara, Cram and Richards (2008) warn that simply making web 2.0 tools available does not guarantee their utilization. McLoughlin and Lee (2007) in their discussion on the affordances of social software assert that teachers need to use careful planning and have a thorough understanding of the dynamics of these affordances in order to make the most of them in the classroom.

Students having access to the internet through the use of 1:1 laptops can cause potential problems. Chamberlain (2004) finds that increased use of the internet to source information raises several concerns for teachers. Firstly, students need to be educated to assess the validity of information retrieved from the internet, secondly, training needs to include fair and ethical use of information and thirdly, teachers need to be given time to write and develop a more digitally based curriculum. Teachers' problems with classroom management relating to 1:1 laptop learning and the internet are also discussed in Section 2.4.6.

2.5.2 Multimedia.

Student access to multimedia applications which may be used for a range of educational purposes is facilitated by 1:1 laptop learning. Grimes and Warschauer (2008) report that there are 3 main ways that students use multimedia: for instruction, interpretation, and production of knowledge. They also found that teachers used multimedia to help students understand difficult concepts through online access to maps, video and audio simulations. In addition, The 2008 Horizon Report (2008) states that video papers and projects are increasingly common assignments and student-produced clips on current topics are an avenue for students to research and develop an idea, design and execute the visual form, and broadcast their opinion beyond the walls of their classroom (The 2008 Horizon Report, 2008).

Research studies such as CRF and Associates Inc. (2004), GMSP (2004), Swan, Van 't Hooft, Kratcoski and Schenker (2007) and TCER (2006) reveal that students in 1:1 laptop learning classrooms are more likely than their non 1:1 laptop learning peers to receive instruction in multimedia format, or to use

multimedia in their independent research. Swan, Kratcoski, Van 't Hooft, Schenker and Lin (2005) in their mixed methods research study observe that students are more visual learners than ever before and therefore lessons created by teachers need to visually rival video games, television, and DVDs. Students they observed in their study created digital representations of their knowledge via a website, PowerPoint and digital movies; they noted that the students were very engaged in these projects and took great pride in the quality of their work. However Windschitl and Sahl (2002) report that some teachers felt that the presence of multimedia in presentations was glitzy, time consuming, not necessary and a distraction from the real learning.

In his journal article on matching learning tasks with learning technologies according to their affordances, Bower (2008) states that computers allow the use of photo, video and sound which serve to aid retention in the learning environment. Lai, Yang, Chen, Ho, and Chan (2007) in their study on the affordances of mobile technologies found these technologies also enable the use of multimedia such as photography. Similarly Webb (2005), in her article on the affordances of ICT in Science learning, notes that ICT enables the use of multimedia.

There is a gap in the current literature which needs to be addressed; this is students' use of multimedia applications to reflect on their learning and improve their oral presentation skills in a 1:1 learning environment.

2.5.3 Laptop preloaded software.

Students frequently and extensively use the laptop's preloaded productivity tools. Programs such as *Microsoft Office Word* are frequently used by students as their primary writing tool to record their learning in notes, papers and presentations (Bebell, 2005; CRF and Associates Inc., 2004; Dunleavy et al., 2007; Lei & Zhao, 2008; Lowther et al., 2003, 2008a; MEPRI, 2003; REA, 1998; Russell et al., 2004; Sclater et al., 2006; Swan et al., 2005; TCER, 2006). Students in these studies also reported that using their laptop to write resulted in neater work which was produced more quickly and was easier to share electronically with their classmates. However, in their Australian 1:1 laptop learning study of students in years 1, 2 and 3, Tierney and Hunt (2009) report that technical difficulties such as the laptops not being able to run multiple applications at the same time impacted on student work practices. Almost as frequently as they use *Microsoft Office Word*, students use *Microsoft Office PowerPoint* to produce slideshows to easily create presentations and projects which represent their knowledge (Bebell, 2005; GMSP, 2004; Sclater et al., 2006). Likewise, Bower (2008), Webb (2005) Wijekumar et al. (2006) observe that computers allow data entry, writing, audio, image and text input and output in classrooms.

2.5.4 Organising work.

Students use their 1:1 laptops as personal organisational tools. Research by Chamberlain (2004), Davies (2004), Davis et al. (2005), GMSP (2004), Grimes and Warschauer (2008), Jeroski (2003), Lowther et al. (2003), MEPRI (2003) Silvernail and Lane (2004) and Zucker et al. (2005) reveals that 1:1 laptops enable students to have ready access to all of their learning materials and assignments which helps them to develop better organisational skills and study more efficiently. Further, having everything they are studying and learning in one place, organised in a way that makes sense to them, is powerful and motivating for students. However, Zucker et al. (2005) in their study report that for some students the laptops did not help with the organization of their work and that the teachers reported feeling frustrated when students came to class unorganised because they did not have their laptops with them.

2.5.5 Student communication.

Student communication is facilitated in a 1:1 laptop learning environment according to the research. Reports that students have increased capacities for interaction, collaboration and communication and that they communicate with each other through email and video conferencing more often than do students without laptops (Dinnocenti, 2001; Dunleavy et al., 2007; GMSP, 2004; Hill, & Reeves, 2004; Russell et al., 2004; TCER, 2006). The GMSP (2004) found that 52% of students in 1:1 laptop learning environments report using their laptops every day to communicate with other students and their teachers, a further 21% of students use their laptops at least weekly for communication purposes.

This adds value to the teaching and learning process by providing an increased capacity for communication between teachers and students (Bateman & Oakley, 2009; Bebell & Kay, 2008; Christensen & Knezek, 2006; CRF and Associates Inc., 2004; Dunleavy et al., 2007; Lei & Zhao, 2008; Sclater et al., 2006). Both students and teachers report that they interact and communicate with each other more frequently and effectively since the introduction of laptops, particularly where they have access to e-mail and instant messaging (Bateman & Oakley, 2009; Fairman, 2004; Livingston 2006; Lowther et al., 2003; Niles, 2006; Zucker et al., 2005). Further, this increase leads to improved relationships between students and teachers (Bebell, 2005; Davies, 2004; MEPRI, 2003).

These studies confirm the work of Kreijns and Kirschner (2001) who, in their paper on the social affordances of computer supported learning environments, and Wijekumar et al. (2006) who, in their research on technological affordances, all note that the computer is a tool which enables communication with others.

2.5.6 Relevance of student learning to the real world.

Both Anderson (2004) in his discussion of the affordances of the World Wide Web, and Lai et al. (2007) in their discussion of the affordances of mobile technologies find that computers provide access to information which is real time, expedient, immediate, authentic, accessible, efficient, convenient and up to date. Therefore, 1:1 laptop learning programs make student learning more relevant to the real world. Further, computers bring the real world into the classroom through streaming video and audio conferencing and web 2.0 applications. Likewise, research finds that 1:1 laptops add relevancy, authenticity, real world meaning, and interest to the students' education (Lowther et al., 2003; TCER, 2006). Computers create new opportunities for curriculum and instruction by bringing real world problems into the classroom for children to explore and solve (Commission on Behavioral and Social Sciences and Education, 2000).

2.5.7 Interesting and enjoyable learning.

Many research studies have found that students find learning more interesting and enjoyable with their own laptop. For example Bebell (2008), Chamberlain (2004), CRF and Associates Inc. (2004), Davies (2004), GMSP (2004), Grimes and Warschauer (2008), Jeroski (2003), Lowther et al. (2003), Lowther et al. (2008a) and Silvernail and Lane (2004) show that both teachers and students feel that using 1:1 laptops in class has inspired interest in students and made learning more enjoyable. REA (1998) found students reported that they prefer to use laptops to do schoolwork as laptops make learning fun and interesting and enabled the application of their own imagination. The same study also found that teachers believed that this increased student interest encourages students to spend more time on their work and complete larger projects. Dinnocenti (2001) found that students in the school she studied were eager to come to school, eager to turn on their laptops, and enthusiastic about learning.

However, Christensen and Knezek (2006) in their comparative study of a 1:1 laptop learning school with a non 1:1 laptop learning school found that students in the non 1:1 laptop learning school reported greater enjoyment and less anxiety in learning with a computer than their 1:1 laptop learning peers. The results inferred that students in the 1:1 laptop learning school perceived working with computers as more "work" than their

counterparts in non 1:1 laptop learning schools. Similarly, Wijekumar et al. (2006) assert that student orientation toward learning is different when computers are present because the students' previous experiences of the affordances of computers prompts them to multitask, for example simultaneously chatting online with friends whilst completing a computer based educational activity. They conclude that this multitasking comes at the expense of student learning. They argue that researchers' and designers' attempts to create computer-based, learning-rich environments are lost on school age learners who only see computers as providing them the opportunities to be entertained, play games and chat with friends. However, in spite of these findings, Wijekumar et al. (2006) conclude by stating that educators' best course of action may be to take advantage of the communication tools and games to help students to learn through enjoyable activities.

2.5.8 Higher order thinking, problem solving and in-depth learning.

Students with laptops spend more time than their non 1:1 laptop learning counterparts on higher order thinking, problem solving and in-depth learning tasks. Davies (2004) found that in 1:1 laptop learning classrooms students spend more time on academic work and show greater evidence of their ability to employ higher-order thinking skills. Similarly, Bateman and Oakley (2009) in an Australian study found that 1:1 laptops helped students to grasp difficult curricular concepts, to work harder at their assignments and consequently to develop deep understanding of the subject material. REA (1998) found that 1:1 laptops enabled students to better access, organise, analyse and communicate information so, consequently they concluded that teachers were able to make lessons more detailed and rigorous which assisted the students in reaching a higher level of intellectual complexity. Likewise, in his review of the literature around 1:1 laptop learning, Newhouse (2002) stated that unnecessary repetition of low-level tasks is inefficient and not necessary in this environment. He asserts that many computer applications provide the tools to support students in rapidly completing these lower-level tasks so that students can more quickly focus on the main purpose of the activity.

Other studies such as Florida Department of Education (2006-7), Gaynor and Fraser (2003) and Lowther et al. (2003), have also found that 1:1 laptop students frequently engage in higher-level thinking, problem solving and in-depth learning. Moreover, Lowther et al. (2008b; 2003) and Windschitl and Sahl (2002) found that the introduction of laptop programs into classrooms frequently serves as a catalyst encouraging teachers to implement teaching and learning strategies designed to facilitate the development of higher order thinking skills in their students. However researchers at TCER (2006) caution that in some instances, although teachers in 1:1 laptop learning schools were using ICT more, their lessons typically lacked intellectual

challenge. They subsequently asserted that ICTs impact on student achievement hinges not just on more frequent ICT use, but also on using ICT to facilitate more rigorous and authentic learning.

REA (1998) conducted research on the application of critical thinking skills in laptop students as opposed to non-laptop students in middle and high schools in the United States of America. They found that 1:1 laptop students applied critical thinking skills more readily than non-laptop students. Further, these laptop students immediately became engaged in addressing the controversial nature of their problem, gathering and evaluating evidence related to the alternative perspectives on the issue, seeking information about the situation and developing a strategy for supporting their own position on the matter. In contrast, non-laptop students tended to ignore the real-life controversial aspects of their problem. They seemed to view their task as a request to write a descriptive report rather than to take and defend a position on the matter in a public forum. REA (1998) concluded that these differences support the idea that 1:1 laptop students are thinking critically and creatively about various aspects of the real-life issues, whereas non-laptop students are more likely to follow established procedures typically used when gathering information for school reports.

Conole and Dyke (2004) in their paper examining the affordances of ICT find that asynchronous technologies enable in-depth learning and reflection by offering students the potential for reflection and critique, with learners engaging in discussions over a longer time frame than is possible in face-to-face discussions. Also, Bower (2008) in his discussion of learning technology affordances finds that ICT offers synthesis affordances by providing the capacity to combine multiple tools together to create a mixed media learning environment. Webb (2005) asserts that ICT can be used to provide new affordances for developing deeper learning, problem solving strategies, data collection and interpretation skills, and to promote cognitive development and conceptual understanding.

2.5.9 Individualisation of student learning.

Research shows that in 1:1 laptop learning environments teachers are better able to individualise the curriculum in order to meet individual students' needs. For example, Russell et al. (2004), in their study comparing the teaching and learning in classrooms equipped with shared carts of laptops and classrooms with 1:1 laptops, found that the complexity of the worldwide web allows teachers to differentiate instruction to meet an individual student's learning requirements by selecting different web sites for students to use in order to meet their individual learning needs. Also, researchers at MEPRI (2003) found that teachers in 1:1 laptop classrooms are able to cater for many individual student learning styles by using technology to demonstrate concepts which

were previously not able to be modelled in a classroom. This made lessons more interesting, inclusive of up-to-date information, engaging, and of real world relevance for students. Swan et al. (2007), in the preliminary findings of their study of ubiquitous computing environments, report that 1:1 technology keeps the more advanced students engaged with enrichment work so that the teacher can spend more time with students who are having difficulty with fundamental concepts or skills. Likewise Dunleavy et al. (2007) report that each student is able to proceed through learning tasks at his or her own pace in an engaging, but challenging laptop or web-based program.

Other ways in which the 1:1 laptops facilitate teachers' ability to individualise the curriculum have been noted in the research. Laptops provide sound, pictures, movies, text and animation which allow teachers to meet individual students' learning styles by, for example, including video clips, interactive manipulatives, and three-dimensional displays in their lessons (Zucker et al., 2005). Teachers acknowledge that the quality of the information available on the internet is more visual, and that the visual stimulation is especially helpful to increase visual learners' awareness and understanding of key concepts (Dinnocenti, 2001; Swan et al., 2005). In addition, Bateman and Oakley (2009) found that some teachers constructed podcasts or short media clips to present work to their students, creating visual and audio segments, which meant that students could choose when and how to complete the task rather than all do it at the same time. One teacher in this study reflected that a benefit of this practice was that students with learning difficulties could replay the clip as often as they required. Other studies demonstrate that 1:1 laptop learning can increase teachers' ability to individualize their instruction and the curriculum, thus facilitating the students' ability to work independently (Bebell, 2005, 2008; Chamberlain, 2004; CRF and Associates Inc., 2004; Davies, 2004; Dinnocenti, 2001; Dunleavy et al., 2007; Silvernail & Lane, 2004).

The teacher's attitude toward helping individual students with their learning is changed in 1:1 learning environments. Fox et al. (2007) suggest that students in these environments see their teachers as being more relaxed and approachable in the classroom, and more effective in helping individual students to learn. Whilst Katz and Kratcoski (2005), in their research on teacher – student interactions in ubiquitous computing environments, find that the presence of ICT in the classroom causes an interactive triad between the teacher, student and the computer, rather than the traditional teacher-student dyad and the computer appears to be an active (rather than passive) participant in the learning context.

However, Miller (2008) finds that laptops can be a catalyst for superficial changes in pedagogical practice where only the medium of lesson presentation is changed, for example, a teacher using a slide show to

present a lesson which was previously presented on a chalkboard. According to Miller (2008), this is the most common level of pedagogical change seen in 1:1 laptop classrooms. However, Miller (2008) did also find examples of conceptual change in pedagogical practice, such as a shift to more constructivist or cooperative learning.

Bower (2008) and Conole and Dyke (2004), write that the non-linearity of the world wide web offers navigational, searching and linking affordances which lead to the potential for different routes through learning, enabling learners to individualise their learning. Likewise Collins and Halverson (2010) in their discussion of the affordances of digital media in education state that information technologies allow for the customization of learning environments to the needs of learners, with computer learning environments facilitating creative expression, providing hints and support to students when they need help, adapting to the level of the student's ability thus providing the kinds of individualized learning environments that allow all students to succeed (Collins & Halverson 2010).

2.5.10 Projects and assignments.

Students using laptops complete more independent projects and assignments that their non 1:1 laptop learning counterparts according to the literature. For example, research from Ainley et al. (2000), Davies (2004), Fairman (2004), GMSP (2004), Lowther et al. (2003), Niles (2006) and Sclater et al. (2006) shows that students in 1:1 laptop learning classrooms are engaged in significantly more independent project based activities in which they are given choices about what they will learn, how they will learn it, and how they will represent their learning. Katz and Kratcoski (2005) find that laptop classrooms are busy, active learning environments where there will frequently be multiple activities going on simultaneously in order to best meet student needs. Interestingly Tierney and Hunt (2009), in their quantitative and qualitative Australian study, found that the 1:1 laptop learning students in their study did not participate in more project-based instruction than non 1:1 laptop learning students. However the teachers in this study did indicate that the projects which the students had completed had a greater number of references and more information than similar projects completed by their non 1:1 laptop learning counterparts.

2.5.11 Student responsibility.

According to Grimes and Warschauer (2008) a major impact of 1:1 laptop programs is to promote greater student autonomy in learning. Also, in an Australian study of 1:1 laptop programs in grades 3 to 6,

Bateman and Oakley (2009) find that teachers believe that students in 1:1 laptop learning classrooms are more self-reliant and asked for help less. In addition both Niles (2006) and Windschitl and Sahl (2002) find that 1:1 laptops make the students more independent and that students take more responsibility for their learning by finding information and creating projects without constant teacher guidance. This is supported by Webb (2005) who writes that computers assist in students' self-management and enable them to track their progress so that teachers' time is freed to focus on supporting and enabling student learning (Webb, 2005).

Many other studies have also found that students in 1:1 laptop learning environments assume responsibility for their learning and take a leadership role in directing their learning, for example, Chamberlain (2004), Davies (2004), Dinnocenti (2001), Fairman (2004) and GMSP (2004). However, Tierney and Hunt (2009) in their study of grades 1 to 3 found that the 1:1 laptop learning students in their study did not direct their own learning indicating that this outcome may be age related.

In a 1:1 laptop learning environment, students also have the additional responsibility of caring for their computer. Whilst Chamberlain (2004), found that some students believed that they needed to be taught more about the responsibilities of caring for their laptop (such as what can be loaded onto it, keeping it safe, and not losing it), Jeroski (2003) found that many teachers reported surprise at the ownership, respect, and responsibility demonstrated by students when they become involved in 1:1 laptop learning programs and which resulted in an extremely low incidence of damage to the laptops.

There is a gap in the current literature which needs to be addressed; this is students' in a 1:1 environment taking responsibility for their learning by creating their own learning resources.

2.5.12 Group, cooperative and collaborative learning.

Collaborative learning occurs more often in 1:1 laptop learning programs according to Silvernail and Lane (2004) and Jeroski (2003). Similarly, REA (2004) found that educators involved in 1:1 laptop programs overwhelmingly promote collaborative learning, and that students in 1:1 laptop learning programs often gather together to work together on projects. In addition, Bebell (2005) reports that students' ability to work collaboratively with their peers improved in a 1:1 laptop environment. Other studies also report greater collaboration and cooperative group learning (Florida Department of Education, 2006-7; Davies, 2004; Dunleavy et al., 2007; Fairman, 2004; GMSP, 2004; Lowther et al., 2008a, 2008b; Swan et al., 2005; TCER, 2006; Tierney & Hunt, 2009).

Students work together and help each other with their learning tasks. A major feature of the 1:1 laptop classroom environment is the large amount of debate, conferencing and peer tutoring that occurs in the classroom; frequently students teach other students (Gaynor & Fraser, 2003; GMSP, 2004). In many cases, students seek support and advice from their peers before seeking help from their teacher, despite the teacher constantly being available and moving around the classroom to assist and help students (Bateman & Oakley, 2009; Gaynor & Fraser, 2003). Often there were further collaborations outside of the self-selected or teacher-selected groupings, for instance consulting students in another classroom, or consulting with multiple people in a virtual forum (Bateman & Oakley, 2009).

As students in 1:1 laptop learning programs work together more frequently on collaborative tasks, their social interactions increase. This is supported by Dinnocenti (2001) who found that social interactions occur between children as they discuss the curriculum. Similarly, Bateman and Oakley (2009) observed that, regardless of the ways the tasks were set, students often communicated amongst themselves both virtually and orally, discussing their approach to the work and their learning. In addition, Chamberlain (2004) observed that the incidental social aspects of collaborative work tasks enhanced the learning activity. Informal helping among students occurred in all lesson types, even in lessons where the teacher structured the activity in a way that emphasized individual work and minimized collaboration and student discussion (Fairman, 2004). However Niles (2006) reported that some teachers complained that students spent too much time instant messaging each other at the expense of productivity.

The introduction of 1:1 laptop learning can change the social dynamics in the classroom. Windschitl and Sahl (2002) report that teachers noticed that when students used laptops it changed who the student experts in the classrooms were. Fairman (2004) found that several teachers emphasized that the students who were deemed most “tech savvy” in a 1:1 laptop learning classroom were not always the high academic achievers, but were sometimes the low-achieving, at-risk, or even special needs students in the classroom. Similarly, Swan et al. (2005) found that teachers stated that certain students who had been marginalized in their regular classrooms took on leadership roles in a 1:1 laptop classroom and, as students learned with different people and assumed different roles in the class, relationships changed between the students and they were more willing to help each other and work collaboratively. Angelo et al. (2009) also report that social barriers crumble as students who would not consider interacting in the cafeteria, work together to offer advice on technological issues. The environment also facilitated ease of social interactions for shy children who expressed the views that they could use the laptop to email and communicate with other children in the grade thus making friends with the other

students, and that the laptop adds elements to their class presentations which enables them to overcome shyness and feel more confident talking in front of their peers (Chamberlain, 2004; Dinnocenti, 2001; Fairman, 2004).

Anderson (2004), Conole and Dyke (2004) and Webb and Cox (2004) in their articles on the affordances of ICT in education observe that the communication, collaboration and interactive abilities of ICT and the internet present a key affordance that offers the potential for collaborative learning. Likewise Volet and Wosnitza (2004) state that online learning provides social affordances which build social relationships between participants, and result in an increase in the individual's enjoyment, engagement and motivation for learning online, as well as providing mutual scaffolding in the construction of knowledge. However Kreijns and Kirschner (2001) highlight that just because social interaction is technically possible in a computer supported learning environment, it does not automatically mean that it will occur.

2.5.13 Presentation of student work.

According to the research, the presentation and quality of the students' work improves in a 1:1 laptop learning environment. Silvernail and Lane (2004) found that there was an increase in the quality of students' work and that students were more willing to do the editing and reworking that they would have avoided in a non-1:1 laptop learning environment. Other studies also indicate that the digital tools inherent in laptops add creative and artistic dimensions to the students' work and allow students to produce more professional looking work (Bebell, 2005, 2008; Dinnocenti, 2001; Gaynor & Fraser, 2003; GMSP, 2004; MEPRI, 2003; REA, 1998; Swan et al., 2007). Webb and Cox (2004) write that computers provide many formats for students to use including multimedia resources and text to create products and presentations in the area of Science education.

2.5.14 Inappropriate use of 1:1 laptops by students.

Having their own laptop presents the opportunity for students to use them inappropriately. In her research on their use in elementary schools, Dinnocenti (2001) finds that the majority of students were conscientious in how they used and cared for their laptops. However, Zucker et al. (2005) in their research in secondary schools find that teachers reported some management and discipline problems associated with the 1:1 laptops. Some teachers also stated that they found it difficult to monitor students' use of laptops for appropriateness. Students can sometimes use their laptops in inappropriate ways, for example: instant messaging each other in class time (GMSP, 2004; Jeroski, 2003; Niles, 2006); installing games or software which they do not own onto their laptops (Chamberlain, 2004); and using their laptops for games or other non-educational

activities, such as using it as a "Boom Box" (Chamberlain, 2004; Dunleavy et al., 2007; GMSP, 2004). Chamberlain (2004) also reports one incident of a student hacking into the school's grading database.

Some studies found that the students' frequent use of the internet raised problems, for example: students accessing pornographic or inappropriate web sites (Chamberlain, 2004; Dinnocenti, 2001; Dunleavy et al., 2007; GMSP, 2004; Jeroski, 2003) teachers' concerns about student safety on the internet (Donovan, 2006); teachers concern that students might just copy and paste information from the internet (Lei & Zhao, 2008); and students getting distracted by internet sites which are irrelevant to the current topic (Niles, 2006).

2.5.15 Learning at home.

Students who participate in these programs often complete more homework. In their Australian study Tierney and Hunt (2009) report a 300% increase in student homework completion rates in 1:1 laptop learning environments as compared to non 1:1 laptop learning environments. Lei and Zhao (2008) in their study of middle school students' use of laptops found that the increase in time spent on homework also encouraged parents to spend significantly more time working with their children on their homework. Other research into 1:1 laptop learning programs reports similar findings, that is that students in1:1 laptop learning programs are more anxious to share schoolwork which they have generated on the laptop and this facilitates greater parental awareness of their child's education and increased parent-child communication (Chamberlain, 2004; CRF and Associates Inc., 2004; Dunleavy et al., 2007). The programs also appear to extend the school day with students spending substantial amounts of out of school time completing schoolwork on their laptop computers (Davis et al., 2005; GMSP, 2004; Lowther et al., 2003; MEPRI, 2003; REA, 1998; Russell et al., 2004; Swan et al., 2005).

However, Zucker et al. (2005) reported a contradictory finding. Teachers in their study would have preferred the laptops not to go home with the students. Teachers reported that students did not use their laptops properly at home, but rather used them to download pictures and music and to create "all kinds of things that they shouldn't". It was also reported in this study that homework set on the laptops was often not completed.

2.5.16 Students' technology skills.

Studies of these programs find that students have improved technological skills and are better able to use their laptops to record and analyse data, create multimedia presentations, and search the internet for information (Bebell, 2005; Davies, 2004; Jeroski, 2003; Lei & Zhao, 2008; Lowther et al., 2003, 2008a; REA,

1998, 2004; TCER, 2006). These studies also show that 1:1 laptop learning students feel a greater confidence in their ICT skills.

Consequently students often teach the teachers as frequently students have more technical knowledge than their teachers. Teachers comment that students know more than they do about how to use the laptops and are the best teacher-resource for computer-related questions (Burns & Polman, 2006; Fairman, 2004; GMSP, 2004; Windschitl & Sahl, 2002). In their research on how middle school teachers integrate 1:1 laptops into their programs, Burns and Polman (2006) found that this role reversal creates an atmosphere that produces more personal communication and goodwill between teachers and students, facilitating closer teacher-student relationships. Similarly, Niles (2006) reports that students and teachers both recognize the change from the teacher being the only instructor in the classroom, to the students being instructors as well. Confidence is bolstered as students reported feeling more important when they can teach their teachers new technology skills and then realise that they have become more of an expert in class than the teacher (Chamberlain, 2004; Niles, 2006).

2.5.17 Student attitude toward school.

Students' self-confidence is built through 1:1 laptop learning programs which often improve the students' attitude toward school. Research confirms that the programs build students' confidence and self-esteem which enhance student satisfaction and promotes a positive attitude toward school (Davies, 2004; Dinnocenti 2001; Fairman, 2004; Zucker et al., 2005). Fox et al. (2007) write that many students express a very strong attachment to school, their peers and their teachers after working in such an environment. Further, Silvernail and Lane (2004) report that teachers believe that 1:1 laptop learning improves students' attendance, behaviour, motivation, engagement, participation in class and interaction with teachers and other students. Seventy percent of the students in their study report that they prefer to use their laptops and that the laptops allow them to get their work done more quickly, with better quality, and make school more interesting. In addition, research conducted by Volet and Wosnitza (2004) and Zhang (2008) into the affordances of ICT in education reports that an individual's perceptions of the ICT affordances in their environment can impact on their emotions. This is important in understanding the affective aspects of laptop programs.

2.5.18 Student motivation.

Students in 1:1 laptop learning environments are more motivated learners as reported in the research because having their own laptops gives students a more active role in choosing what and how they study, which stimulates dramatic changes in student motivation and work habits (Bateman & Oakley, 2009; Bebell 2005; 2008; Davies, 2004; Dinnocenti, 2001; Florida Department of Education, 2006-7; GMSP; 2004; Jeroski, 2003; Lowther et al., 2008a; Russell et al., 2004; Swan et al., 2005; Zucker et al., 2005). Livingston (2006) argues that in these environments students become more motivated to complete school work and often go beyond required assignments, thereby improving the quality of their work.

Other authors also indicate that students can be motivated by their perceptions of their environment. For example, Davis (2004) in his article on the emotion underlying behaviour and thought, states that an individual's perception of the affordances of their environment plays a significant role in their motivation levels. Similarly, Dunleavy, Dede and Mitchell (2008) write that students frequently report that using handheld computers is highly motivating. In her report on the potential of online learning environments Ala-Mutka (2009) states that such environments can provide meaningful activities for participants thus facilitating motivation and engagement. However, while evidence shows that 1:1 programs stimulate motivation in the short term, Chamberlain (2004) reports that in this environment over time student interest and motivation for learning decreases.

2.5.19 Student engagement.

Teachers report that their students are more engaged in learning in a laptop environment. This was illustrated by Bateman and Oakley (2009) who found that students became more engaged in their learning after the introduction of the 1:1 laptop learning program. Similarly, Bebell (2005) reports that students of all abilities have higher levels of engagement in learning in these environments. Whilst CRF and Associates Inc. (2004) report an increase in student engagement in classroom learning from 25% prior to the introduction of the 1:1 laptop learning program to 90% after the introduction of the program. In addition, Mei-Chuen and Wu (2010) in their study found that students were less distracted and more frequently on-task than their non 1:1 netbook learning peers. However, one teacher in Niles' (2006) study of teacher and student perceptions of 1:1 learning observed that some students are easily distracted by all the "bells and whistles" associated with laptops, and would be more focussed without technology.

The case for engagement in learning is further supported by Dunleavy, Dede and Mitchell (2008) and Volet and Wosnitza (2004) with regard to online interactive environments. Likewise, Collins and Halverson (2010) state that one potential of online learning environments is that they can be directed towards what people want to learn and, hence, are more engaging for the individual. In addition, 1:1 laptop learning studies by Bebell and Kay (2010), Davies (2004), Dunleavy et al. (2007), Fairman (2004), Florida Department of Education (2006-7), Jeroski (2003), Russell et al. (2004), Silvernail and Lane (2004), Swan et al. (2005), TCER (2006), and Tierney and Hunt (2009) all conclude that 1:1 laptop learning programs improve student engagement, attentiveness and willingness to work.

2.5.20 Student behaviour.

In many schools research reports that student behavioural problems decrease after the introduction of a 1:1 laptop learning program. A number of studies such as Bebell (2008), Dinnocenti (2001), Gaynor and Fraser (2003), Jeroski (2003), Silvernail and Lane (2004) and TCER (2006) report a decline in discipline problems. Teachers in these studies believe the laptops influence student behaviour and learning in a very positive way, observing that students who previously contributed negatively to the classroom learning environment can become the technology experts providing assistance and instruction to other students and teachers. In their Australian study, Tierney and Hunt (2009) report a drop of between 30% and 70% in "time-out" student offences in the 1:1 laptop learning schools. However, Chamberlain (2004) finds that 1:1 laptop learning presents the potential for student behaviour problems as students can become distracted by surfing the internet and "playing around" with their laptop when they should be concentrating on what the teacher is saying.

Dunleavy, Dede and Mitchell (2008) in their study on the affordances of ICT in teaching and learning find that computers can improve student behaviour. They found that students who had previously been disengaged and uninterested in school became better behaved and were more engaged in learning in a computer supported learning environment.

2.5.21 Are the affordances offered by the 1:1 laptops important to students?

Studies by Christensen and Knezek (2006), Davies (2004), Donovan (2006), Lei and Zhao (2008), Lowther et al. (2003) and Sclater et al. (2006) find that after having participated in a 1:1 laptop learning environment, the majority of students state that they believe that having a laptop is important to their learning, and that they would not like to go back to learning without one. Students in these studies state that laptops are

important as they enable access to up-to-date information, make it easier to edit work and to communicate faster. Silvernail and Lane (2004) in their study of the impact of 1:1 laptop learning programs on middle school teachers and students find that most students believe that laptops help them to complete more work, be better organized and be more involved in school.

There is a gap in the current literature which needs to be addressed; this is whether students' positive view of 1:1 learning translates into a more positive view of themselves as learners in these environments.

2.5.22 Summary.

There is strong support from the literature for the benefits associated with the introduction of 1:1 laptop programs in schools. Some research conveys reservations regarding the negative affordances of 1:1 laptops and their use in these programs.

Student access to the internet through a 1:1 laptop program increases classroom efficiency enabling students to consult reference material or conduct research without leaving their desks. Students are also able to use web 2.0 applications on the internet. In addition these programs facilitate student access to multimedia applications which may be used for a range of educational purposes. As well, students frequently and extensively use the laptop's preloaded productivity tools such as Microsoft Office Word, and use their laptops as personal organisational tools, giving them ready access to all of their learning materials and assignments which aids better organisational skills and more efficient study.

Student communication is facilitated through their laptops and students have increased capacities for interaction, collaboration and communication through email and video conferencing. In addition, students find learning more interesting and enjoyable. Students spend more time than their non 1:1 laptop learning counterparts on higher order thinking, problem solving and in-depth learning tasks, with computers affording access to information which is real time, expedient, immediate, authentic, accessible, efficient, convenient and up to date. Thus, 1:1 laptop learning programs make student learning more relevant to the real world.

In these learning environments the teachers are better able to individualise the curriculum to meet individual students' needs. For example, laptops provide sound, pictures, movies, text and animation which allows teachers to meet individual students' learning styles by including video clips, interactive manipulatives, and three-dimensional displays in their lessons. Students complete more independent projects and assignments and take more responsibility for their learning. Further, the presentation and quality of the students' work improves and they complete more homework than their non 1:1 laptop learning counterparts.

Students in these programs report an increase in their ability to use technology. Frequently the students have more technical knowledge than their teachers and as a consequence students often teach the teachers. Students participate more often in collaborative learning situations. Moreover, as they work together and help each other with their learning tasks their social interactions increase and the social dynamics in the classroom change. However, having 1:1 laptops in the classroom presents the opportunity for students to use them inappropriately, for example: instant messaging each other in class time.

Laptop learning programs build students' self-confidence which improves the students' attitude towards school. These students are often more motivated learners and are more engaged in learning. In many schools student behavioural problems decrease after the introduction of a 1:1 laptop learning program and after learning in this environment students state that the 1:1 laptops are important to their learning.

3. Methodology

3.1 Introduction

The philosophical assumptions of pragmatism underpin this research project and, as such, a mixed methods research design was deemed to be the most appropriate approach in order to answer the research questions. This mixed methods research study uses a triangulation design, convergence model, whereby the quantitative and qualitative data were given equal weighting, concurrently collected and separately analysed prior to the researcher integrating the data by comparing and contrasting the two data sets during the discussion phase of the research.

The theoretical lens of affordance theory provided the framework for developing the research problem and research questions in this study. The research problem for this study is: "What are the affordances of 1:1 netbooks for teaching practice and student learning in grade 6 classrooms, and how do these affordances impact on teachers and students?" The research questions were developed to firstly discover what are the affordances in a 1:1 netbook learning environment, and secondly how these perceived affordances impact teaching practice and student learning in grade 6 classrooms. The research questions for this study are:

1. What are the affordances of 1:1 netbooks for teaching practice, and how do these affordances impact on teachers?
2. What are the affordances of 1:1 netbooks for student learning, and how do these affordances impact on students?

This chapter discusses the methodology of this study, including: the mixed methods research approach, the triangulation design convergence model, challenges in using this model, examples of mixed methods research, participants and setting, quantitative data collection and analysis, qualitative data collection and analysis, mixed method data analysis and validity in mixed methods research.

3.2 Mixed Methods Research

Many authors have sought to define mixed methods research, (Bergman, 2008a; Johnson, Onwuegbuzie, & Turner, 2007; Tashakkori & Creswell, 2007). These independent definitions consistently characterise mixed methods research as involving the mixing within a single study of both quantitative and qualitative approaches then by integrating the findings from these two datasets, the researcher can draw

inferences and conclusions. The term "mixed methods research" as used throughout this thesis is defined as in Creswell and Plano Clark (2007):

> A research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method, it focuses on collecting, analysing and mixing both quantitative and qualitative data in a single study. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (p.5).

The world view and philosophical assumptions of pragmatism are typically associated with mixed method research (Creswell & Plano Clark, 2007). Mixed methods research offers many strengths. For example words, pictures and narrative can be used to add meaning to numbers, and numbers can be used to add precision to words, pictures and narrative (Johnson & Onwuegbuzie, 2004). Mixed methods research provides the strengths of both quantitative and qualitative research methods, as the researcher can use the strengths of qualitative research methods to overcome the weaknesses of quantitative research methods, and vice versa (Johnson & Onwuegbuzie, 2004). Further, mixed methods research can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach. It can provide stronger evidence for a conclusion through convergence and corroboration of findings and can add insights and understanding that might be missed when only a single method is used (Johnson & Onwuegbuzie, 2004).

Mixed method research aims to take the best of qualitative research and quantitative research methods and combine them (Bergman, 2008b). Quantitative research is weak in understanding the context or setting in which people talk, also, the voices of the participants are not directly heard in quantitative research. Further, quantitative researchers are in the background and their own personal biases and interpretations are seldom discussed. However, qualitative research makes up for these weaknesses (Creswell & Plano Clark, 2007). Qualitative research is seen as deficient because of the personal interpretations made by the researcher, the ensuing bias created by this, and in the difficulty of generalising findings to a large group because of the limited number of participants studied. Quantitative research it is argued, does not have these weaknesses (Creswell & Plano Clark, 2007).

Consequently a more complex picture is achieved noting trends and generalisations as well as in-depth knowledge of participants' perspectives (Creswell & Plano Clark, 2007). Mixed methods research helps answer questions that cannot be answered by qualitative or quantitative approaches alone (Creswell & Plano Clark, 2007). Employing both approaches enhances the integrity of the findings and affords greater credibility to the study (Bryman, 2008). In addition, mixed methods research is practical in the sense that researchers can use all methods possible to address a research problem (Creswell & Plano Clark, 2007).

It is for these reasons that this researcher chose a mixed methods research design. By combining the individual strengths of both quantitative and qualitative methods the researcher was able to gain greater insight and appreciation of the research questions. Both quantitative and qualitative research methods have potential weaknesses (See Sections 3.7 and 3.8), however by combining both methods into a mixed method research design this researcher was able to counterbalance these weaknesses more fully than if one single research method alone was used. In integrating the two datasets a full and complex understanding of trends, as well as an in-depth knowledge of participants' perspectives was gained.

3.3 The Triangulation Design: Convergence Model

The most common and well known approach to mixing methods is the triangulation design (Creswell et al., 2003). This design is used when a researcher wants to directly compare and contrast quantitative statistical results with qualitative findings or to validate or expand quantitative results with qualitative data (Creswell & Plano Clark, 2007). Triangulation refers to checking the validity of an interpretation based on a single source of data by recourse to at least one further source that is of a strategically different type (Hammersley, 2008).

The triangulation design is a one phase design in which the researcher implements quantitative and qualitative methods during the same timeframe and with equal weighting (Creswell & Plano Clark, 2007). It involves the concurrent, but separate collection and analysis of quantitative and qualitative data so that the researcher may best understand the research problem (Creswell & Plano Clark, 2007). By merging the two data sets, typically by bringing the separate results together in the interpretation or discussion phase of the research (Creswell & Plano Clark, 2007), the two different types of data provide complementary information that illuminates different aspects of the research questions (Hammersley, 2008).

The convergence model is a variant of the triangulation design. In this model the researcher collects and analyses quantitative and qualitative data separately on the same phenomenon and then the different results are converged by comparing and contrasting the different results during the interpretation (Creswell & Plano

Clark, 2007). Researchers use this model when they want to compare results or to validate, confirm, or corroborate quantitative results with qualitative findings. The purpose of this model is to end up with valid and well-substantiated conclusions about a single phenomenon (Creswell & Plano Clark, 2007).

Triangulation research design has many strengths: it makes intuitive sense, it is an efficient design as each type of data can be analysed using the techniques traditionally associated with that data type (Creswell & Plano Clark, 2007). The idea behind triangulation is that by drawing data from sources that have different potential threats to validity it is possible to reduce the chances of reaching false conclusions (Hammersley, 2008). For example it may be argued that there is a greater tendency for people to give researchers socially desirable rather than honest responses in face to face interviews than in anonymous questionnaires, so in this respect the latter can be used to check the validity of the conclusions drawn on the basis of the former (Hammersley, 2008).

Diagram 1 illustrates the concurrent collection of qualitative and quantitative data during a single phase of the research design. Both the qualitative and quantitative datasets are analysed separately at approximately the same time. The two data sets are merged during the discussion phase when the researcher explicitly integrates them by comparing and contrasting results to draw valid interpretations and conclusions (Creswell & Plano Clark, 2007). "QUAN" is used to denote quantitative research and "QUAL" is used to denote qualitative research. The use of capital letters for both QUAN and QUAL indicates that equal weighting is given to both datasets (Johnson & Onwuegbuzie, 2004; Creswell & Plano Clark, 2007).

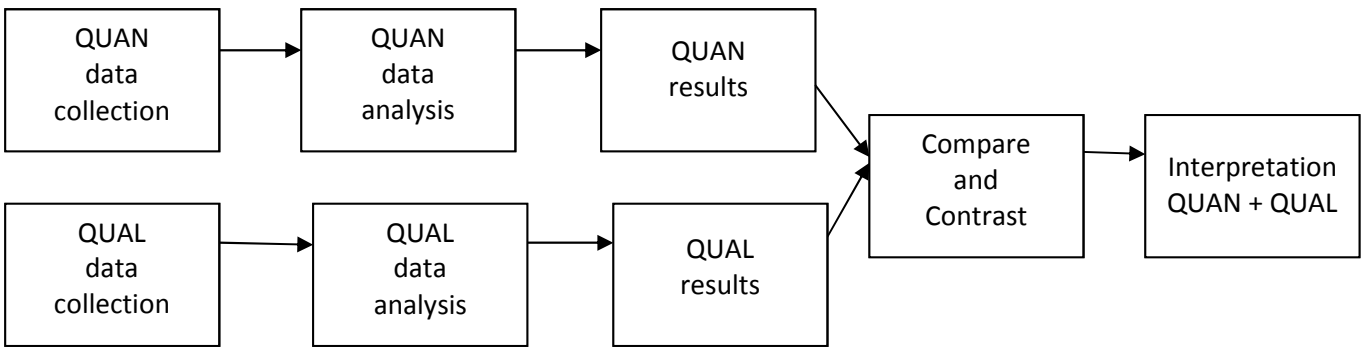

Diagram 1: "Triangulation Design: Convergence Model" (Creswell & Plano Clark, 2007, p. 63)

The research design for this study is illustrated in Diagram 2. This model demonstrates the concurrent collection of qualitative and quantitative data during the single phase of this research design. Both the qualitative and quantitative datasets were analysed separately at approximately the same time. The two data sets

were merged during the discussion phase when the researcher explicitly integrated them by comparing and contrasting results to draw valid interpretations and conclusions. As is denoted by the use of "QUAN" and "QUAL" equal weighting was given to both datasets.

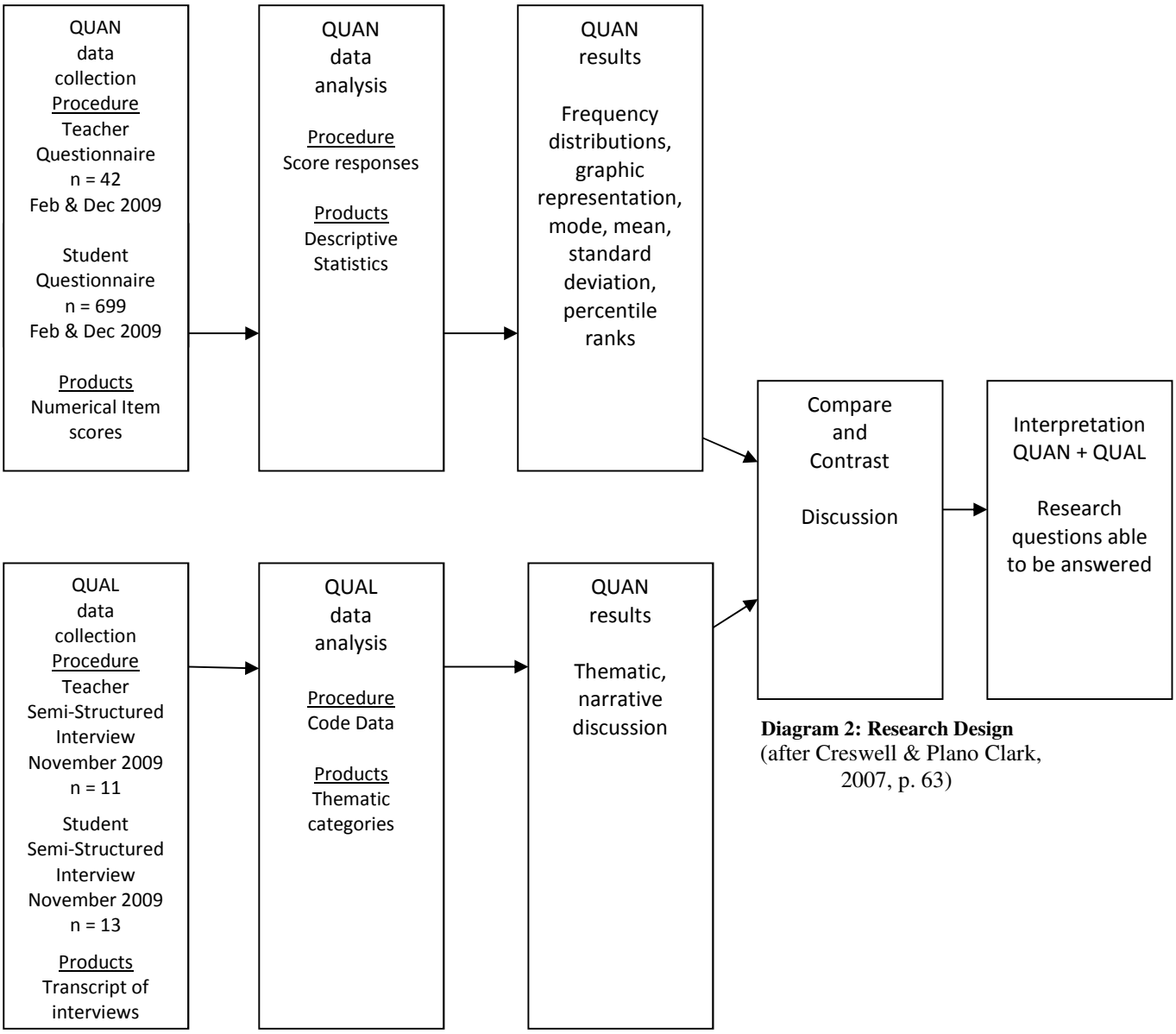

Diagram 2: Research Design
(after Creswell & Plano Clark, 2007, p. 63)

3.4 Challenges in using Mixed Methods Research, Triangulation Design: Convergence Model

The utilisation of mixed methods research does present potential difficulties for researchers. For example, it can be difficult for a single researcher to carry out both qualitative and quantitative research

concurrently and the researcher has to learn about multiple methods and approaches and understand how to mix them appropriately. It can be more expensive and more time consuming to conduct the research and the problem exists of how to interpret conflicting results (Johnson & Onwuegbuzie, 2004).

Similarly, there may be challenges in using the convergence model triangulation design such as: the effort and expertise required, particularly because of the concurrent data collection and the fact that equal weight is usually given to each data type; researchers may face the question of what to do if the quantitative and qualitative results do not agree; researchers need to consider the consequences of having different samples and different sample sizes when converging the two data sets; and it can be very challenging to converge two sets of very different data and their results in a meaningful way (Creswell & Plano Clark, 2007).

In order to address these potential challenges this researcher has completed formal and informal studies in quantitative, qualitative and mixed methods research, and has ensured adequate allocation of time to both quantitative and qualitative data collection and analysis, and subsequent integration of the datasets to ensure rigorous application of the methodology and to prevent potential validity threats. To address potential problems with contradictory findings and unequal sample sizes in qualitative and quantitative studies this researcher used the entire population of teachers and students for the quantitative questionnaires, and selected individuals from within that population for qualitative semi-structured interviews to make the sets of data more comparable (See Section 3.8 for details of the selection process for interview participants). As recommended by Creswell, Plano Clark and Garrett (2008) in the event of contradictory findings the original data was reanalysed with the possibility of uncovering new theories. To overcome problems with data integration and the possibility of bias, all research questions were addressed by both quantitative and qualitative methods and compared during the discussion phase of this study (Creswell et al., 2008).

3.5 Examples of Mixed Methods Research Design in 1:1 Laptop Learning Research

A number of researchers have studied 1:1 laptop learning programs using mixed methods research design. For example: Grimes and Warschauer, (2008), Lowther et al., (2008a), MEPRI (2003) and Newhouse & Rennie (2001). However, as discussed earlier there are no Australian studies found at the time of writing which have used mixed method research design to study the population addressed in this research project.

3.6 Participants and Setting

The setting for this study was a rural city in Victoria. Analysis of the data received from the 2006 census reveals that 25.2% of the population in this city was aged between 0 and 17, and 19.0% were aged 60 years and over, 6.1% of the population was born overseas, and 2.7% were from a non-English speaking background, 94.1% of the population spoke English only, and 2.3% spoke a non-English language, 12.1% of the population earned a high income, 46.2% earned a low income, and 37.2% of the population held educational qualifications, and 51.0% had no qualifications (Australian Bureau of Statistics, 2010).

All 16 government primary schools in the city were invited and agreed to participate in this study. This amounted to 699 grade 6 students and 42 grade 6 teachers. The 16 primary schools in this city cater for grades preparatory to grade 6. The schools range in the size of their student population from 135 students to 607 students. The Index of Community Socio-Educational Advantage (see definition of terms) for these schools ranges between 981and 1122 (Australian Curriculum, Assessment and Reporting Authority, 2010). The average Victorian ICSEA value is 1000, with most schools having an ICSEA score between 900 and 1100 (Australian Curriculum Assessment and Reporting Authority, 2010).

Permission for the researcher to conduct research on human subjects in Victorian government primary schools was granted by both the Department of Education and Early Childhood Development, and the LaTrobe University Education Faculty Human Ethics Committee. All 16 school principals were contacted in person by the researcher and had the research study explained to them. Information sheets and informed consent forms were provided to the principals at this time and all principals signed and returned the informed consent forms to the researcher. These sheets and informed consent forms may be viewed in appendices 1 to 4 of this thesis.

3.7 Quantitative Data Collection and Analysis

Quantitative research is a type of educational research in which the researcher decides what to study and asks specific narrow questions, collects numeric data from participants, analyses these numbers using statistics and conducts the inquiry in an unbiased, objective manner (Creswell, 2005). Quantitative research methods are useful for studying large numbers of people; they provide precise, quantitative, numerical data, which has high credibility with administrators and politicians (Johnson & Onwuegbuzie, 2004; Creswell & Plano Clark, 2007). This researcher collected data pre and post the introduction of 1:1 netbooks. The same individuals were studied at successive points in order to gain understanding of the changes which occurred in

them (Johnson & Christensen, 2008). For example, questions such as: "The work we do in class is interesting" and "Learning is enjoyable" were asked on both the February and December student surveys to enable the researcher to compare responses between the two surveys (See Appendices 15 and 16).

In this study, the researcher used a quantitative survey design. Survey designs are procedures in which the researcher administers a questionnaire to a group of people in order to collect quantitative data which is then statistically analysed to identify trends in attitudes, opinions and behaviours (Creswell, 2005). A questionnaire is a self-report data collection instrument that each research participant fills (Johnson & Christensen, 2008). When designing the questionnaire instrument the researcher took into account several principles to ensure a high quality instrument to produce reliable data. These principles, as well as the actions the researcher took to meet these principles are discussed in the following paragraphs.

The first principles are designed to ensure that the questionnaire items match the research objectives (Johnson & Christensen, 2008). The researcher took care to cross check that each research question was answered through multiple questions on the survey instrument and the wording of each survey question was carefully examined to ensure it was clear, unambiguous and would result in information which specifically related to a particular research question. For example, questions from the "Student Attitude to School Survey" (Department of Education and Early Childhood Development, 2008) designed to measure student motivation were included in both the February and December student surveys in this study. These questions include: "Doing well at school is important to me" and "I try very hard to do my best in school" (See Appendices 15 and 16).

The next principles are designed to ensure that the researcher understands the research participants and designs a survey instrument which they can easily understand and accurately fill out (Johnson & Christensen, 2008). The survey language should be natural and familiar to the participants, with wording that is short, precise and clear (Johnson & Christensen, 2008). This researcher gave the wording of the survey questions careful consideration to ensure they would be easily understood by grade 6 students and teachers. The surveys were pilot tested in December 2008 with grade 6 students and teachers to ensure that they were unambiguous and it was found that the participants placed the same interpretation on the questions as the researcher.

Survey questions should not be leading (suggesting a certain answer), loaded (emotionally charged), double barrelled (two questions in a single item) or use double negatives (Johnson & Christensen, 2008). The researcher was careful to examine each question to ensure it did not contain any of these faults.

In this research study the rating scales used for participant responses in the close-ended questions had a limited number of mutually exclusive (no overlapping responses) and exhaustive (a category for all legitimate responses) responses on the questionnaire instrument (Johnson & Christensen, 2008). This researcher chose not to use reverse worded items (an item for which a lower score indicates a higher level on the construct of interest) as there is evidence that this practice reduces reliability and validity of multi-scale items (Barnette, 2000). The researcher wanted to ensure that the questionnaire was easily understood and did not want to risk potential threats to the validity of the instrument through the use of reverse worded questions.

In developing the questionnaire instruments the researcher adapted some portions from other relevant studies. For example, questions to measure student attitude, motivation and self-perception such as; "I feel positive about my school work" and "I find it easy to learn new things" were taken from the "Student Attitude to School Survey" (Department of Education and Early Childhood Development, 2008) in which these questions are used to measure those specific aspects of student attitude to school.

Other questions such as those used to determine affordances offered to teachers in a 1:1 netbook learning environment were adapted from Silvernail and Lane (2004). Although Silvernail and Lane (2004) did not use an affordance theory lens in their research study, questions from their study such as; "I use my laptop to access diverse teaching materials" and "Students having their own netbooks has enabled me to more easily individualise the curriculum to meet individual student learning needs" were determined by this researcher to fit within the affordance theory lens of this research study, and so were included in the teacher questionnaires for this study.

Other questions used to determine affordances offered to students in a 1:1 netbook learning environment were adapted from Silvernail and Lane (2004), for example, "Students are able to explore topics in greater depth when they have their own netbook" also from Bebell (2005) such as, "How frequently do you use netbooks for educational games?" In addition, from, Jeroski (2003) I adopted the statement "Having a netbook is important to my learning." The researcher then developed further questions specific to the affordance theory lens of this study using Bebell (2005), Creswell (2005), Department of Education and Early Childhood Development (2008), Jeroski (2003), and Silvernail and Lane (2004) as guides in question development.

As discussed in the "Participants and Setting" section in this chapter the population of grade 6 students studied in this research consists of 699 students. The population of grade 6 teachers studied was 42. As these were manageable numbers of participants, the researcher chose to include all grade 6 students and teachers in the population in the quantitative survey research. This type of survey study which includes the entire

population is called a census study and permits conclusions to be drawn about the entire population, therefore random sampling and sampling error data are not necessary (Creswell, 2005).

The response rate in a survey is the basic parameter for evaluating a data collection effort (Fowler, 2009). The response rate is the percentage of people in a sample that participate in the research study (Johnson & Christensen, 2008). In this research study there were 699 grade 6 student participants asked to complete the survey, of these 492 completed and returned the February surveys, giving a response rate of 70.39%. Of the December student surveys, 486 were completed and returned giving a response rate of 69.53%. There were 42 grade 6 teacher participants who were asked to complete the survey, of these 38 completed and returned the February surveys, giving a response rate of 90.48%. Of the December teacher surveys, 41 were completed and returned giving a response rate of 97.62%. Johnson and Christensen (2008) state that response rates of 70% and higher are considered acceptable, making the response rates in this study valid.

In order to ensure high response rates this researcher contacted all teachers in person to explain the research study to them in advance, and to give them a copy of the information sheet and to obtain signed informed consent from them. All 42 teachers returned the signed informed consent form. The teachers were then contacted again by email at the time the surveys were delivered to remind them to complete and return the surveys, and to reassure them that they may contact the researcher if they experienced any difficulty in completing the questionnaire. The questionnaires were delivered with an explanatory cover letter and were printed on brightly coloured paper to make them visually appealing and difficult to lose or misplace. An email was sent to all teacher participants the day prior to collecting the surveys to remind them of the collection day; participants were asked to leave the surveys at the school front office for the researcher to collect.

The student surveys were delivered to the grade 6 teachers with information sheets and consent forms for the grade 6 students' parents. The teachers were asked to send the information sheets and consent forms home with the students and collect returned signed consent forms from the students. All information sheets had both the researcher's email and phone contact details in case the parents wished to contact the researcher directly. The student surveys were packaged with a cover letter for the grade 6 teachers to explain survey administration procedures and the teachers administered the surveys in class time to the grade 6 students who had returned signed informed consent forms. The student surveys were then collected from the school front office at the same time that the teacher surveys were collected.

All teacher and student information sheets, consent forms, February and December surveys and cover letters can be found in the appendices 5, 6, 7, and 8 of this thesis.

3.7.1 Data analysis.

The data were first prepared for analysis by scoring the responses according to the pre-assigned numbers on the questionnaire instrument. The data were statistically analysed by the LaTrobe University Curriculum, Teaching & Learning Centre. The researcher then used descriptive statistics to describe, summarise and make sense of the data (Johnson & Christensen, 2008). The data were analysed through frequency distributions, graphic representations, mode, mean, standard deviation and percentile ranks. The value of the standard score "z" was determined using a statistical calculator provided by Brockett and Levine (1984). In a census study random sampling and inferential statistics are not necessary and researchers may simply report descriptive statistics about the entire population (Creswell, 2005).

3.7.2 Validating of data.

The quantitative data in this research study were validated against the qualitative data in a mixed methods triangulation design, convergence model approach.

3.8 Qualitative Data Collection and Analysis

Qualitative research is a type of research in which the researcher relies on the views of the participants, asks broad general questions, collects data consisting largely of words from participants, describes and analyses these words for themes, and conducts the research in a subjective manner (Creswell, 2005). Qualitative data consists of answers to open-ended questions gathered through interviews with participants. Open-ended questions allow the participants to supply answers in their own words (Creswell & Plano Clark, 2007). The analysis of qualitative data typically follows the path of aggregating the words or images into categories of information representing the diversity of ideas gathered during data collection (Creswell & Plano Clark, 2007).

Qualitative research offers strengths such as: it is useful for studying a limited number of cases in depth, it is useful for describing complex phenomena, it provides individual case information, the researcher can conduct cross-case comparisons and analysis, it provides understanding and description of people's personal experiences of phenomena, it can describe, in rich detail, phenomena as they are situated and embedded in local contexts (Johnson & Onwuegbuzie, 2004).

In this research study the potential weaknesses of qualitative research such as: knowledge produced may not generalize to other people or other settings, it may have lower credibility with some administrators, and the results are more easily influenced by the researcher's personal biases and idiosyncrasies (Johnson & Onwuegbuzie, 2004), are offset through the quantitative research component of this study.

This research takes a qualitative phenomenological approach in which individual's experiences of a phenomenon are described. The purpose of phenomenological research is to obtain a view in the research study of the participants' life-worlds and to understand their personal meanings constructed from their lived experiences (Johnson & Christensen, 2008). Phenomenologists generally assume that there is some commonality in human experience, and they seek to understand this commonality (Johnson & Christensen, 2008).

The primary data collection method in a phenomenological research approach is in-depth interviews with 10 to 15 participants (Johnson & Christensen, 2008). The researcher purposefully selects individuals who have experience with the central phenomenon being explored and can provide the necessary information (Creswell & Plano Clark, 2007). A common practice among mixed methods researchers is to select individuals from the quantitative research sample to also complete the qualitative research component, although the qualitative sample size will be smaller than the quantitative sample size. This ensures that data can be more easily converged or compared than if different individuals are selected, which introduces personal characteristics that might confound the comparison (Creswell & Plano Clark, 2007).

Some qualitative interviews are also called in-depth interviews as they can be used to obtain in-depth information through a conversational approach about participants' thoughts, beliefs, knowledge, reasoning, motivations and feelings about a topic (Johnson & Christensen, 2008). However, this researcher used an interview guide approach whereby the topics and issues to be covered are specified in advance in an outline form and the researcher decides the sequencing and wording of questions during the course of the interview (Johnson & Christensen, 2008). This type of interview increases the comprehensiveness of the data collected, and makes data collection somewhat systematic whilst allowing the interviews to remain fairly conversational (Johnson & Christensen, 2008).

The researcher took care to ensure that the possible weaknesses of this interview type were addressed and avoided. For example the potential inadvertent omission of a salient topic during an interview was addressed by the researcher having a list of salient topics which was taken into the interview with the researcher discreetly checking off each topic as it was covered throughout the interview. The flexibility in sequencing and

wording of questions which this type of interview allows can result in substantially different responses from different perspectives, thus reducing the comparability of the responses (Johnson & Christensen, 2008). The researcher took care to where possible, without interrupting the natural flow of conversation, or the participant's train of thought, to direct each interview in a similar manner, using similarly worded questions, prompts and format throughout.

The researcher invited all 42 participating grade 6 teachers to also participate in semi structured individual interviews. Of these teachers 11 opted to be included in the research interviews. Initially the researcher approached these teachers inviting them to be involved in individual interviews; however, many of the teachers requested small group interviews. To provide a greater degree of comfort the researcher agreed to alter the interviews to this format. While participants who may have preferred an individual interview were still offered the option to participate in that format; all participants elected to take part in small group interviews. The researcher was aware that such focus group interviews offer an advantage in that the interaction between the group participants is more likely to yield clearer information (Creswell, 2005).

Initially the researcher planned to conduct interviews in June and again in December, however, when time came for the June interviews participants expressed concern that they were still adjusting to having the 1:1 netbooks in their classrooms, and did not feel ready to discuss changes in their teaching practice and student learning as a result of having the netbooks. All participants requested that the June interviews be cancelled, and instead a longer and more in-depth interview be conducted in December. As all participants expressed a greater sense of ease with this proposed change in interview timing the researcher agreed to this new format.

Student interviews were conducted in the schools in which the grade 6 teachers were participating in both the quantitative questionnaires and the small group teacher interviews. The teachers called for volunteer students to participate in small group interviews to be conducted by the researcher in November during school hours. Information sheets and consent forms were sent home and signed informed consent forms collected by the grade 6 teachers. A total of 13 students participated in these interviews.

All teacher and student interview information sheets, consent forms, and interview schedules are included in appendices 7, 8, 11, 12, 17, and 18 of this thesis.

3.8.1 Data analysis.

All interviews were digitally recorded and transcribed for careful data analysis. The data were initially coded using descriptive coding. Saldana (2009) defines descriptive coding as the summarising of the topic of a passage of qualitative data into a word or a short phrase. Descriptive coding is appropriate for the coding of

interview transcripts as it provides the researcher with an organisational grasp of the study and is an essential foundation for secondary coding and analysis of the data (Saldana, 2009). During this first cycle of coding, tags were used for assigning units of meaning to the descriptive information compiled during the study (Johnson & Christensen, 2008). For example: the tags *blogs, wikis, web 2.0 applications*, and *Internet research* were applied to blocks of data.

This first cycle of coded data then underwent a secondary cycle of pattern coding. Secondary cycle coding is an advanced method of reanalysing coded data, during which categorical and thematic organisation is developed from the array of first cycle codes (Saldana, 2009). The first cycle of coded data was analysed in detail to describe what was learned, and to develop themes which were used to answer the research questions forming an in-depth understanding of the central phenomenon through description and thematic development (Creswell, 2005). During the secondary cycle coding similarities, differences, sequences and correspondences in the initial coding were examined. The previously coded data was then reorganised and, for example, the passages tagged *blogs, wikis, web 2.0* applications, and *Internet research*, were then categorised under the new tag of *Internet.*

Saldana (2009) recommends that in organising the written thesis the category and thematic tags used in coding also be used as the headings in the written report. This keeps the reader focused on the development of the linear units of the research (Saldana, 2009). The headings, *Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers* and *Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students,* used throughout this thesis represent the two major themes of this study, and also the research questions used for this study. The subheadings used throughout this thesis represent the tags used in the secondary cycle of data coding, which served to unpack the major themes of the study into categories. In order to facilitate clarity and ease of reading the thesis, the headings and information in the review of literature were then also aligned with the coding tag headings used throughout this thesis. The qualitative findings are reported in a thematic narrative discussion in Chapters 4 and 6 of this thesis.

3.8.2 Validation of data.

The qualitative data in this research study were validated against the quantitative data in a mixed methods triangulation design, convergence model approach.

3.9 Mixed Method Data Analysis

In mixed methods research, triangulation design convergent model the quantitative data and qualitative data are initially analysed and reported separately. The researcher then merges the datasets in the discussion phase of the research by using a discussion matrix or by discussion, paying attention to what extent the quantitative and qualitative data agree or disagree, in order to develop a complete picture (Creswell & Plano Clark, 2007). In such a discussion, researchers report a statistical result and then follow it up with specific quotes or information about a theme that confirms or fails to confirm quantitative results, or vice versa (Creswell & Plano Clark, 2007).

As a result of the merging of the data the researcher is able to answer the research questions, and also must address the following questions which are specific to mixed methods research: To what extent does the quantitative and qualitative data converge? How and why? To what extent do the same types of data confirm each other? To what extent do the open ended themes support the survey results? What similarities and differences exist across the levels of analysis? (Creswell & Plano Clark, 2007). This researcher merged the two datasets during the discussion phase of the research as per the model (See Section 3.3). Using a discussion format, whereby a quantitative statistical result was reported and then followed up with quotes from the qualitative interviews, or vice versa, the researcher was able to answer all research questions, as well as address the previous questions which are specific to mixed methods research designs.

3.10 Validity in Mixed Methods Research

Validity is one of the major issues in mixed methods research, and is the most important aspect of a research project (Tashakkori, & Teddlie, 2003). Validity within this design may be defined as: the ability of the researcher to draw meaningful and accurate conclusions from all of the data in the study (Tashakkori, & Teddlie, 2003). In order to address this issue, this researcher has taken the following steps as recommended by Creswell and Plano Clark (2007): report and discuss the validity within the context of both quantitative and qualitative research in a mixed methods study; use the term validity to refer to validity procedures in this approach; discuss from the standpoint of the overall mixed methods design chosen for the study; identify and discuss potential threats to validity that arise during quantitative and qualitative data collection and analysis, and how these threats will be minimised (these discussions are found in the "Qualitative Data Collection and Analysis" and the "Quantitative Data Collection and Analysis" sections in this chapter).

When a pragmatic philosophy guides the mixed methods research, validity follows if the researcher draws evidence from different datasets that provides better results than either dataset alone; this is called triangulation validity (Creswell & Plano Clark, 2007). In this way this research study claims triangulation validity based on the pragmatic worldview underpinning this research, and the fact that the two data sets combined provided a more comprehensive and in-depth result than did either dataset alone.

3.11 Conclusion

In conclusion on account of the philosophical assumptions of pragmatism which underpin this research project, a mixed methods research design was deemed to be the most appropriate approach in order to answer the research questions. The theoretical lens of affordance theory guided the development of the research problem and the research questions in this study. The research questions were developed to firstly discover what are the affordances in a 1:1 netbook learning environment, and secondly how these perceived affordances impact upon teaching practice and student learning in a grade 6 classrooms. This researcher decided that the most suitable method to use was a triangulation design, convergence model, whereby the quantitative and qualitative data were given equal weighting and were concurrently collected and separately analysed prior to the researcher integrating the data by comparing and contrasting the two data sets during the discussion phase of the research. The next chapter discusses the research findings from the teacher interviews, looking at the affordances of 1:1 netbooks for teaching practice and student learning and how these affordances impact on teachers practice.

4. Findings Teacher Interviews

4.1 Introduction

As discussed in the methodology chapter of this thesis, the setting for this study was a rural city in Victoria located 150 kilometres from Melbourne. The researcher invited all grade 6 teachers who participated in the questionnaires to also participate in semi-structured interviews. Of these 42 teachers 11 opted to be included in the research interviews. All these participants were offered the opportunity to participate in individual interviews, however, all participants elected to take part in small group interviews. All teacher interviews took place in November 2009.

The 11 teachers participating in the interviews were from 5 different primary schools. Three participants were from School A, 2 from School B, 1 from School C, 1 from School D, and 4 from School E. All teacher participants were asked to rate their own ICT skills level according to the State of Victoria, Department of Education (2006) Epotential Continuum. This 4 part rating system gives teachers the option of selecting foundation (beginning ICT skills), emergent (utilising ICT in the classroom), innovative (innovative use of technology for learning and teaching) and transformative (transforming learning and teaching within and beyond the school).

Of the 3 grade 6 teachers from School A who agreed to participate in the interviews one female has been teaching for 20 years, is currently employed as an expert teacher, and rates her ICT skills as being between innovative and transformative. The second female has been teaching for over 20 years and is currently employed as a leading teacher. She rates her ICT skills as emergent. The third participant is a male who has been teaching for 4 years and is currently employed as an accomplished teacher. He rates his ICT skills as being between innovative and transformative. These 3 teachers were interviewed together.

Of the 2 teachers from School B who agreed to participate in the interviews the first one is a male who has been teaching for 18 years and is currently employed as a leading teacher. He rates his ICT skills as transformative. The second teacher is also male. He has been teaching for 14 years and is currently employed as an expert teacher. He rates his ICT skills as innovative. These 2 teachers were interviewed together.

The female teacher from School C who participated in these interviews has been teaching for 10 years and is currently employed as an expert teacher. She rates her ICT skills as being between innovative and transformative. The female teacher from this School D who participated in these interviews has been teaching

for 10 years and is currently employed as an expert teacher. She rates her ICT skills as being between innovative and transformative. The teachers from School C and School D chose to be interviewed together.

Of the 4 teachers from School E who participated in the interviews one was male who has been teaching for 30 years, is currently employed as a leading teacher, and rates his ICT skills as emergent. The second teacher is female, has been teaching for 5 years and is currently employed as a graduate teacher. She rates her ICT skills as being between innovative and transformative. The third teacher is female, is currently employed as an accomplished teacher, and rates her ICT skills as innovative. The fourth teacher is also female, she has been teaching for 21 years, is currently employed as an expert teacher, and rates her ICT skills as emergent. These 4 teachers were interviewed together.

This chapter reports the research findings from the teacher interviews which were conducted in November 2009. Final discussion and analysis of all results can be found in Chapter 8 whereby the results from the teacher interviews are compared and contrasted with the results from the student interviews, teacher and student surveys and the literature which was reviewed in Chapter 2 of this thesis. This chapter begins with the affordances of 1:1 netbooks for teaching practice and the impact these affordances have on teachers. Following is the discussion of the affordances of 1:1 netbooks for student learning and the impact these affordances have on students, according to the teachers' perceptions.

4.2 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers

4.2.1 Lesson planning and preparation.

When asked about how having 1:1 netbook computers in their classrooms has changed the way in which they plan and prepare lessons all teachers mention the increased flexibility and convenience which they found came from having ready 1:1 access to netbook computers in the classroom, and not having to schedule and book the computer lab for lessons incorporating ICT. A teacher from School A observes that previously when he planned to utilise computers in lessons that he would have to book the computer lab in advance, and then have the students complete the activity within one hour. Whereas with 1:1 netbook computers he comments that he can change lessons on a whim and instantly have the necessary ICT resources available. Another teacher from School A states that the individual computer access provided through the netbook program allows her to genuinely and confidently plan to use ICT without worrying about the restrictions of access to a computer lab. A third teacher at school A states that the unlimited access to ICT which the 1:1 netbooks provide has enabled her

to give her students sufficient time to develop an understanding and be better able to productively relay their learning in digital mode.

The female teacher from School D states that the greatest change for her since the introduction of the 1:1 netbook program has been in lesson planning. She states that she has had to do, "A lot of adapting in how I approach things and changing my mindset as to how I can do this task. For example, I just do not have to do it with maps I have got netbooks and I can use online maps. I have found that probably the biggest challenge is finding the new and different ways to actually incorporate the netbooks and untapping a myriad of resources now available to me." She explains that she has had to work at getting out of the mindset of just using pen and paper and to question "Well how else can I do this?" She states that in her planning she has challenged herself to find new ways to use the netbooks to present information to the students as well as devise new ways for the students to research information, format and present their work. She explains that she has also found the first year of the 1:1 netbook program challenging as she has a composite class of grade 5 and 6 students. Whilst the grade 6 students are all included in the 1:1 netbook trial, the grade 5 students are not, and do not have access to 1:1 netbook computers. Her planning has been especially challenging as she has had to plan for all lessons to be inclusive of both the grade 6 and grade 5 students.

Teachers comment that they often used ICT to present lessons to their students, such as creating a Powerpoint, or scanning documents to share with students. Teachers at School A state that whilst they have always done this, the difference was that now they can place this document into a virtual shared space and all students could access it and each save a copy of the document onto their own netbook. They cite an example of how they had changed their lesson planning to incorporate student 1:1netbooks in teaching Australian history. The teachers saved multimedia information relating to Australian history to a virtual shared space which the students could then access. Examples of this information included songs, poems, scanned information texts, pictures and short stories. The students were required to save these documents to their own netbooks along with a series of comprehension questions and then complete the questions at home using their netbooks.

Teachers at School A comment that their lesson planning now more often included the students using their netbooks to access information from a shared virtual space. They comment that in their virtual shared students space they had set up folders such as "Literature Circle", "Mathematics" and "Science" with sub categories inside each folder, for example in the "Science" folder is an "Electrical Circuits" and a "Solar Energy" sub folder into which teachers save relevant information for the students to access. The teachers explain that unlike a classroom display which gets taken down at the end of that unit of study, the information

placed on shared students' space and then saved to each student's netbook is there permanently, enabling students to go back and check this information at any time. Students also have access to this information both at home and at school, enabling teachers to plan homework for the students which requires them to access this information to complete.

The teacher from School C similarly comment that her lesson planning now includes saving a copy of all worksheets and information to the class wiki which has been setup since the introduction of the 1:1 netbook program. She explains that students are required to download a copy of the information and worksheet from the wiki, complete it on their netbooks and then email the completed worksheet to the teachers. She states that this has reduced the amount of time which teachers spend photocopying work for students.

The teacher from School C states that they have been able to utilise a lot of programs such as movie making programs and animation programs which they would not have attempted last year using a computer lab. She states, "We were able to give the students a good 2 hour block of "Digital Sandpit" time which enabled them to really play with the program and explore what the program could do. Whereas normally in the computer lab you can only give the students one hour of time, and often with your Lab time you do not take on anything too ambitious because you know that you are restricted."

Teachers from School A comment that they have tried to incorporate the software programs which are preloaded onto the students' netbooks into their classroom lessons. They state that often when they were planning they realised that a particular netbook software application, for example Google Sketchup, would be ideal for teaching a particular topic, for example scale. Likewise the teacher from School C states that they tried to incorporate the netbook's software into lessons, for example instead of drawing a graph on graph paper, students might now complete it on Microsoft Excel.

Teachers from School A comment that because of the students' ease of access to the internet since the introduction of 1:1 netbooks they now plan for greater use of more online and web resources. They specifically indicated that they now use web 2.0 tools such as blogs and wikis more frequently in class. Teachers from School A also indicated that they now plan for the use of interactive web sites such as "Smartkiddies" to set tasks designed to meet individual students' needs more frequently. They state that the ease of access which 1:1 netbooks provide facilitates this type of use of the internet.

Teachers from School B comment that the 1:1 netbooks have given them access to so many "hands on" activities for the students to use. They specifically mention tools like online dictionaries, thesauruses, wikis, Google search engine, and the abundant information and resources available on the internet. They state that

prior to the 1:1 netbook program they only had access to 4 or 5 computers at the back of the classroom, and this factor limited the amount of internet activities which they could plan to include in their lessons. 1:1 netbook access has given them unlimited access to the internet. They state that they have found knowing the students have unlimited access to these resources has stimulated them to plan for the incorporation of these supportive resources into their lessons. They explain that for example, "When we are planning to teach a particular Mathematics topic we go to the Digilearn, Mathletics or Rainforest Mathematics web sites and look for digital resources which can help us out. So instead of just scribbling on the board and speaking you have got something else which can hopefully help make the connection better with more students."

One teacher from School E observes that finding support material for her lessons from the internet is very time consuming. She states that she "Sits for a long time just cruising through the internet, I find it really interesting but you could spend hours just sitting there because there is just so much out there. If I am looking for a support for something I want to do and go online, sometimes it is hard to find exactly what you want." She further states that she does not see it as time wasted, but that it is a very time consuming part of her planning.

A teacher from School A notes that 1:1 netbook computers open up options for both himself and his students. He states that often during a lesson either he or a student would have an idea for extending or differentiating the lesson by utilising the 1:1 netbooks. As he no longer had to book a computer lab in advance to incorporate ICT, he is now able to instantly change the direction of the lesson to incorporate new ideas immediately. He further finds that this flexibility in class would often then result in more suggestions from other students building on a previous suggestion. Ideas and alternatives continue to flow enabling the lesson to evolve in real time, largely directed by the students.

Similarly another teacher from school A observes that students tend to make more suggestions about "How we can do this or do that" and thus have more input into their learning when they have access to 1:1 netbooks. She states that since the introduction of the 1:1 netbooks, lesson planning has become more relaxed, allowing the students to have more freedom in directing the lesson themselves. She adds; "It's not that it's ad hoc [the lesson planning], you still have teach, for example, the spelling rules, it's more of an openness about it because the students might discover something and then you say, oh, let's go with that." This teacher observes that whereas previously she has always had in mind where a lesson was going, now lesson planning is not quite so rigid and a lesson could end up in lots of places depending on the students.

Two teachers at School A comment that with the introduction of the netbooks it has been a really busy year. They observe that this flexibility of lesson direction has meant that they "Haven't been able to really finish

stuff off." They observe that it is really interesting, sometimes they have got to a stage and they have had to say to the students, "What are we going to do with this?" "We have had conversations with the students about how we thought we were going to go here, but that this is where we are now and due to time constraints we will have to stop here, and the students have agreed."

4.2.2 Constructivist teaching.

Teachers from School A comment that they have noticed that 1:1 netbooks have facilitated greater scaffolding opportunities enabling their students to direct their own learning to a greater degree. One teacher from School A explains that using the netbooks her students video record themselves explaining how to do something such as a Mathematics equation. They set themselves up with a whiteboard so they can use it to illustrate examples and record themselves explaining how to solve this problem. They keep the videos on their netbooks and next time they come across a problem instead of having to come to us they can remind themselves when they look at their own video. They save this recording and can refer back to it later to support their own learning, thus creating their own learning resource.

Another teacher from School A offers an example of negotiated learning in which her students have developed their skills and knowledge in a specific netbook software program through "Digital Sandpit" time. These students then planned lessons and workshop activities designed to teach other students how to use this software. Her students were fortunate to have the opportunity to actually be able to run these workshops for students from other schools at Kids' Congress. Following Kids' Congress, these students developed online questionnaires which they used to receive peer feedback about their workshop presentation.

Teachers from School B state that the 1:1 netbooks have definitely enabled them to be more constructivist in their teaching approach. They explain that the 1:1 netbook program fits in beautifully with an "Integrated Inquiry" or the 5E Model pedagogical approach. "It just fits in beautifully because the ability to explore and engage, to gather data with the sheer amount of resources which the netbooks have on them really opens up the boundaries and gives the students the opportunity to go where they may." On reflection one teacher from School B comments "When I think back to what the students were like with inquiry work last year, we have made such a big step in what the students can actually do now. I remember the frustration last year that the students had when there was only 4 or 5 computers at the back of the room and they couldn't get access." These teachers explain how for example they may give a snippet of information in guided reading and then ask the students "What else can you find out about this?" "We definitely do more wondering and inquiry work this

year. Now that the students can all research their own wonderings and questions, the students have just taken it so much further when you compare them to last year's students prior to the 1:1 netbooks."

However, the teacher from School D reflects, "I am still having to talk myself out of thinking that I am the provider of knowledge, I still feel like I'm the giver of the information. I do not want to be, it's not desirable, and that's become the battle in how do I use these netbooks to their best advantage. I still use modelling on the interactive whiteboard but the battle inside myself is to let the students direct things as much as me feeding it into them. My teaching practice hasn't changed as much as I thought it would by the end of the year, I thought I would have been completely revolutionised by the end of the year, but I am still learning."

Teachers from School E comment that the 1:1 netbooks have enabled students to take ownership of their learning. The teachers explain that they set up a learning task and that with the 1:1 netbooks students are now starting to drive their own learning. One teacher offers an example, "We looked at an article on 'Ice Men' and it sparked a particular interest in some students and therefore that becomes a particular channel of learning that some students may go down, but some may not. The overall parameters of the task are set up, but where it finishes is dependent on the interests of the students and what they actually find out." Teachers make it clear that some students are now driving their own learning more than others.

In another example from the teachers at School E they explain, "We did a handwriting sheet the other day which was about Marco Polo and Columbus. The students said 'We do not know who they are.' So they got their netbooks out and they researched and found the facts themselves rather than being told the facts by us. We then asked them, 'Okay where did you get your evidence from, can you support that, and was it a good and reliable source?' For a lot of students when we first started on the netbook journey their first point of call was always Wikipedia because it often comes up in the first 1 or 2 search engine results. However now they realize 'Oh we can read this but we also need to challenge our thinking, it that it might not actually be correct' so that was probably the steepest part of the students' online research learning curve."

Teachers from School A reflect, "I think the netbooks have let students know that teachers are not the 'holders of all knowledge' and that they may be the 'teacher' in some instances. Students share their skills with the teachers and with other students, and as the students have become the experts the 'balance of power' has changed in the classroom. The netbooks illustrate that computers are a tool for learning and that the control is up to the individual."

4.2.3 Integration of the 1:1 netbooks.

Teachers from all schools are able to give many examples of where and how they had integrated the 1:1 netbooks into their curriculum program. Teachers from School A offer the following example, "During our literature circle tasks we have been reading a piece of text and then putting forward arguments about it. Using their netbooks and the web based Etherpad application [real time collaborative text editing program], students were able to all add their comments and arguments for sharing with each other. Every student's comments are printed in real time on the screen in a different colour, so they can all see each other's comments appear as they are typing them. We put all the students in different locations so that they weren't sitting together as a group, which made it a bit more of a novel activity for the students. It kept them very focussed. Once the students have Etherpad logins we can then use it whenever we are doing collaborative projects, for example the Energy Breakthrough Challenge. In future we could also extend this application to other classrooms or schools and even schools in other countries, it offers lots of scope for its use."

The teachers at School A offer further examples. "Each week the students watch 'Behind the News' [web based current affairs program] on their netbooks. The students pick a current affairs topic of interest to them and create a presentation on their netbooks based around that topic. This week they had to create a Powerpoint presentation, but we have used animations, movies and paint applications previously. Then we connect their netbooks to the whiteboard projector and the students show their presentations. The students also use the netbooks to add photos into their word documents which adds meaning to their text, supports examples of their learning and improves the presentation of their work. The students use photos which they have taken themselves and downloaded onto their netbooks, or photos which they have downloaded from shared students space. The students have also used Audacity (audio editing and recording program) to record mock interviews, voices and sound effects which the students then put over the top of animations."

The teachers at School B offer the following example of how they have integrated 1:1 netbooks into their curriculum. "I think having the 1:1 netbooks has totally transformed just about every part of teaching and learning. For example when students have to use pen and paper all the time to present their information it becomes boring. The netbooks offer students a variety of different ways to present information, for instance they can use programs such as Powerpoint, Moviemaker, Publisher, Photostory or Comic Life. They can cycle it around so that they are not always doing a poster. Sometimes we will say 'I want it done this way' and sometimes it is students' choice. However, I have had to work with them on their prioritising as their tendency is to spend all their time on the presentation of the work. I have had to work with them to figure out how much

time they need to spend on planning, researching and working through the actual task. Using the netbooks students are definitely showing that they are engaged in the work."

Teachers from School E explain that they have used a lot more online Literacy tasks since the introduction of the 1:1 netbooks. These tasks have included reading on the netbooks for pleasure, such as an online novel, as well as reading online information sites and newspapers. They have also used the netbooks to facilitate research. For example they report, "Today we went to an online archaeological web site and the students looked up a particular report which had photographs, information texts and newspaper reports. The students then had to create their own report pretending that they were archaeologists using the information in the web site to support their own report."

Teachers make the following comments with regard to the implementation of the 1:1 netbooks in the different curriculum areas. The teacher from School D states, "I have found the challenge is in thinking outside of the box, remembering that these resources are right at our fingertips. For example if someone asks, 'What is the population of Guatemala?' We can find that out, but the challenge has been to then ask myself, well how can I can I best utilize the fact that this knowledge is at our fingertips, how can I incorporate that into Literacy, how can I incorporate that into Mathematics, how can I incorporate it into every area and not just think of using it for researching projects."

As well, one teacher from School A comments, "It has been easy to implement netbooks into all areas of the curriculum. The difficulty has been in prioritising programs and activities as there is so much variety, so many resources available. The development of specific virtual spaces to 'house' exemplary material and organise it for easy reference will provide a powerful resource." Another teacher from school A observes, "Different domains have different computer needs, for example in Mathematics the students have been using Excel for graphing, tables for fractions, and using Microsoft Word for timetables and calendars. Interactive spelling and Mathematics have been better achieved with every child having a netbook at school. The writing genres have been better covered with students using computers to research genres, having examples of the forms of poetry or having the format of a newspaper article to display their work. It has been fun exploring the different ways we can engage students."

One teacher from School A reflects that the 1:1 netbooks have had a significant impact on her teaching practice, the easy access enabling her to now use computers in class every day. "It is possible now for me to plan for multiple activities relatively easily, assigning tasks that will engage students and keep them actively engaged in independent or small group tasks while I concentrate my efforts on individual or small group

teaching. I can modify or change tasks with greater speed, and there is now a greater variety of possible responses and activities that students can complete. Because of the ease of access I now use more online web resources and web 2.0 tools."

4.2.4 Teacher communication.

Several teachers make comments about various ways in which the 1:1 netbooks have facilitated different sorts of communication between themselves and their colleagues. One teacher from School A comments, "There have been considerable professional development opportunities to discuss programs with staff from different locations, I have had to rely on colleagues for trouble shooting and advice. It has been a shared journey."

Teachers at School B comment on how they share 1:1 netbook resources with each other via email, in addition they explain, "We upload stuff to our share point so that of all our units of work are there and we just add in the digital resources." Similarly the teacher from School C reports on how the grade 6 teachers have shared online resources such as blogs and wikis which were set up by one grade 6 teacher for all grade 6 teachers and students at the school to use.

4.2.5 Teacher workload.

Some teachers comment on some aspects of 1:1 netbook learning which have resulted in a greater teacher workload. For example, the time it takes to upload information to the wiki and to reply to students' online communications. The Teacher from School C comments, "I think that I would like to get the kids more involved in putting things on there (the wiki) because it becomes a time management issue. However, I do not feel that it has necessarily created more work for us because for example, if we put a worksheet on our wiki it saves me time actually going and photocopying it, and I can actually upload it at home and then it is ready to go for tomorrow." Similarly teachers from School B explain, "I do not know whether it has made the workload more or less but it has been very good to be able to use the wiki and to have everything there. The kids know that they can get what they need from the wiki so there is never even something as simple as 'I have lost my sheet.'"

Another teacher from School B reflects, "It probably hasn't reduced the workload, but it has meant that the work that you do put in has become more effective; you get more bang for your bucks. It's more streamlined, you are not double handling things all of the time. You put more time into looking for other

resources and looking at web sites where the kids can go to and thinking ahead what is going to be the problem when they get to this site or what is going to be the problem when we are doing this."

The teacher from School D observes, "I would say that the netbooks have increased my workload as far as my feeling that I want to get more out of it. I'm still going onto the netbook Ning to see what else I can do." The teacher from School C states, "I know for me though one of the things is that I want more time to actually learn to use all the programs. I do not want to just fiddle; I prefer to be shown how to use something. All of the regional professional development stuff is fantastic to a degree, but when do I have time to sit down and sift through and even read the [netbook] newsletters. It's terrible because it is only a page [the netbook newsletter], but I print them off every time and I put them in a folder and they are still waiting for me to read them. You need at least one year as a teacher with the netbooks to learn how to use them."

One teacher from School E states, "I have to say that I sit for a long time just cruising through the internet. I find it really interesting but you could spend hours just sitting there because there is just so much out there and it is hard when I am looking for a support to find exactly what I want. You can adapt things and so forth but I could sit for ages; that is where I waste my time. It is not wasted time but it is time consuming. So the netbooks haven't increased our workload, just changed our workload I think. Like any new program that you introduce, you have just got to change the way that you do things."

Meanwhile one teacher from School A observes, "The skills I have learned will be used elsewhere. It is all professional development. Once I realised that I didn't have to know everything and that the kids could teach me, things were manageable. There are still programs that we haven't used so there is much more to learn. With some programs such as Superclubs Plus, I have found it difficult to maintain my 'presence' in this program as I do not have time to give to it in my own time."

4.2.6 Classroom management.

Teachers did find that some aspects of the 1:1 netbook program required extra classroom management. Such as students waiting to use equipment for example scanners or digital cameras. From School A, "The students were standing in a line waiting for the scanner and meanwhile becoming very social, so we said 'No, no, no put your name down go and do some other work.'" Other teachers cite instances where netbooks were not able to be used by the student such as technical difficulties or the netbooks not being charged as requiring negotiation and classroom management skills.

4.2.7 Teacher energy and enthusiasm.

One teacher from School A made the following comment in regard to the impact of the 1:1 netbook learning program, "Initially there was great excitement about the introduction of a 1:1 netbook learning program, and it was contagious. I am naturally enthusiastic and engaged with teaching; this has just added another dimension. Things are changing all of the time so it is exciting, it has provided an impetus to look at things differently and experiment. It is exciting to do things using new methods and it has been fun exploring the new programs, ways of managing tasks and groups, access to new programs and professional development opportunities. I wonder what we did before the introduction of netbooks?"

4.2.8 Are the affordances offered by the 1:1 netbooks important to teachers?

Without exception teachers at all schools affirm that they liked their students having 1:1 netbooks and feel that they are important to student learning. Teachers at School A state that the 1:1 netbooks are, "Immensely important, they are definitely the way to go. They provide responsibility, engagement, creativity, variety and a powerful link between home and school." Teachers at School E question how they ever managed without the netbooks. All teachers comment that they hope the 1:1 netbook program continues into the future. One teacher at School A states, "I do not want to go back to not having them, I think that we have just scratched the surface, we have been on a huge learning curve this year and there are lots of programs that are on there that we haven't even looked at yet. It's just this wealth of information and knowledge, how do you prioritize it? We have just had a bit of a play this year, had a bit of a dabble with a few of the programs. We look at the netbooks as a tool to support learning and there is no doubt that they do that." One teacher at School B comments, "You know it would be like chopping an arm off now if it [The 1:1 netbook program] didn't continue it would be ridiculous would it not? The kids themselves would be that frustrated, they have had it at their fingertips they have had a taste of what it is like to be free and independent and having responsibility."

4.3 Teacher Perspectives on the Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

4.3.1 The Internet.

All teachers agree that the ready access to the Internet which the 1:1 netbooks have allowed has impacted on their teaching practice and student learning. For example, Teachers from School B comment that

the 1:1 netbooks have given them access to so many "hands on" activities for the students to use. They specifically mention tools like online dictionaries, thesauruses, wikis, Google search engine, and the abundant information and resources available on the internet. They state that, "Prior to the 1:1 netbook program we only had access to 4 or 5 computers at the back of the classroom, and this factor limited the amount of internet activities which we could plan to include in our lessons. 1:1 netbook access has given us unlimited access to the internet." They state that they have found knowing the students have unlimited access to these resources has stimulated them to plan for the incorporation of these supportive resources into their lessons. They explain that for example, "When we are planning to teach a particular Mathematics topic we go to the Digilearn, Mathletics or Rainforest Mathematics web sites and look for digital resources which can help us out. So instead of just scribbling and speaking you have got something else which can hopefully help make the connection better with more students."

Teachers from School A explain one of the ways in which they incorporate the internet into their classrooms. "We frequently use things like 'Google Earth', 'Google Maps,' 'Ask Jeeves' and 'Behind the News'. For example, with 'Behind the News' the children view it and then they choose one of the topics that they are interested in and they have to write a summary of the topic which they have chosen. They can use their netbooks to either view that video again or to read the transcript or a combination of both. They use the transcript to check their spelling. Most of them use Power Point to present their summary, some prefer to handwrite it in their books, and some have made movies or used Comic Life."

All teachers cite multiple examples of students using their 1:1 netbooks to access information from the internet. Teachers from School A explain, "The netbooks give students accessibility to information that they would not have got without them. It is more convenient, more accessible, and easier for them to find by a long shot." Similarly the teacher from School C states, "Without the netbooks you have got to wait till library time or computer lab time to look up stuff. It has been handy to just instantly look something up you want." The teacher from School D comments, "I have found the challenge to be thinking outside of the box, thinking, 'Well how can I can I best utilize the fact that this information is at our fingertips?'"

Teachers from School B comment that the netbooks give them a lot more flexibility with access to information being quicker and easier. Teachers from School E reflect that they have had to, "Teach the students how to do a smart web search. For example at the start of the year someone would type in a complete sentence and want the answer to it. So they have become far better at refining what it is that they want to find. That was probably the steepest learning curve for them. The netbooks are helpful because this is the generation that when

they want something they want it now and they are not willing to go and look for different resources other than what is right in front of them."

Teachers from all schools are able to name many interactive web sites which they regularly use for teaching and learning activities, stating that the ease of access has facilitated the use of these web sites. The most frequently named sites are: Superclubs Plus, Smartkiddies, Mathletics, Cool Mathematics, Behind the News, Google Earth, Google Docs, Google Maps, Digilearn, Ether Pad, and Survey Monkey. Several teachers comment that they used interactive web 2.0 sites more widely since the introduction of the 1:1 netbooks to reinforce skills and increase engagement.

Teachers from School A explain, "During our literature circle tasks we have been reading a piece of text and then putting forward arguments about that piece of writing. Using their netbooks and the web based Etherpad application [real time collaborative text editing program], students were able to all add their comments and arguments for sharing with each other. Every student's comments are printed in real time on the screen in a different colour, so they can all see each other's comments appear as they are typing them. We put all the students in different locations so that they weren't sitting together as a group that made it a bit more of a novel activity for the students. It kept them very focussed. Once the students have Etherpad logins we can then use it whenever we are doing collaborative projects, for example the Energy Breakthrough Challenge. In future we could also extend this application to other classrooms or schools and even schools in other countries, it offers lots of scope in its use. The students have also worked collaboratively using 'Google Docs' (online document creation, editing and sharing program) to coordinate Kids' Congress this year, they are also using blogs collaboratively."

Several schools also mention using blogs in the classroom; teachers from School A explain, "Our kids are doing blogs on their netbook. They cannot wait to get on to their blog. This year we have allowed them to discuss personal things as well as educational topics on their blogs, we have one diabetic student and she used her blog to explain all about diabetes. Sometimes we have asked them to reflect on things, or to put up some school work but it is basically up to them what goes onto their blog. For those students that were involved with the cricket or the football, they have been able to include information about sporting side of their life."

The teacher from School C reports that they have used blogs for group discussions. "Students are able to research information and then add it to the blog. This way, students can really take a topic further." In another example of blog use in the classroom, the teacher from School D explains that her class regularly read the blog

of a woman who was on an expedition to the South Patagonia Icecap. By doing this the students could follow her journey and reflect on her experiences.

Several teachers have also used wikis in their classrooms this year. The teacher from School C states that they have used their wiki as a discussion page, as a link for students to specific web pages, for uploading weekly homework activities, and for placing copies of classroom notes for students to access. Similarly, teachers from School B have used their wiki to link students to relevant web sites, as a portal for students to submit their homework, for placing a copy of all class notes on to the wiki and for providing structural and organisational information to students, parents and community members. Meanwhile, the teacher from School D says, "I haven't used the wiki this year as much as I wanted to. We had one, but it was just the bare essentials, I think that next year we will build on it and it will become an even better vehicle for what I want to do."

However, the teacher from School C advises that she, "Has got to make sure that students are referencing properly as there is a couple of lower students who just cut and paste a great big slab of information because they struggle to read through it. We do try to steer our kids toward the encyclopaedia program because it is a bit more kid friendly than the internet. It is really only our better readers and writers that can actually rewrite information from the internet in their own words. The average and below average kids just will cut and paste a whole slab, so that doesn't teach them anything. But then that could happen anyway, because even if they are using books from the library some are still going to copy the entire thing."

4.3.2 Multimedia.

Teachers from School A offer several examples of students using multimedia with the 1:1 netbooks, for instance, connecting the students' netbooks up to a projector, and showing their presentations which include animation, audio, photos and videos. In another example, the students conducted interviews with other students whilst recording them using Audacity. The students were then able to reflect on the questions which they had asked and to refine the questions to develop questions which were easier to answer. The teachers also cite examples of the students using flip cameras, digital cameras and video cameras to take photos and videos for inclusion in projects and presentations and to support the students' learning.

In another example from School A the teacher reports, "The students video recorded 3 minute oral presentations live. They then view the video and the student can decide how well or how badly they have gone, where they spoke clearly and where they ummed and ahhed. They can decide where they did an excellent job or whether they just thought they did an excellent job! Another way we are doing presentations is using the video

camera and the student gives the presentation in isolation which they then edit and present the good copy to the class. The kids will have their bloopers as well as their good copy which they can put onto their own netbooks as a digital portfolio. Throughout the year you can see whether they are continually making the same mistakes, or improving dramatically."

The teacher from School C explains how the children had used many of the netbook multimedia applications. She provides these examples: they used Audacity to create radio shows for broadcast on the school radio station; they recorded their learning journals and reflections in a video format rather than writing them down; they used multimedia in class presentations rather than just making a poster. They also use their netbooks to produce special effects and music for the school production, and in recording interviews with people in their unit of study on memoirs.

This teacher explains how the students went about creating radio shows in greater detail, "In term 2 we actually got the kids to pre-record a radio program that had to go for approximately 60 minutes. The kids had to sit down and write a list of songs that they would play and then we had to teach them about appropriate songs, that is songs with no swear words. They also had to look at how they would introduce their hour time slot and what other things they might for example, like competitions or quizzes. The kids had a fair bit of timing that they had to work out and they had to have a full script. It was interesting because the kids would have a sentence that they were going to say and they had put one minute beside it in their script. So I offered to time them and they would say it in ten seconds, I would say to them, 'But you have got another 50 seconds to go.' It was a really big thing for the kids to do and because we were just starting the radio station we didn't want to go live just yet because quite frankly we didn't trust them, and as it turns out one student made up a delightful little song about poo! We had to give the kids a big talk explaining that it is not just going to be other kids listening to this radio station. It is on the normal airways and when parents are picking up their kids from school or grandma and grandpa happen to be driving down the road they can tune in. The students had to learn a lot about the wider audience, it is not just about what they want on, it is what everybody can listen to."

Teachers from School B offer this example of multimedia use with the netbooks. "We had the kids do a major project in third term using flip and digital cameras. Their task was in teams of 3 and 4 to choose a topic to do with either human hygiene, diseases, or healthy living. They had to story board it, script it, film it, edit it, put it together in Movie Maker and then present it. Students produced everything from a movie that was about "Why should you wash your hands?" an actual demonstration of how to do it properly, to healthy eating. We visited the supermarket and we got footage of the kids picking up chips and swapping them for fruit and veggies

and things like that. There were real life messages within the digital creation." Teachers from School B continue, "The problem with multimedia production is that it is very time intensive. So you cannot do it all of the time but our kids have done 2 movie projects and a few photo story activities."

One teacher from School E offers this example of multimedia use with the netbooks. "We used the kid's netbooks to help them learn Auslan (Sign Language). I got them to video themselves signing. That has been really powerful feedback for me and for them because I've sat down with them and asked them to show it to me and we talk about their use of facial expression, their use of correct vocabulary and so forth. That has been powerful in not only teaching vocabulary, but the correct grammatical way of signing."

Another teacher from School E explains, "The students did presentations of information which they had researched. One of the girls had her microphone and her video and she pretended to be a reporter interviewing the 2 eye witnesses. I think that sort of learning is really powerful. Initially they would worry about how they sound or look on the screen and the audience's reaction. But it has become the norm now; they use it if they need to. There are a lot of students that actually drag a video clip from the internet to put into their Powerpoint so if they do not make their own movie they will find another one to put in it."

4.3.3 Netbook preloaded software.

Teachers from all schools cite many examples of the students using the netbook's preloaded software programs. The programs teachers most commonly described students using are animation programs such as; Kahootz, Scratch, Monkey Jam, Google Sketch Up, Paint, Game Maker and Comic Life. Productivity tools such as Onenote, Microsoft Powerpoint, Microsoft Office Word, Microsoft Publisher and Microsoft Excel. Multimedia programs such as Moviemaker, Debut, Audacity and Picassa, and information software such as Encarta Dictionaries and Encyclopaedia and Tux Mathematics. Teachers further note that in order to teach students how to use these programs that they must first learn to use them themselves.

4.3.4 Organising work.

Teachers express mixed responses when asked if the students were using their netbooks to help them to organise their work. Teachers from School A believe that students are more organised with their netbooks, "They are not fossicking through their desks and losing things, it is all on their netbooks. The netbooks have encouraged the children to take more responsibility for their own learning because there are routines and

consistent ways of saving things. If they haven't followed them then there is no excuse. It has been really good being able to go to someone and say 'Rightio show me your dictation piece'; we put it back onto them.

Whereas teachers from School B state that they thought that their students are "Still pretty unorganised. We have encouraged them to save their work into Onenote and onto the wiki, but a lot of them just want to print it out and be done with it. Also there have been problems because the students do not understand the difference between a local folder and a network folder, then we get things like 'I cannot find the file I was working on yesterday'. So we probably need to do a little more 'prework' at the start of the year on teaching what a network is and how it works and how your personal netbook then fits into that network structure."

Teachers from School E also find that their disorganised students had, "Disorganized icons all over their desktop, they cannot find where they have saved anything. The disorganized ones are still disorganized, now they just lose it in their Net book. They will have saved their work in the wrong place or they won't save it at all. The students always say that it is the netbooks fault you hear 'Stupid netbook' as you sit at the table. Some students find it frustrating because they are not organized themselves so they do not organize their netbook even though I have sat down and tried it to help them they still cannot refind things."

4.3.5 Student communication.

Teachers from Schools A, B, C and D ware all able to offer examples of their students using their netbooks to communicate with each other through wikis, blogs, email or web 2.0 programs such as Epal, Superclubs Plus and Google Docs.

The introduction of 1:1 netbooks has seen a shift in communication between teachers and their students. Teachers from School A reflect that the introduction of emails has been interesting. "We did introduce email this year and it has been interesting to receive and send emails during school time. Sometimes the class seems more 'relaxed' and this improves communication. We can talk about problems, help each other and share knowledge." School C also uses email as a form of communication with their students, "The students and I email each other, students can download their work from the wiki, then complete it and email it to us."

One teacher from school E recalls an incident where a student emailed her, "One of my girls emailed me from home and said 'I left part of my project at school can I please get it tomorrow and hand it in the next day?' and I was able to reply to her 'Yes, no problem.'" Similarly another teacher from School E explains, "A student emailed me to ask a question about a project, I got the email on my mobile phone and I wrote back explaining the project criteria, and so he was able to hand the project in the next day, otherwise it would have

been late." When asked if they are using blogs or wikis at school, these teachers from School A reply, "No we haven't started one yet. They are things that we probably need to work on, to develop. There is just so much, it's huge."

Teachers at School B used a wiki to facilitate communication with their students, "It has changed the way that we plan, and how we mark student work. The kids can upload their work from home and we can access it ourselves at home, it can be corrected that night and handed back the next morning. We even use it for structural or organizational things like for example we turn up on a Thursday for our gardening and cooking sessions and the gardener has already been onto the wiki and allocated the jobs to each group and given some information or maybe a website which the kids can visit, or extra jobs the kids can do. That way before the kids go gardening they know what they are going to be doing with what implements, with what plants and what they can do when they run out of time."

Teachers at School B continue, "We put homework assignments, class notes, everything onto the wiki. Everything I plan I put on there so the kids have access to it all, it is their resource as well. It becomes their digital portfolio as well because they are uploading work to their own folder. We can see what students have achieved and their parents can get into that folder as well, it's terrific."

The teacher from School C elucidates, "We use our wiki as a discussion page. For instance we put discussions about how to fix possible netbook technical difficulties like microphone or battery trouble on the wiki so the kids know that if they have technical trouble that they can go and search the wiki for a solution first and then come to me as a next option if they cannot find the answer." She gives another example of how they have used the wiki to facilitate communication with their students at School C, "We put our term homework planner onto the wiki and then the kids can look up what they have to do each week for homework. They all have access to the wiki and they all check it to see what's there. We do not even have to remind them. It has been really good." This teacher observes that she could even put work and information up onto the wiki during the time which she had off work this year following an operation.

4.3.6 Relevance of student learning to the real world.

Teachers from School E believe that 1:1 netbooks have helped their students to link their learning into the real world. They explain that students reading articles on the internet is, "More relevant than some text which has been in the school for 10 years. Netbooks absolutely makes learning more relevant to the real world, it has been really powerful." Likewise, a teacher from School A comments, "We live in a technology rich world,

students are used to mobile phones, ipods and multimedia, they are enthusiastic about utilising ICT. 1:1 netbook programs enable learning to be communicated using different formats that are appealing to students. Computers are used in the wider society and students are using skills that they can develop and teach to their parents."

4.3.7 Interesting and enjoyable learning.

One teacher from School A explains how she believes that 1:1 netbooks have made learning more interesting and enjoyable for students, "With the netbooks there are different ways to present lessons, different ways to communicate and new programs to utilize. Netbooks can transport the students out of the classroom and can enable them to share work with their parents. They can use game formats to learn and practise skills, they can design games, web pages and wikis. Students can take the lead in introducing and facilitating the use of programs. Netbooks give students greater variety and greater access to ICT." Another teacher from School C comments, "Students love playing on 'Mathletics' they think that they are getting rewarded and that they are not working at all. They do not realize that teachers can set tasks and levels for them to work on and then check their progress; we can actually see what they have done and where they have improved. They are really bluffed that it is fun games and nothing to do with learning whatsoever."

4.3.8 Higher order thinking, in-depth learning and problem solving.

Teachers from School A are able to offer examples of how they had used the netbooks to create a higher order thinking environment in the classroom. One teacher explains, "The students wrote and edited articles which they then audio recorded themselves reading. They put all these recordings together with photos and videos in to a movie. It was a sizeable job, it's not just one simple task, there is about 11 steps to complete the articles, the audio, the visual, the opening and closing and to get it to all work together. There is a lot of thinking through what needs to happen next. So I tell them 'This is what we are going to have at the end, what do we need to do to get there?' Some kids got it straight away and some kids needed a bit more teaching with it but everyone knew what the aim was at the end."

On reflection a teacher from School A explains that the netbooks have facilitated the use of higher order thinking strategies such as analysing, comparing, contrasting, organising, deconstructing, separating, distinguishing, evaluating, checking, critiquing, judging, justifying, hypothesising, ranking, substantiating, arguing, validating and assessing. She states that they have also used the netbooks with many other thinking tools for example: Bloom's Taxonomy, Gardner's Multiple Intelligences and the PoLT framework.

One teacher from School A explains how he had engaged his students in problem solving activities using the 1:1 netbooks, "I got my kids to take photos of the preps reading a book and then they gimped them into a different background so some of the prep kids were riding unicorns and some of them were sitting on the tail wing of an F1 a fire jet and some sitting on the side of a flying saucer. The grade 6 students found that often the photo they had didn't fit in with the background they wanted to use it with. My grade 6 students would say, 'I haven't got the right photo, this is just not working!' I would tell them, 'Okay go and find the kid again and put them in the right position.' Sometimes they found that a photo was the wrong way around, and the child should be facing the other way, then they had to work out if they could flip the photo which depended on the book the child was reading, you couldn't have the book back to front. It was interesting the grade 6 students really liked doing it, there was a lot of problem solving and thinking outside the box."

The teacher from School D reports that her students have developed greater problem solving abilities since the introduction of the 1:1 netbook program. She explains that "Whenever children ask how do I do this, or how do I do that on the netbooks I always encourage them to go away and have a fiddle to see if they can figure it out for themselves. They have become a lot more independent in how to solve netbook related problems. Half the programs on their netbooks I do not know how to use so I cannot teach them how to do it!" She continues, "In a way I guess that it has bridged that gap that we are not the superior teacher versus the student. We are a bit more level in that respect in that they can teach us stuff, we can teach them stuff, and they can teach each other as well. One of my mantras in my classroom is that we are all learners. I am a learner. Before the netbooks I always quoted that to my students, and I think the advantage to me has now been that I can say, 'Hey listen, who knows how to do this because I do not know?' It has been another way for the students to actually say, 'Well she's not just talking the talk, she's walking the walk.'"

Some teachers reported that students are able to explore topics in greater depth since the introduction of the 1:1 netbook program. The teacher from School C explains, "You do not have to wait until computer lab time to go and research something you can do it right here and now. For example, a few months back we did some work on a Transport Accident Commission advertisement. We viewed the advertisement on 'You Tube' and then we linked it to our blog and then the students did some further internet research. Whereas previously we would have shown the advertisement on the interactive whiteboard and then had a discussion about it and that would have been the end. But now the students are able to instantly get on board with the topic and really take it somewhere. You can discuss a topic all week. Instead of leaving it until Friday when we have computer time, you can start it on Monday and set tasks each day that get deeper and deeper."

The teacher from School D continues, "There has been a lot more follow up discussion. For example, some kids might say 'Oh last night I looked up...' whereas that might not have actually happened before because they had to fight for computer time at home with their siblings and then the computer time they had was used was to chat with friends on MSN or to go and update their Facebook. Whereas having access to a netbook all of the time means that they will actually go and look up something which they are wondering about. There is more home learning, as opposed to just the 'homework that I have to do'. The students following through their personal interest and being able to access information has been a difference." Likewise one teacher from School A makes the comment, "Students have quicker and easier access to information and can continue their learning at home, therefore they complete more work."

In contrast one teacher from School A expresses doubt that the netbooks have enabled his students to take their learning deeper. He states that he definitely believes that the netbooks have enabled his students to access more information, but feels that if would be debatable as to whether this necessarily translated into deeper learning, "It gives alternate ways of finding information, but whether they actually go deeper than what they were capable of without netbooks I would not like to say yes or no."

Teachers from School E feel that having netbooks did enable students to go deeper with their learning. One teacher gives this example of how they use the netbooks to extend their students' learning, "I have got some kids who are working at the end of Year 7 if not Year 8 level and I can put them onto sites like the 'McDonald's Mathematics' website and they can go in and look at trigonometry and high level algebra and things like that."

Teachers from School B also believe that having the 1:1 netbooks has enabled their students to go deeper with their learning. One teacher expounds, "I think that it has given them access to a lot more information, I have quite a few kids that in the past have done certain things and have been very superficial about them. Now, they are still quite superficial initially but it is only a matter of putting them back onto the computer and they can keep finding out more." Another teacher from school B continues, "One girl who really does struggle was able to do a Powerpoint on 'Hand, Foot and Mouth' disease in humans. It was just brilliant the amount of information that she had, she could tell you everything that you possibly wanted to know about that particular disease, where it came from, what the virus looked like, how to treat it, the whole lot. In some cases it really has allowed them to get a much deeper understanding. Also you are able to teach the kids how to get deeper because it's not just gaining the information; it is the process of getting down into that deeper knowledge."

Another teacher from School A expresses the view that the netbooks have helped her students to go deeper with their learning in the classroom through using them in their reflective thinking. She explains, "We get the kids to go back after they have done an activity and look at how they did it, reflecting on the strategies that they used. The students realised that they weren't just guessing how to do something, that they used strategies. We have been doing a lot more reflective activities with the netbooks and that is part of the justification of why we think that it is important that they have these netbooks in the classroom. Their true value is in their use as a reflective journal, a portfolio including reflections on their work. The netbooks can help the students by enabling them to easily pull everything together. The kids can look back on their work, it is there, they can bring it up and they have got their photos, their text. They have got video of them talking about it, lots of different ways of recording that information and putting it together. I think that that has got to make their understanding deeper because they are explicitly making connections. We are finding that the netbooks help kids to transfer one piece of information and connect it to another. Before they used to do something and then they would finish it and that would go there and it is finished with. Now I think with the access to computers more they can pull that information back and go on with it. They do not see it as a separate task. I think that's probably something that we are doing better with the netbooks."

4.3.9 Individualisation of student learning.

Teachers from School A explain how they believe the netbooks have helped with individualising student learning, "The access to video is powerful for those kids that just do not quite get that visual Literacy, they can watch a little bit and then stop it and think "What did she say?" and work it out and then write it in their own words. They can go back and watch it again and then keep going and that's great for your low level kids. One of my low level students deliberately puts the headphones on and he just listens to it intently again while I race off and work with other people to get them on task to ask questions. So you can gainfully keep people genuinely doing something while you are teaching. You can get more out of everybody if they aren't waiting for you."

Teachers from School B describe how they have used the netbooks to individualise the curriculum, "For example, with the Mathletics web site you can go into the 'Class Administration' section and set the level for individual students, so grade 6 students do not have to be on grade 6 curriculum. You can go in and drop them down to a grade 5 or a 4 if need be. You can modify what they are doing to then support them at the level that they are at."

Teachers from School E find the Smartkiddies Mathematics web site beneficial in individualising the curriculum for students as they receive a report back from the web site as to how the students went in the tasks. They say one problem with the netbooks has been that, "It is a little bit harder to monitor exactly what the students are doing and what they are capable of. Sometimes you can set them an online task and they say "Yep I have done that and I found it really easy." But if you actually watch them do it they are not finding it easy and they are not getting it. It's that whole 'click and go' mentality, 'I am over that what's next?' That is where you do start to lose a little bit of that control of not knowing exactly what it is that they have done. However, it is a lot easier to modify a task if it is not at the right level, you can step it up by just adding something on their Net book."

Teachers from School E describe how they have used the netbooks to present information to students in a variety of ways; "We use a lot of online Mathematics resources to support our program. There are lots of videos and teaching tools out there and the kids will actually listen to video a hundred times better than they will listen to the teacher at the front of the room. You can stop and you can start and you can go through it that way. I have found that side of things great for the whole class; it is someone else explaining it in a different language. Some of the kids might pick up things that they might not have with just me explaining it. It is also there for the students who are struggling with the tasks that are set to be able to go back and to watch the video and pause it and go through at their own pace. It certainly engages the students. They are also doing a lot more automatic recall Mathematics games and activities, like Tux Mathematics. We also use Smart Kiddies and Mathematics Playground, there are endless sites out there."

Similarly teachers from School B have also used the netbooks to assist with teaching Mathematics in variety of formats. "The visual support sites like Mathletics offer is great, having us explain something on the board and then also having it explained by the Mathletics teacher is great. When something is presented digitally the students can really see what is happening, the visual aspect is really helpful. They can also go back over it too if they want, which really helps for sure. There are so many supportive sites out there, for example Rainforest Mathematics or Digilearn, which provide support for all of our different learners."

One teacher from School A explains, "Prior to 1:1 netbooks we used the data projectors to illustrate, demonstrate, inform and direct our students. We still do that, but the difference is that now the students also use the data projectors with their netbooks to demonstrate and explain their own learning."

Teachers from all schools report that the 1:1 netbooks offered the students more choices in how they presented their work. Teachers from School B explain, "The netbooks allow the students to have more choice

with how they present their work. For a while we used "Digital Sandpit" time for the students to play with the programs. Then when we gave the students assignments and they would say things like 'Oh I could use Google Sketch Up for that.' There's lots of scope to bring all the different software into the curriculum, it's definitely definitely good." Whilst the teachers from School E comment, "A lot of the students still like to use Powerpoint because they are comfortable with how to use it, but I have got more students now wanting to make videos and to use Audacity in their projects."

Teachers from School E also reflect that the 1:1 netbooks have enabled students to drive their own learning. They explain that the teachers set overall parameters of tasks but that the 1:1 netbooks allow the students to choose the direction and extent of the task according to their individual interests. Similarly teachers from School B explain how netbooks have enabled them to offer more choices to their students. They explain how they give a snippet of information in guided reading and then ask the students "What else can you find out about this?" They affirm that they have definitely offered their students more choices this year through wondering and inquiry work, "The sheer amount of resources which the netbooks have on them really opens up the boundaries and gives the students the opportunity to go where they may." Teachers from School A also affirm that 1:1 netbooks have facilitated an even greater constructivist approach to their teaching, allowing them to enable their students' choices to direct their own learning to an even greater degree.

Teachers are able to give examples of how students worked better individually in 1:1 netbook classrooms. One teacher from School A states, "Students most definitely work better individually with the netbooks. I think this is one of the main successes. Students can complete tasks individually and feel success. Particularly for the students who have difficulties, as students of all ability levels can utilise the programs and meet their specific needs and be challenged at different ability levels."

The teacher from School D believes that the netbooks have been especially helpful for the boys in her class who would not normally be engaged in individual work, "We have got a couple of boys in particular that if I make them do their work in a workbook then they would not be as engaged, but they like using the computer because they have been raised with computers. They are good at using computers, so they enjoy their school work a bit more. Again I think it is that levelling factor, using a workbook these kids would take a really long time to complete the work, it would be a battle and it would look messy and awful. For them to actually do individual work that looks exactly the same as everyone else's is really levelling. 1:1 netbooks increase student engagement."

4.3.10 Projects and assignments.

Teachers from School B state that the netbooks have facilitated them in doing more project work with the students. However, whilst teachers from School A state that they have not done more project work as a result of having the 1:1 netbooks, they explain, "We do integrate the 1:1 netbooks with project work. The netbooks give more flexibility and options in how students research and present projects. For example, this year the students have used email, Microsoft Office Shared Docs, Audacity, Game Maker, Powerpoint, animation programs and Survey Monkey. With practice the students have become experts in using these programs. We have kids working in different groups and the netbooks are great for this type of group work. We use the netbooks for creativity, revision, reinforcement and documentation. We still value handwriting and handwritten presentations and netbook presentations are negotiated with us."

4.3.11 Student responsibility.

Teachers observe that 1:1 netbooks have made the students more responsible, both in the context of caring for their netbooks, and in the students' ability to be responsible for their own learning. Teachers from School B explain how their students have been responsible netbook owners, "The students know that they have been given something which is a great opportunity, and they know that they have got to do the right thing. We have drummed into them that they are responsible for the choices that they make." Teachers from School A note that students show responsibility by charging their netbooks at home, or by bringing power leads to school so netbooks can be charged at school. Teachers from School E reflect that the 1:1 netbooks have enabled students to take more responsibility in directing their own learning.

This responsibility has also been reflected in the students' learning. Teachers from School B state, "We still get the occasional question 'How do I spell this?' or 'How do I do this?' We tell them, 'You have got Google or the share point, or the online dictionary, or there is the online thesaurus... look it up.' Many of our students now take responsibility themselves and find the information they need. Some of them will just go off and start researching and reading on a particular thing. Sometimes we then get the student to do a presentation on it and sometimes it is just exploration for their own general knowledge and enjoyment."

Teachers from School A offer another example of how 1:1 netbooks have helped the students to become more responsible for their own learning by videoing themselves during oral presentations and then using the video to reflect on, and improve their presentation skills.

Teachers from School A offer this example of students becoming more responsible for their own learning, "The students set themselves up using 'Debut' (Video Recording Program) and talk about a concept which they have learned, for example 'how to do division'. They keep the video and then next time they come across a problem instead of having to come to us and reminding themselves they look at their own video. They have created their own learning resources." Teachers from School A remark, "Students have 'raised' their level of involvement in the school for example, designing and implementing surveys to gather information about the school production. There are not as many 'excuses' from students for not getting things done. Students are using OneNote to organise sections, subsections, pages and subpages to showcase their work for their parents, students are responsible for keeping their own portfolio up to date with relevant information to show their parents."

4.3.12 Group, cooperative and collaborative learning.

Teachers from School A provide examples of collaborative learning, "Working in groups the students used Survey Monkey [Online survey and questionnaire software] to design a survey to be done by the grade 3 to 6 students and staff in relation to the school production, in order to get feedback about what staff and students thought about the production. They have also designed surveys for the prep teachers to do in relation to prep attitudes to school. The students have also worked collaboratively using Google Docs' [online document creation, editing and sharing program to coordinate Kids' Congress this year. They are also using blogs collaboratively, this year we are allowing them to discuss personal stuff on the blog as well as educational topics." One of these teachers also mentions the Superclubs Plus web site which she says has enabled students to actively problem solve together, as well as preinstalled netbook software such as Game Maker which enable a small group of students to work together to devise a teaching program for students from other schools.

The teacher from School D also refers to the Superclubs Plus web site, "It is brilliant and with the collaborative project that we have done with (another primary school) it has been good because we both have Superclubs Plus, so it is a way that the kids can actually contact each other." She continues, "There are a lot of things that I would like to refine and do better, for example with the collaborative project that we have just done we set up a research Wiki with the 2 schools and that was really good. We did have one group working collaboratively on creating a Movie Maker news cast and they found it hard to work collaboratively across the 2 schools using Movie Maker. Other groups have been able to be involved in ongoing collaboration adding to the

Wiki and emailing each other. I am getting emails from the kids at [the other primary school] saying 'Thanks Mrs…it was really good and I hope that you have a nice weekend' and smiley faces."

The teacher from School C observes, "I have had some issues with kids doubling up on work because they are not coordinating well with their group. Also, you are still going to have a couple of kids that do not pull their weight in the group, or a couple of kids who dominate the group." However, the teacher from School D reports, "Because I've got a composite grade 5 / grade 6 the pairs work has really increased. We have had to be really cooperative as the grade 6 students are sharing their netbooks with the grade 5s who do not have netbooks. I usually like a grade 6 to partner up with a grade 5 so that there is technology equality across the partner groups. Often I am pairing kids that aren't necessarily friends and have different ability levels, but the cooperation has worked. The kids are like, 'Well you are not my friend and I consider you a dork, or, you are one of the cool kids, but it is not a big deal, okay come on'. Whereas before the 1:1 netbook program students might have been rolling their eyes saying, 'Oh, look who I am with!' Whereas now the grade 6 students have been really good about sharing and saying 'Well here you have a go, you look it up.' I really thought sharing would be an issue because the netbook is theirs and to begin with it was very new and shiny and lovely but as far as the cooperative work goes they still offered their netbooks to the grade 5s to have a go."

Teachers from School B have also used the netbooks in cooperative work and cite the example of students using EPal to establish email friendships with students in schools overseas. Teachers from School E mention Google Docs where all students work on the same document at the same time, as being really effective for time management and to keeping the students on track.

However teachers from School E also observe that, "Sometimes the netbooks are good and help with group work but then other times you have got 25 students in the group just focused in their own little world. Some students tend to hide within themselves; I really noticed that at Kids' Congress. All of these kids just sat there in their own world for 2 days." She concedes however that, "They were on task though, and they were doing things that they find interesting so we got a lot more out of them."

In contrast some teachers noticed increased social interactions between students as a result of the 1:1 netbook program. Teachers at School A expound, "Some of the kids have taken on different roles. It was really good for one of my boys who was at the Kids' Congress; he is not a very social kid. But with technology he is fantastic. He ran a workshop teaching 'Game Maker' to his peers. He had a huge learning curve in thinking how do I teach these other kids and tolerate the different levels and not get frustrated that they do not understand. It was huge for him. Initially he would do big jumps; he would know in his head what he meant and he would

expect everybody else to be able to jump with him. This experience improved his communication skills, his tolerance, and appreciation of other people and their differences. It also improved the other student's tolerance and appreciation of him."

Teachers at both School C and School D state that the 1:1 netbooks have encouraged students to interact with others who they may not normally interact with. The teacher from School D explains, "Especially because the children that do have the 1:1 netbook technology skills aren't necessarily the academics or the students who always know all the right answers. It is often different kids, ones who do not usually have success who are getting to be leaders in the classroom. It is these students who will say 'Here I will show you.' More so than I ever thought would occur, it has been the crossing over of these kids that you would not expect. The peer coaching and interaction has been the most powerful thing to come out of the 1:1 netbook Program really."

The teachers observed several examples in their 1:1 netbook classrooms of a developing culture of students sharing knowledge with each other, teaching each other and building together a collective knowledge base. Teachers from school A illustrate, "We taught one student to use the scanner with their netbook, it was then up to that student to teach the next student, who then taught the next student and so on so that eventually all students were taught how to use the scanner by a student, and they then had the opportunity to teach another student how to use the scanner." Teachers from School A also explain that the students have frequently connected their netbooks to the projector in order to teach or share something with their peers.

The teacher from School C explains that the netbooks have facilitated a type of peer teaching and interaction that didn't occur in the computer lab. "That's been one of the most powerful things for us, for example we have one student who we taught a little bit of animation in class. She took it home and fiddled with the program and now some of the stuff that she has done is brilliant. She taught her brother at home and now they make animations together. It has been so powerful with students all teaching each other. They are willing to get in there and show someone how to do something, whereas normally in the Lab they are not as engaged with each other. For us one of the most powerful things has been what the kids have taught each other."

The teacher from School D has observes similar interaction in her class, "The netbooks have been a real leveller because the students have all got the same programs. The peer coaching and peer connectedness that has occurred with the 1:1 netbooks has been a driver in the students' engagement in learning this year, that can only be a positive thing." Similarly teachers from School B state, "The netbooks have improved the communication between everyone in the room, if someone finds something good it is shared more now than it was in the past."

Another teacher from School A gives an example of how some of her students developed their own skills and knowledge in a specific netbook software program through "Digital Sandpit" time, then planned lessons and workshop activities to teach other students how to use this software. Her students were fortunate to have the opportunity to actually be able to run these workshops for students from other schools at Kids' Congress. Further, these students also developed online questionnaires which they used to receive peer feedback about their workshop presentation at Kids' Congress.

4.3.13 Presentation of student work.

Teachers observed an improvement in the presentation of some of their students' work when they used the 1:1 netbooks. The teacher from School D explains how the netbooks have helped one of her lower achieving students improve the presentation of his work, "I think that that has helped with his self-esteem, the fact that he can actually print it out and it looks neat, it can be corrected on the screen as opposed to lots or circles and marks, because he would get every single word wrong." Whereas another teacher from School E reflects that it is actually her higher achieving students whose work presentation has benefited most from the 1:1 netbooks. She says "I think that the presentation of my children's work when it is done on their netbook is much higher than in previous years. But once again there are those children that even though they might think that they have completed their work still have a lot of errors in it. So it will be the spelling and the punctuation, particularly capital letters of words that they still do not see no matter if they are typing or handwriting. In terms of presentation it definitely has levelled the playing field a little. The top achievers still put in that extra bit, the language that they use is far greater and deeper than the children that aren't working at the expected level. In terms of being able to do graphics and titles and models and all those sorts of things they are all capable of doing that, I think that the higher achievers put it all together better. Your lower achieving students still struggle with the concept of presentation and how it should look, some of them are very messy and so their presentation of work is still very messy."

4.3.14 Inappropriate use of the 1:1 netbooks by students.

All teachers cite examples of individual students using their netbooks in an inappropriate manner. One teacher at School A gives this example, "I have got 2 kids in my classroom who are just obsessed with screen savers. They cannot get past screen savers to do their work." Also from School A one teacher states, "We have been having a look at some of the kid's netbooks just to see what that they have got on there that they shouldn't

have, such as photos or screensavers. So we are discussing copyright at the moment, in the past we have talked a lot about copyright with text but we do not always discuss copyright with pictures. Also music, they can only put music onto their netbook if they own the CD, and we have limited them to only having 20 songs on their netbooks. It was really difficult for the majority of students to understand our approach and request that music must be down loaded legally. This was a behaviour that they were all used to; 'everybody' does it so it should be allowed. This is an interesting mindset and I do not think that we have convinced all of our students (or parents) as to the 'moral compass' needed here. We also had the sharing of illegal movies, again, a learning opportunity for us all."

Several other serious issues also arose. Teachers at School A report, "We have had an incident of offensive material that was shared between students via email, also we had a group of boys early on in the program who used 'communicator' without the staff knowing and this led to some pretty awful online bullying and foul language. When we found out, it was pretty awful for all concerned as there was a little bit of 'hurt' to get over. It was a good learning experience for us all though as it brought home to us that the netbooks do open up a whole new world to us and there is much that we all have to learn. I saw the 'ugly' side of the power of this technology. I saw kids behave in a manner which truly surprised me. I thought that I knew these kids but they said things that I would not have believed if I hadn't seen it. This was the worst, I felt like I had been 'hit in the guts.' It was also constructive as I realised that there was a huge responsibility with these netbooks and there was much to consider. They really are a powerful toy and we are treading in 'unfamiliar' waters. I realised that I had a role to play in this 'cyber world' and that I needed to become a strong mentor and strongly advocate the development of the 'moral compass.' We discussed cyber bullying, with the students and then we had the kids do animations which had to have at least 3 scenes about cyber bullying; that was really powerful learning."

The teacher from School D also cites an example of cyber bullying, however she states, "But that was happening before the netbooks, I do not think I would link that to the netbooks at all. We haven't seen an increase in it since the netbooks. The kids have been educated that this is unacceptable, but it is going to happen regardless of whether they have got their own netbook or not."

The teacher from School C explains, "We did have a few kids busted for having inappropriate material on their netbooks and the parents didn't even know because the parents weren't even keeping an eye on what they were doing on the netbook at home." The teacher from School D describes a particular incident, "I had one incident where a student told me that he didn't have his netbook with him at school today. I said 'Now Nick you know it is part of school requirements that you bring your netbook every day. Why do not you have it here

today?' and he said that his brother had it because he had to do a project and it was due today so he has got it at his school. I said 'No, the netbook is for you to use, that is what the netbook lease is all about, he is not allowed to have it, you need to have it here for access every single day.' I asked him 'Does mum know that Joshua has got it?' and he replied 'Yes'. So Joshua was using it for his project and had taken it to his school to use and Nick missed out. That was really interesting because it turned out that the whole family was using it. Apparently mum knew all about Joshua taking the netbook and that was fine, Joshua's project was more important than Nick's learning, so I do not know."

Teachers from School B state, "Probably our biggest problem at the moment is MSN on the netbook, because you cannot regulate it you have no control over who is coming in and who is going out and what they are saying." They relate an incident in which a parent was using MSN to communicate with her child at school through the day, "We had one parent communicating with her child during the day on MSN, so we had to remind the students they cannot do that. We have had a couple of incidents where some kids have had their netbook taken off them, and we have explained that it is because of an email they have shouldn't have sent or some songs that they shouldn't have downloaded. We take them back to the [netbook] agreement that is still stuck up on the board so that we can just constantly remind them. There will always be someone pushing the boundaries. It doesn't matter what it is."

Teachers from School E also cite students accessing MSN as being a problem, "There has been a little bit of cyber bullying which happened at home on MSN. I think that would have happened anyway. I do not think that it is reflective of us or the netbook trial; I think it is a parental thing. It might be happening on their netbooks but it is happening at home. However, because the students are upset with each other they end up bringing it to school, and then you have parents on the phone to deal with." They also cite some examples of students communicating with each other on the netbooks when they should have been working in class.

4.3.15 Learning at home.

Teachers are able to offer several examples of how students used their netbooks to continue their learning at home. The teacher from School C explains, "That's been one of the most powerful things for us is that often at home they will keep fiddling with the programs or researching topics that interest them. It is home learning as opposed to just the homework that they have to do. Being able to access information about their personal interests outside of just what I ask them to access has been the difference." The teacher from School D continues, "They can continue their learning at home still teach themselves so much more when they get home.

Then they come back and teach everyone else." Teachers from School B find the netbooks helped the students to continue learning at home by giving them access to web 2.0 interactive educational sites, "We use sites like Digilearn, Mathletics, Superclubs Plus and Smart Kiddies to set homework."

Teachers at School A notice that parents are more involved in helping with their child's homework since the introduction of the 1:1 netbook learning program. "Kids are constantly saying, 'Oh mum and dad were helping me with this and they showed me how I can cite these sources.' I haven't heard a great deal of that before the netbooks came in. So the kids are definitely more engaged with their parents in doing their homework, and their parents can see what the child is actually doing in class. It is more of a family thing. They are showing their work with their younger siblings also. You know when parents ask, 'What did you do at school today?' the common response is 'Oh no nothing.' At least now they have got something to show what they did at school this week. They have all made folders for whatever pieces of work that they have created, a lot of them use One Note to put information in, which has been particularly powerful."

4.3.16 Students' technology skills.

Teachers from Schools A, B, C and D all comment on the fact that many of their students have developed more proficient ICT skills in relation to the netbooks and the netbook's preloaded software than they have themselves. The teacher from School C explains that "Whenever students ask how do I do this, or how do I do that on the netbooks I always encourage them to go away and have a fiddle to see if they can figure it out for themselves. They have become a lot more independent in how to solve netbook related problems. Half the programs on their netbooks I do not know how to use so I cannot even teach them how to do it!" She continues, "In a way I guess that it has bridged that gap that we are not the superior teacher versus the student. We are a bit more level in that respect in that they can teach us stuff, we can still teach them some stuff, and then they can teach each other as well." The teacher from School D continues, "One of my mantras in my classroom is that we are all learners. I am a learner. Before the netbooks I always quoted that to my students, and I think the advantage to me has now been that I can say, 'Hey listen, who knows how to do this because I do not know?'"

One teacher from School A states, "Students have had opportunities to learn how to use a great variety of programs. Students use the netbooks to complete work and to communicate so their ICT skills have developed. The students have also become the experts and teachers in relation to technology skills. They teach each other and the staff. Because students could take the netbooks home, skills could be practised at home or

over the weekend. It was common to hear students come in to the room with great excitement as they mastered another skill."

Teachers from School A find that often several students in the classroom will become experts in a particular piece of netbook software. The teachers then encourage them to get up and share with their peers, to say, "This is what I have been doing, this is how I do it." It advertises that this student is an expert in this, but also the rest of the kids say, "Ah ha this is what you can do." One teacher observes, "The students help each other out with the netbooks all of the time, which is nice." Another teacher reflects, "Students take on the role of the expert more often, for example with game maker programs or animation programs. They take the netbooks home and extend their skills and knowledge at home with practice. They share their skills with other students, and as the students have become the experts the 'balance of power' has changed in the classroom. I think the netbooks have let students know that teachers are not the 'holders of all knowledge' and that they may be the 'teacher' in some instances. The students have taken on different roles within the school."

In another example from School A one teacher says, "Working in groups the students used Survey Monkey [online survey and questionnaire software] to design a survey to be done by the grade 3 to 6 students and staff in relation to the school production, to get feedback about what staff and students thought about the production. They have also designed surveys for the prep teachers to do in relation to prep attitudes to school. So in those sorts of different roles the students have become experts within the school."

Teachers from School B observe that the students have quickly worked out which students are the experts in which programs. "The students know who to go to to ask for help and the expert students say 'Oh yeah, I can fix that.' It is this massive ego boost for these expert students; it's like a self-esteem injection! These expert students are itching to go ahead and do more." However, they continue, "There are still some students though who are left behind, who are still battling to remember their passwords. They still haven't grasped the basics of it yet. I am at the stage where I am starting to get frustrated with these students who keep asking for help with the netbooks, whereas the expert students just hop in and say 'I can help with that'; they are great support for us."

The teacher from School C discusses the students' role as experts, "I was quite proud to write in some of my reports that the student has been teaching the teachers and other students to do some things. The students love the fact that they can teach us things. We have had a group of students that have taught 2 teacher professional development workshops; that has been fantastic for them. We have another group that taught our own staff at a staff meeting one night. It is just so powerful that they can go and teach adults. We have also had

some grade 6 students actually go and help in our grade 5 classes. Once they heard about 'Google Sketch Up' the teachers said 'Well we want to teach our kids how to do it' so we sent in a team of our kids who actually taught the grade 5s how to use 'Google Sketch Up.'"

The teacher from School C asserts, "It has built their communication skills in formal talking such as how to present and how to stand in front of other people. They know what they are talking about and so their speech flows a lot easier and that carries through in their confidence." The teacher from School D continues, "It is really good for their confidence and social Literacy skills. I will often ask, 'Who knows how to do (a specific ICT skill)? Next lesson could you stand up with the interactive whiteboard and go through it with us?' When the students actually own the knowledge you can see the difference in their body language and their eye contact, you see them stand up tall and you know that they know what they are talking about and all the stuttering and embarrassed to be standing up and talking stuff is just not there, which makes sense!"

The teacher from School C tells how 2 of her students, through their own initiative, were able to solve 2 technical problems with the netbooks at her school. "Our netbooks had not been connected into the school network as yet; none of us knew how to do it. Two of our grade 6 boys went searching at lunchtime on their netbooks and found Student Shared and figured out how to connect the netbooks to it. They also found the printers and connected the netbooks to the printers. They were able to show everyone else how to connect to the network and the printers as well."

The teachers from School E state that they have not had students developing a level of expert knowledge with the netbooks. One teacher observes that some of her students think that because they can play the games on the netbooks that they assume they are good at ICT. However she believes that there is a lot of things about the netbooks which the students do not understand because they have not investigated them. She describes an incident which occurred whereby one of her designated "ICT Leader" students managed to fix a netbook problem by accident. She concedes that some students can fix some problems, for example problems with the sound dropping out, but asserts that many students will still come to her to have the problem fixed. She does acknowledge that there are things that she does not know how to do on the netbooks and that she has asked one particular student for assistance at times.

4.3.17 Student attitude toward school.

Teachers from School A believe that the introduction of the 1:1 netbooks did have an initial positive impact on their students' attitude to school, however as the novelty wore off this effect has dissipated. They

comment, “Initially the students were arriving at school extra early to get on to the netbooks. However the netbooks seem to be taken a bit for granted now that the novelty has worn off. They still like to use them and would hate not to have them, but now they see it as part of the daily routine. I do not feel that this aspect has been as significant as I thought it would have been.”

The teacher from School D believes that the netbooks have increased students’ self-esteem in relation to their learning, which in turn produces a positive impact on their attitude to school. Similarly teachers from School E state that with the netbooks students experience a lot less frustration at school which helps them to have a more positive attitude to school.

4.3.18 Student motivation.

When it came to the impact of the 1:1 netbook program on the students’ motivation to learn, teachers agree that there was a definite initial positive impact, but that this impact has lessened over time. Teachers from School A comment, “It did initially effect student motivation to learn, it was amazing. Because our students didn’t take their netbooks home for a while, they would run to the car when you pulled up to get your keys so that they could get inside. Initially it was significant. It has become more common place now as students have become used to having their netbooks. It is still exciting when we discover a new site or program. Students happily use the netbooks for skill development.”

The teacher from School C comments, “They want to come to school to do stuff on their netbooks. There are still times though when they do not want to do the standard Mathematics lesson and the standard writing lesson but I think we have talked to them enough to explain that they still need to do those basic things, that to be able do some of the fancy stuff on the netbook they still need basic skills. Initially they would always ask, ‘Oh can we type our story?’ I had to explain to them that when they get to high school you may not always have a netbook to write on, so they still need to learn those basic skills. Now the kids just accept the fact that we are going to use them some of the day and there is going to be other days when we do not use them. The netbooks have definitely made them want to come to school. They are proud of using their netbooks.”

One teacher from School E comments, “Definitely at the beginning the students were motivated by the netbooks.” However a colleague from School E who has a different observation says, “I would not say the netbooks have motivated them. I do not know that they are working harder I think that they are just trying to work faster. I think that the quality of their work is probably still the same, the quantity just looks different.”

4.3.19 Student engagement.

Teachers at School A notice that their students are now much more "on task" since the introduction of 1:1 netbook Learning. "I think the kids are now on tasks that are much more credible and of a much higher level. The kids stay on task more with them. They are gainfully employed and not just kept busy on something." Whilst they suggest that generally the netbooks have a positive effect on student engagement in learning, they do caution that, "This does seems to waiver a little depending on the task and the child. However, we would not have as many boys completing these tasks without the netbooks, as they can be slow or reluctant writers."

The teacher from School C states, "The netbooks have definitely engaged students in learning. They are more willing to actually get in there and have a go at the work. I think the students' engagement in learning has definitely increased, that can only be a positive with their learning outcomes. Initially we had a few kids that would have been side-tracked by playing with stuff [on their netbooks] and then they soon found out that they still have to do the work and get it finished even though they are doing it on the netbook. So it has been a bit of change of thinking for them to realize that, 'Oh you have still got to get your work done you are just doing it on the netbook now instead.'"

The teacher from School D observes, "We have got a couple of boys in particular that if I made them do their work in a workbook then they would not be as engaged but they like using the netbook because they have been raised with computers. They like to use them and are good at using them so they enjoy doing their work a bit more on the netbooks. The netbooks increase student engagement definitely. Next year I need to ensure the engagement continues in order to improve the learning outcomes. So use this student engagement for good as opposed to just engaging the class."

The teachers from School B state that the netbooks have definitely increased student engagement, however the teachers from School E are more cautious about student engagement in the long term, "The netbooks definitely keep the students on task. There are lots of videos and teaching tools out there and the kids will actually listen to video a hundred times better than they will listen to the teacher at the front of the room. You can stop and start a video and go through it that way. It is someone else explaining in a different language. It has certainly engaged the kids, they are doing a lot more automatic recall sorts of things, sometimes there is not a sound in the room. It will be interesting though to see if this time next year the novelty has worn off. We are starting to get a little bit of defiance even now, whether next year when they are asked to do something will they just go off and do their own thing I wonder? I gave them some "Digital Sandpit" time 2 weeks ago on a new program and they were bored within about ten minutes."

4.3.20 Student behaviour.

Most teachers agree that 1:1 netbook learning has had a positive impact on student behaviour, especially the threat of losing the netbook in the event of poor behaviour. Teachers from School A state, "It is easier to maintain students on a task with the netbooks, students do not want to be 'banned' from using them. We have penalties for breaking (ICT) rules which has resulted in a small number of students having their computer confiscated for the 2 week penalty."

The teacher from School C states, "At our school we have got good kids anyway so their behaviour is not normally a problem, so we didn't notice a massive difference." Whilst teachers from School B note, "I think that the netbooks have had a positive impact on student behaviour. I mean there are still problems, there always will be, but the netbooks have definitely had a positive impact on behaviour for sure. We had a threat at the start of the year that students will lose their netbooks if they transgressed against the [netbook] agreement which they signed. Some kids have lost their netbook for a day or a week. This allowed us the opportunity to teach them that, 'Yes you have a right to your netbook and yes, you have a right to have access to it but you also have a responsibility to do the right thing and if you choose to abuse your rights well then the netbook is taken away from you.' It's real life. Netbooks make the whole classroom run more smoothly, for example if you have only got 5 [computers in the classroom] and everyone wants to be on them, well there is a problem to begin with."

Teachers from School E reflect, "Netbooks have helped with wet day and hot day timetables, it is pretty quiet inside on these days. We have got within our rooms certain practices, if you are misusing your netbook, or if you are on an internet site when you should be doing something else then you lose it for a certain time. The students know the expectations. Sometimes they will push the boundaries, I had one student push the boundaries today. He was playing a game when he shouldn't have been so I just took it [the netbook] straight off him. He didn't like it but I said to him 'You know the rules in the classroom and you have broken them.' I have got 27 students sitting at a netbook each so even though I am wandering around the room and talking to them I have got to trust that they're doing the right thing. So it is building lots of discussion about what is appropriate at school on their netbooks and what is not. It has been a big learning curve for them."

Full discussion and analysis of these results can be found in Chapter 8 whereby the results from the teacher interviews are compared and contrasted with the results from the student interviews, teacher and student surveys and the literature which was reviewed in Chapter 2 of this thesis. The following chapter reports the findings from the teacher surveys.

5. Findings Teacher Surveys

5.1 Introduction

This research took place in a large rural city of Victoria. There were 42 grade 6 teacher participants who were asked to complete the survey, of these 38 completed and returned the February surveys, giving a response rate of 90%. Of the December teacher surveys, 41 were completed and returned giving a response rate of 97%.

This chapter reports the findings from the teacher surveys which were conducted in February and December 2009. Discussion and further analysis of these results can be found in Chapter 8 whereby the results from the teacher surveys are compared and contrasted with the results from the student surveys, teacher and student interviews and the literature which was reviewed in Chapter 2 of this thesis.

A score of 5 was allocated to a "Strongly Agree" response, a score of 4 to an "Agree" response, a score of 3 to an "Unsure" response, a score of 2 to a "Disagree" response, and a score of 1 was allocated to a "Strongly Disagree" response. Thus, the higher the mean score for the question the more the respondents agreed with the statement.

Similarly, a score of 5 was allocated to an "All of the Time" response, a score of 4 to a "Most of the Time" response, a score of 3 to a "Sometimes" response, a score of 2 to a "Not Very Often" response, and a score of 1 was allocated to a "Not at All" response. Thus, the higher the mean score for the question the more often the respondent believed that this statement matched their actions.

This chapter begins with the affordances of 1:1 netbooks for teaching practice and the impact of these affordances on teachers. Following that the affordances of 1:1 netbooks for student learning practice and the impact of these affordances on students is reported.

Foremost the reader is directed to Appendix 21 which offers all of the following statistical data in table format. The work offered here begins with an overview of the statistical outcome. Each overview is then justified with a reference to the most relevant data.

5.2 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers

5.2.1 Lesson planning and preparation.

In 1:1 netbook learning environments teachers more frequently use their own laptops for lesson planning. Evidence: in the February surveys teachers were asked if they use their own laptops for planning and preparation 89.5% of respondents answered "Strongly Agree" or "Agree" ($M = 4.5$, $SD = 0.910$). Whereas in the December surveys 92.5% of respondents answered "Strongly Agree" or "Agree" ($M = 4.7$, $SD = 0.691$). See Appendix 21, Table 4

Teachers are significantly more likely to access diverse teaching materials on their laptops and use their own laptops to present information to the class in these environments. Evidence: in the February surveys teachers were asked if they use their own laptops to access diverse teaching materials 47.4% of respondents answered "Strongly Agree" ($M = 4.4$, $SD = 0.704$). However, in the December surveys 75.0% of respondents answered "Strongly Agree" ($M = 4.7$, $SD = 0.560$). The z score (standard score) for the difference between the February and December "Strongly Agree" responses is 2.347, which is statistically significant at a 95% confidence level. See Appendix 21, Table 5. In addition, in December surveys teachers were asked if they used ICT more often to present information to the class since the introduction of 1:1 netbooks 85.4% of respondents answered "Strongly Agree" or "Agree" ($M = 4.4$, $SD = 0.793$). See Appendix 21, Table 6.

5.2.2 Constructivist teaching.

Teachers act as facilitators allowing students to create their own knowledge in 1:1 learning environments. Evidence: in the December surveys teachers were asked if since the introduction of the 1:1 netbooks, they more often facilitate a classroom environment which enables the children to create their own knowledge rather than have it explicitly taught to them 73.2% of respondents answered "Strongly Agree" or "Agree" ($M = 3.9$, $SD = 0.942$). See Appendix 21, Table 7.

5.2.3 Integration of the 1:1 netbooks.

Teachers frequently integrate the netbooks into their curriculum. Evidence: in the December surveys teachers were asked if they integrate the netbooks into their lessons 90.3% responded "All of the Time," or "Most of the Time" ($M = 4.4$, $SD = 0.732$). See Appendix 21, Table 8.

5.2.4 Teacher communication.

Teachers get assistance from their colleagues in 1:1 learning environments. Evidence: in the December surveys teachers were asked if their colleagues have assisted them with 1:1 netbook learning in their classroom

87.5% responded "All of the Time" or "Most of the Time" (*M* = 4.0, *SD* = 1.036). See Appendix 21, Table 10. In the December surveys teachers were asked if the 1:1 netbooks have improved their communication with colleagues 51.2% of respondents answered "Strongly Agree" or "Agree" (*M* = 3.4, *SD* = 1.054). See Appendix 21, Table 9.

5.2.5 Teacher workload.

Half or all respondents agreed that netbook learning has increased their workload. Evidence: in the December surveys teachers were asked if they believe that 1:1 netbook learning has increased their workload 50% of respondents answered "Strongly Agree" or "Agree", 25% were "Unsure", and 25% "Disagree" or "Strongly Disagree" (*M* = 3.4, *SD* = 1.198). See Appendix 21, Table 11.

5.2.6 Classroom management.

Most teachers believed that 1:1 netbook learning had not caused difficulties in classroom management. Evidence: in the December surveys teachers were asked if they believe that 1:1 netbook learning has caused difficulties in classroom management 77.5% of respondents answered "Strongly Disagree" or "Disagree" (*M* = 2.0, *SD* = 1.193). See Appendix 21, Table 12.

5.2.7 Teacher energy and enthusiasm.

Teachers found a renewed enthusiasm for teaching after the introduction of the program. Evidence: in the December surveys teachers were asked if the introduction of 1:1 netbook learning has renewed their energy, enthusiasm and engagement in teaching 73.1% of respondents answered "All of the Time" or "Most of the Time" (*M* = 3.9, *SD* = 1.045). See Appendix 21, Table 3.

5.2.8 Are the affordances offered by 1:1 netbooks important to teachers?

Teachers' like the students in their class having netbooks, and believe that the netbooks are beneficial. Evidence: in the February surveys teachers were asked if they like the students having netbooks in their classroom 79.4% of respondents answered "Strongly Agree" or "Agree" (*M* = 4.4, *SD* = 1.026). However, in the December surveys 97.5% of respondents answered "Strongly Agree" or "Agree" (*M* = 4.8, *SD* = 0.454). The z score of 1.846 is significant at a 90% confidence level. In addition, the standard deviation on this response drops from 1.026 in February to 0.454 in December. See Appendix 21, Table 13. In the December surveys teachers

were asked if they believe that 1:1 netbook learning is beneficial for teaching and learning 90.3% of respondents answered "Strongly Agree" or "Agree" (*M* = 4.4, *SD* = 0.885). See Appendix 21, Table 14.

5.3 Teacher Perspectives on the Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

5.3.1 The Internet.

Teachers are significantly more likely to include Internet based teaching and learning activities in their programs in a 1:1 learning environment. Evidence: in the February surveys teachers were asked how frequently they use the Internet for teaching and learning activities in the classroom 56.7% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.7, *SD* = 0.920). In the December surveys 92.1% of respondents answered "All the Time" or "Most of the Time" (*M* = 4.4, *SD* = 0.757). The z score of 3.711 is significant at a 99% confidence level. See Appendix 21, Table 59.

Also, students use computers significantly more often for researching information in a 1:1 environment. Evidence: in the February surveys teachers were asked how frequently their students use computers/netbooks for researching information 21.6% of respondents answered "All the Time" (*M* = 3.9, *SD* = 0.831). In the December surveys 58.5% of respondents answered "All the Time" (*M* = 4.6, *SD* = 0.543). The z score of 3.335 is significant at a 99% confidence level. See Appendix 21, Table 60.

In addition, interactive web activities are more frequently included in these environments. Evidence: in the February surveys teachers were asked how frequently they use interactive web learning activities for teaching and learning in their classroom 54% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.4, *SD* = 1.238). In the December surveys 70.7% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.8, *SD* = 1.214). See Appendix 21, Table 61.

5.3.2 Multimedia.

In a 1:1 learning environment, teachers more frequently use digital photo, video and music programs and activities. Evidence: in the February surveys teachers were asked how frequently they use digital photo editing software for teaching and learning activities in their classroom 24.3% of respondents answered "All the Time" or "Most of the Time" (*M* = 2.9, *SD* = 0.980). In the December surveys 51.2% of respondents answered

"All the Time" or "Most of the Time" (*M* = 3.4, *SD* = 1.105). The z score of 2.458 is significant at a 95% confidence level. See Appendix 21, Table 62.

Also, in the February surveys teachers were asked how frequently they use digital videos or digital video editing software for teaching and learning activities in their classroom 8.3% of respondents answered "All the Time" or "Most of the Time" (*M* = 2.2, *SD* = 0.876). In the December surveys 39.1% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.1, *SD* = 1.135). The z score of 3.19 is significant at a 99% confidence level. See Appendix 21, Table 63.

Further, in the February surveys teachers were asked how frequently they use digital music or music editing software for teaching and learning activities 80.6% of respondents answered "Not at All" or "Not Very Often" (*M* = 1.8, *SD* = 0.866). But, in the December surveys 56.1% of respondents answered "Not at All" or "Not Very Often" (*M* = 2.4, *SD* = 0.931). The z score of -2.33 is significant at a 95% confidence level. See Appendix 21, Table 64.

5.3.3 Netbook preloaded software.

In these environments, teachers use productivity and animation programs and educational games more frequently. Evidence: in the February surveys teachers were asked how frequently they use Microsoft Word for teaching and learning activities in their classroom 81% of respondents answered "All the Time" or "Most of the Time" (*M* = 4.1, *SD* = 0.843). Similarly, in the December surveys 85.4% of respondents answered "All the Time" or "Most of the Time" (*M* = 4.3, *SD* = 0.719). See Appendix 21, Table 65.

Likewise, in the February surveys teachers were asked how frequently they use Microsoft PowerPoint for teaching and learning activities in their classroom 62.1% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.8, *SD* = 0.954). In the December surveys 75.6% of respondents answered "All the Time" or "Most of the Time" (*M* = 4.0, *SD* = 0.961). See Appendix 21, Table 66.

Also, in the February surveys teachers were asked how frequently they use Microsoft Publisher for teaching and learning activities in their classroom 43.2% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.2, *SD* = 1.249). In the December surveys 46.3% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.5, *SD* = 1.084). See Appendix 21, Table 67.

In the February surveys teachers were asked how frequently they use animation programs for teaching and learning activities in their classroom 72.9% of respondents answered "Not at All" or "Not Very Often" (*M* =

2.1, *SD* = 0.997). In the December surveys 29.3% of respondents answered "Not at All" of "Not Very Often" (*M* = 3.0, *SD* = 0.854). The z score of -3.873 is significant at a 99% confidence level. See Appendix 21, Table 68.

Further, in the February surveys teachers were asked how frequently they use Microsoft Paint or drawing software for teaching and learning activities in their classroom 67.5% of respondents answered "Not at All" or "Not Very Often" (*M* = 2.2, *SD* = 1.000). In the December surveys 34.1% of respondents answered "Not at All" or "Not Very Often" (*M* = 2.9, *SD* = 0.861). The z of -2.967 is significant at a 99% confidence level. See Appendix 21, Table 69.

Also, in the February surveys teachers were asked how frequently their students use computers/netbooks for educational games 13.5% of respondents answered "All the Time" (*M* = 3.8, *SD* = 0.754). But, in the December surveys 36.6% of respondents answered "All the Time" (*M* = 4.1, *SD* = 0.802). The z score of 2.354 is significant at a 95% confidence level. See Appendix 21, Table 70.

5.3.4 Organising work.

Students in these programs are more likely to use the computer as an organisational tool. Evidence: in the February surveys teachers were asked how frequently their students use computers/netbooks for organising their work 8.1% of respondents answered "All the Time" or "Most of the Time" (*M* = 2.3, *SD* = 0.955). In the December surveys 63.4% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.8, *SD* = 1.077). The z score of 5.092 is significant at a 99% confidence level. See Appendix 21, Table 71. Further, in the December surveys teachers were asked if netbooks have helped their students organise their work this year 78.1% of respondents "Strongly Agree" or "Agree" (*M* = 4.1, *SD* = 0.921). See Appendix 21, Table 72.

5.3.5 Student communication.

Teachers perceive that students communicate via email and blogs with each other and with their teachers more frequently in these environments. Evidence: in the February surveys teachers were asked how frequently they use email for teaching and learning activities in their classroom 43.2% of respondents answered "All the Time" or "Most of the Time" (*M* = 2.8, *SD* = 1.461). Similarly, in the December surveys 43.9% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.3, *SD* = 1.273). See Appendix 21, Table 73.

However, in the February surveys teachers were asked how frequently they use blogs for teaching and learning activities in their classroom 2.7% of respondents answered "All the Time" or "Most of the Time" (*M* = 1.6, *SD* = 0.845). But, in the December surveys 29.3% of respondents answered "All the Time" or "Most of the

Time" (*M* = 2.7, *SD* = 1.230). The z score of 3.182 is significant at a 99% confidence level. See Table Appendix 21, 74.

Also, in the February surveys teachers were asked how frequently their students use computers/netbooks for communication with peers 24.3% of respondents answered "All the Time" or "Most of the Time" (*M* = 2.7, *SD* = 1.041). Although in the December surveys 61% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.6, *SD* = 0.960). The z score of 3.289 is significant at a 99% confidence level. See Appendix 21, Table 75.

Further, in the February surveys teachers were asked how frequently their students use computers/netbooks for communication with teachers 2.7% of respondents answered "All the Time" or "Most of the Time" (*M* = 1.8, *SD* = 0.874). However, in the December surveys 29.3% of respondents answered "All the Time" or "Most of the Time" (*M* = 2.8, *SD* = 1.102). The z score of 3.182 is significant at a 99% confidence level. See Appendix 21, Table 76.

Also, in the February surveys teachers were asked how frequently their students use computers/netbooks as a visual or audio aid to class presentations of work 37.8% of respondents answered "All the Time" or "Most of the Time" (*M* = 3.1, *SD* = 1.110). Although, in the December surveys 78% of respondents answered "All the Time" or "Most of the Time" (*M* = 4.1, *SD* = 0.905). The z score of 3.625 is significant at a 99% confidence level. See Appendix 21, Table 77. Further, in the December surveys teachers were asked if 1:1 netbook learning has improved their communication with the students 61% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 1.054). See Appendix 21, Table 78.

5.3.6 Relevance of student learning to the real world.

Most teachers believe that these programs make student learning more relevant to the real world. Evidence: in the December surveys teachers were asked if they believe that 1:1 netbook learning makes student learning more relevant to the real world 87.8% of respondents answered "All of the Time" or "Most of the Time" (*M* = 4.2, *SD* = 0.762). See Appendix 21, Table 15.

5.3.7 Interesting and enjoyable learning.

Teachers believe that netbooks help students to find class work interesting and enjoyable. Evidence: in the February surveys teachers were asked if they believed that the students find the work they do in class interesting 7.9% of respondents "Strongly Agree" (*M* = 3.9, *SD* = 0.570). In the December surveys 29.3% of

respondents "Strongly Agree". The mean score in December was 4.2 *SD* = 0.564. The z score of 2.422 is significant at a 95% confidence level. See Appendix 21, Table 16. Further, in the December surveys teachers were asked if they believe that students having their own netbooks has helped the students to find class work interesting 100% of respondents "Strongly Agree" or "Agree" (*M* = 4.4, *SD* = 0.493). See Appendix 21, Table 17.

Also, in the February surveys teachers were asked if they believe that the students find learning enjoyable 79% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.605). In the December surveys 87.8% of respondents "Strongly Agree" or "Agree" (*M* = 4.1, *SD* = 0.655). See Appendix 21, Table 18. Further, in the December surveys teachers were asked if they believe that students having their own netbooks has helped them to find learning more enjoyable 92.7% of respondents "Strongly Agree" or "Agree" (*M* = 4.4, *SD* = 0.700). See Appendix 21, Table 19.

5.3.8 Higher order thinking, problem solving and in-depth learning.

Teachers believe that 1:1 netbooks enable students to use higher order thinking activities more often, and to explore topics in greater depth. However most teachers do not believe that netbook enable more problem solving activities in the classroom. Evidence: in the December surveys teachers were asked if they use higher order thinking activities in class more often since the introduction 1:1 netbook learning**,** 63.4% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 1.009). See Appendix 21, Table 20. Also, in the December surveys teachers were asked if their students are able to explore topics in greater depth when they have their own netbook 95.1% of respondents "Strongly Agree" or "Agree" (*M* = 4.6, *SD* = 0.574). See Appendix 21, Table 22. In the December surveys teachers were asked if they used problem solving activities in class more often since the introduction of 1:1 netbook learning 43.9% of respondents "Strongly Agree" or "Agree", 31.7% were "Unsure", and 24.4% "Disagree" or "Strongly Disagree" (*M* = 3.4, *SD* = 1.187). See Appendix 21, Table 21.

5.3.9 Individualisation of student learning.

Teachers' practice in individualising the curriculum remained unchanged pre and post the introduction of netbooks. However, most teachers recognised the netbooks potential for individualising the curriculum. Evidence: in the February surveys teachers were asked if they individualise the curriculum to meet individual students' needs 79% of respondents answered "Strongly Agree" or "Agree", 15.8% were "Unsure" and 5.3% "Disagree" (*M* = 4.0, *SD* = 0.778). In the December surveys 72.5% of respondents answered

"Strongly Agree" or "Agree", 25% were "Unsure" and 2.5% "Disagree" (*M* = 4.1, *SD* = 0.848). See Appendix 21, Table 23. In the December surveys teachers were asked if students having their own netbooks has enabled them to more easily individualise the curriculum to meet individual student learning needs 89.8% of respondents "Strongly Agree" or "Agree" (*M* = 4.3, *SD* = 0.722). See Appendix 21, Table 24.

Teachers are significantly more likely to give their students choices in their learning in these environments. Evidence: in the February surveys teachers were asked if their students have choices in what they learn 34.2% of respondents answered "All of the Time" or "Most of the Time" (*M* = 3.3, *SD* = 0.714). In the December surveys 63.4% of respondents answered "All of the Time" or "Most of the Time" (*M* = 3.7, *SD* = 0.719). The z score of 2.594 is significant at a 99% confidence level. See Appendix 21, Table 25. Further, in the December surveys teachers were asked if students having their own netbooks has increased the amount of individual choices they have in their learning 82.5% of respondents answered "All of the Time" or "Most of the Time" (*M* = 3.9, *SD* = 0.882). See Appendix 21, Table 26.

Students are significantly more likely to use computers for individual work in a 1:1 environment. Evidence: in the February surveys teachers were asked how frequently their students use computers/netbooks for individual work 58.3% of respondents answered "All of the Time" or "Most of the Time" (*M* = 3.6, *SD* = 1.008). In the December surveys 95.1% of respondents answered "All of the Time" or "Most of the Time" (*M* = 4.5, *SD* = 0.666). The z score of 3.907 is significant at a 99% confidence level. See Appendix 21, Table 33. Also, in the December surveys teachers were asked if students having their own netbooks has increased the amount of individual work which they do in class 75% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 1.094). See Appendix 21, Table 34.

5.3.10 Projects and assignments.

Students use computers for assignment work more often in a 1:1 environment. Evidence: in the February surveys teachers were asked how frequently their students use computers/netbooks for projects and assignments 54% of respondents answered "All of the Time" or "Most of the Time" (*M* = 3.6, *SD* = 1.052). In the December surveys 95.2% of respondents answered "All of the Time" or "Most of the Time" (*M* = 4.6, *SD* = 0.579). The z score of 4.247 is significant at a 99% confidence level. See Appendix 21, Table 27.

5.3.11 Student responsibility.

Teachers are significantly more likely to perceive that students take responsibility for their learning in these environments. Evidence: in the February surveys teachers were asked if they believe that their students take responsibility for their own learning 36.9% of respondents "Strongly Agree" or "Agree" (M = 3.3, SD = 0.804). In the December surveys 58.6% of respondents "Strongly Agree" or "Agree" (M = 3.6, SD = 0.757). The z score of 1.929 is significant at a 90% confidence level. See Appendix 21, Table 28. Further, in the December surveys teachers were asked if they believe that students having their own netbooks has increased the amount of responsibility they take for their own learning 75.6% of respondents "Strongly Agree" or "Agree" (M = 3.8, SD = 0.881). See Appendix 21, Table 29.

5.3.12 Group, cooperative and collaborative learning.

Although the perceived amount of time students spend on group/cooperative work remained unchanged across the two surveys, students are more likely to use computers in their group work, and teachers report that students participate in more group work in these environments. Evidence: in the February surveys teachers were asked if their students participate in group/cooperative work 76.3% of respondents responded "All of the Time" or "Most of the Time" (M = 3.9, SD = 0.703). Similarly, in the December surveys 78.1% of respondents responded "All of the Time" or "Most of the Time" (M = 4.0, SD = 0.733). See Appendix 21, Table 30.

In the February surveys teachers were asked how frequently their students use computers/netbooks for group/cooperative work 33.3% of respondents answered "All of the Time" or "Most of the Time" (M = 2.8, SD = 1.213). In the December surveys 65.8% of respondents answered "All of the Time" or "Most of the Time" (M = 3.8, SD = 0.934). The z score of 2.887 is significant at a 99% confidence level. See Appendix 21, Table 31. Further, in the December surveys teachers were asked if students having their own netbooks has increased the amount of group and cooperative work which they do in class 68.3% of respondents "Strongly Agree" or "Agree" (M = 3.8, SD = 1.064). See Appendix 21, Table 32.

5.3.13 Presentation of student work.

Most teachers believe that 1:1 netbooks improve the presentation of students' work. Evidence: in the December surveys teachers were asked if students having their own netbooks has improved the presentation of

their work 85.4% of respondents "Strongly Agree" or "Agree" (M = 4.2, SD = 0.824). See Appendix 21, Table 35.

5.3.14 Inappropriate use of the 1:1 netbooks by students.

Most teachers disagreed that they had problems with inappropriate use of the netbooks. Evidence: in the December surveys teachers were asked if they had problems with students using their netbook in an inappropriate manner 58.5% of respondents "Strongly Disagree" or "Disagree" (M = 2.5, SD = 1.084). See Appendix 21, Table 36.

5.3.15 Learning at home.

Students use computers for homework more frequently in a 1:1 environment. Evidence: in the February surveys teachers were asked how frequently their students use computers/netbooks for homework 18.9% of respondents answered "All of the Time" or "Most of the Time" (M = 2.4, SD = 1.167). In the December surveys 57.5% of respondents answered "All of the Time" or "Most of the Time" (M = 3.5, SD = 1.095). The z score of 3.516 is significant at a 99% confidence level. See Appendix 21, Table 37.

5.3.16 Students' technology skills.

Teachers perceive that students' technology skills improve in these environments. Evidence: in the December surveys teachers were asked if students having their own netbooks has improved their students' technology skills 100% of respondents "Strongly Agree" or "Agree" (M = 4.7, SD = 0.455). See Appendix 21, Table 38.

5.3.17 Student attitude toward school.

Teachers are more likely to perceive that their students feel positive at school, try hard to do their best at school and like writing and Mathematics in these environments. Evidence: in the February surveys teachers were asked if they believe that their students feel positive at school 26.3% of respondents "Strongly Agree" (M = 4.1, SD = 0.656). In the December surveys 41.5% of respondents "Strongly Agree" (M = 4.4, SD = 0.574). See Table 39: "I believe that my students feel positive at school" Also, in the December surveys teachers were

asked if they believe that netbooks have contributed to their students positive attitude to school this year 82.9% of respondents "Strongly Agree" or "Agree" (*M* = 4.1, *SD* = 0.751). See Appendix 21, Table 40.

In the February surveys teachers were asked if they believe that their students try very hard to do their best at school 73.7% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.695). In the December surveys 78% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.749). See Appendix 21, Table 41. Further, in the December surveys teachers were asked if they believe that netbooks have contributed to their students trying very hard to do their best at school this year 68.3% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.926). See Appendix 21, Table 42.

In the February surveys teachers were asked if they believe that students like writing 55.2% of respondents "Strongly Agree" or "Agree" (*M* = 3.5, *SD* = 0.716). In the December surveys 67.5% of respondents "Strongly Agree" or "Agree" (*M* = 3.7, *SD* = 0.806). See Appendix 21, Table 43. Also, in the December surveys teachers were asked if they believe that netbooks have contributed to their students liking writing this year 70.7% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.813). See Appendix 21, Table 44.

In the February surveys teachers were asked if they believe that their students like Mathematics 57.9% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 0.591). In the December surveys 65.8% of respondents "Strongly Agree" or "Agree" (*M* = 3.7, *SD* = 0.585). See Appendix 21, Table 45. Also, in the December surveys teachers were asked if they believe that netbooks have contributed to their students liking Mathematics this year, 68.3% of respondents "Strongly Agree" or "Agree" (*M* = 3.7, *SD* = 1.018). See Appendix 21, Table 46.

In the February surveys teachers were asked if they believe that doing well in school is important to their students 76.3% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.843). In the December surveys 78.1% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.715). See Appendix 21, Table 47. Also, in the December surveys teachers were asked if they believe that students having their own netbooks has made doing well in school important to their students 56.1% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 0.982). See Appendix 21, Table 48.

5.3.18 Student motivation.

In these environments teachers perceive that their students are more motivated. Evidence: in the February surveys teachers were asked if they believe that their students are motivated to learn 63.2% of

respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 0.745). In the December surveys 82.9% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.715). The z score of 1.98 is significant at a 95% confidence level. See Appendix 21, Table 49. Further, in the December surveys teachers were asked if they believe that netbooks have contributed to their students' motivation to learn this year 75.6% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.854). See Appendix 21, Table 50.

5.3.19 Student engagement.

Teachers perceive that their students are more engaged, actively involved in learning and on task in a 1:1 learning environment. Evidence: in the February surveys teachers were asked if they believe that students are engaged in learning 76.4% of respondents "Strongly Agree" or "Agree" (*M* = 3.8, *SD* = 0.626). In the December surveys 90.2% of respondents "Strongly Agree" or "Agree" (*M* = 4.1, *SD* = 0.646). The z score of 1.654 is significant at a 90% confidence level. See Appendix 21, Table 51. Also, in the December surveys teachers were asked if they believe that netbooks have contributed to their students' engagement in learning this year 90.2% of respondents "Strongly Agree" or "Agree" (*M* = 4.4, *SD* = 0.654). See Appendix 21, Table 52. In the February surveys teachers were asked if they believe that their students are actively involved in learning 76.3% of respondents "Strongly Agree" or "Agree" (*M* = 3.8, *SD* = 0.629). Although in the December surveys 90.3% of respondents "Strongly Agree" or "Agree" (*M* = 4.1, *SD* = 0.692). The z score of 1.678 is significant at a 90% confidence level. See Appendix 21, Table 53. In addition, in the December surveys teachers were asked if they believe that netbooks have contributed to their students being actively involved in learning this year 85.3% of respondents "Strongly Agree" or "Agree" (*M* = 4.2, *SD* = 0.691). See Appendix 21, Table 54. Also, in the February surveys teachers were asked if their students are generally "on task" 81.6% of respondents "Strongly Agree" or "Agree" (*M* = 4.1, *SD* = 0.664). In the December surveys 92.7% of respondents "Strongly Agree" or "Agree" (*M* = 4.2, *SD* = 0.644). See Appendix 21, Table 55. In the December surveys teachers were asked if netbooks have contributed to their students being generally "on task" this year 75.6% of respondents answered "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.993). See Appendix 21, Table 56.

5.3.20 Student behaviour.

Teachers are more likely to perceive that their students are generally well behaved in these environments. Evidence: in the February surveys teachers were asked if their students are generally well behaved 86.8% of respondents "Strongly Agree" or "Agree" (*M* = 4.2, *SD* = 0.731). In the December surveys

92.7% of respondents “Strongly Agree” or “Agree” (M = 4.4, SD = 0.757). See Appendix 21, Table 57. Also, in the December surveys teachers were asked if netbooks have contributed to their students being generally well behaved this year 65.8% of respondents “Strongly Agree” or “Agree” (M = 3.5, SD = 1.308). See Appendix 21, Table 58.

These findings from the teacher surveys are compared and contrasted with findings from teacher interviews, student interviews, student surveys and current literature in Chapter 8. Conclusions drawn from these results are presented in Chapter 9. The next chapter reports the findings from the student interviews.

6. Findings Student Interviews

6.1 Introduction

Student interviews were conducted in 3 of the 5 schools in which the grade 6 teachers were participating in both the quantitative questionnaires and the small group teacher interviews. The teachers called for volunteer students to participate in a small group interview to be conducted by the researcher in November during school hours. Information sheets and consent forms were sent home and signed forms collected by the grade 6 teachers. A total of 13 students participated in these interviews. Three participants were from School A (2 females and 1 male), 5 from School C (2 females and 3 males) and 5 from School E (2 females and 3 males).

This chapter reports the research findings from the student interviews. Full discussion and analysis of these results can be found in Chapter 8.

6.2 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

6.2.1 The Internet.

Students from all schools reported using their netbooks to access the Internet. They state that the netbooks make accessing the internet easier, and allowed them to look up information quickly. Students reported using Google search engine, Wiki answers and Wikipedia most frequently. However they state that they have experienced some difficulty with accessing some web sites as the school had blocked them.

Students all reported using their netbooks to access information on the internet. Students from School C state, “Our projects are better, the netbooks have helped heaps. Without the netbooks we do not have access to a computer all of the time, but now we do.” A student from School A explains, “Having access to the internet has helped us with our research. We also use Encarta. Because we have got better access we do not have to fight over computers anymore. It is quick and easy to get information.”

Students describe using many web 2.0 tools on their netbooks. A student from School C says, “We go onto our teacher’s blog a lot and he usually has a topic up there that we can just write about and post comments to each other. We can do that at home or at school. We also use the class wiki a lot. We can download our

homework and other work programs from it. Our teachers put web links in there so we can just click them and go to the web site. We can upload our work to the wiki as well. We also use a lot of interactive web sites, like spelling games."

6.2.2 Multimedia.

Students report using their netbooks for many multimedia activities. One student from School E explains, "We use Movie Maker to make a little movie. We had pictures of squirrels and cats and we made a movie and put in text. It was a narrative story, so instead of writing it down we got to do a movie. We have used Audacity to mix our songs and then we create a project scene and change the pitch of the song." Students from School A describe using Audacity to record interviews with each other, and using digital cameras to insert videos and pictures into their work. Similarly a student from School C gives this example, "We took pictures and videos of our camp and we put them on the netbook and used Movie Maker to make a movie. We also used subtitles and credits. It was better than just writing something and reading it out. It helped make visual contact with our audience. We also used Audacity to make radio programs for the school. We had to have a script as well."

6.2.3 Netbook preloaded software.

Students from all schools explain that they use their netbooks to present their projects in many different formats by using programs such as Microsoft Powerpoint, Word and Publisher, Photostory, Movie Maker, Audacity, Comic Life and Monkey Jam. All students state that they like having the many choices in presenting their work which the netbooks offer. One student from School C explains, "Having a netbook gives us heaps more choice in how we work on and present projects, before the netbooks we could only use a computer to work on projects during 'IT' (Information Technology) time. But with the 1:1 netbooks we have access to our own computer all of the time." Another student from School E asserts "The netbooks have also made projects a lot easier because we can get information on the netbook straight away."

All students could cite examples of using the netbook's preloaded software programs. The programs students most commonly described using were animation programs such as; Scratch, Monkey Jam, Google Sketch Up and Game Maker. Productivity tools such as Onenote, Microsoft Powerpoint, Microsoft Office Word, Microsoft Publisher and Microsoft Excel. Use of video, photo and audio programs such as Moviemaker,

Debut, Picassa, and information software such as Encarta Dictionaries and Encyclopaedia and Tux Mathematics was also reported.

6.2.4 Student communication.

Students from School C explain that using their netbooks they can communicate with each other. One student says, "We communicate heaps with the netbooks. We can email each other from home or use the class wiki. We talk about school things and social things. When I work in with my friends on a massive project then I need to keep in touch with them at home. It has sort of helped me to become friends with different people from school as well." Also another student from School E explains, "We email each other about school and social things. In Google Docs there is a little instant messaging thing which we use to talk to each other as well." Students from School A report that they never email each other; however one student tells how after he taught a workshop at Kids' Congress that the students in his workshop emailed him asking for help, "So I am going to keep on doing that."

Students explain how they use their netbooks to communicate with their teachers. A student from School C tells, "We have been emailing all of our worksheets to our teachers. We also communicate with them and with each other on the wiki. If we say something to each other on the wiki the teachers can see it also, they can monitor everything we say. If we have a problem with our work though we do not use the wiki we just go and ask the teacher for help." A student from School E explains how their teachers email work to them and they complete it and return it to their teacher by email. "We also email her on Monday mornings to tell her about our weekend. If we ever have any questions we can email her."

6.2.5 Relevance of student learning to the real world.

Students from School C believe that the netbooks make learning more relevant to the real world as one student reports, "The world is orientated around computers now and the netbooks have helped us to be up to date with technology." Students from School E also believe that the netbooks make their learning more relevant to the real world. One states that, "For example we can look up the news on the internet, and it helps us to know a bit more about what is going on in the world. Like yesterday we were researching for a debate about the recent dog attacks and so we had to find out information about them. So just being able to have the internet connects us more with the world." Students from School A also believe that the netbooks make learning more relevant to the real world; as noted by one respondent. "We have had to learn a lot about cyber safety and we have been talking

about cyber footsteps. In the real world computers are used a lot more now, so the netbooks have helped us with our computers skills."

6.2.6 Interesting and enjoyable learning.

Students have found that the netbooks make learning more enjoyable and interesting. As one student from School C asserts, "Each day we do not know how we will be using the netbooks at school. We know that we will use them but we do not know what we are going to be doing. There is so much on them, sometimes we get to choose which program we will use and sometimes the teacher tells us which program to use. It has made it heaps more interesting. We are not sitting at desks with our heads down hand writing all day, we are typing and doing fun games on the computer. We can bring the netbooks down to the floor and move around the classroom. It's been really fun having a netbook, I have learnt heaps."

A student from School E states, "It has helped with concentrating more on work. It is more engaging, it's better than just working in books because the teachers find good websites for us to use like Mathematics sites or a site with all different types of verbs in it to help us with what we are learning. Most of these sites have little activities so it is teaching us about things. It is way better than just working in a book. It makes school more interesting because the netbooks are something that we have never ever had before and just for us to be able to experience that is interesting. Working in books gets boring, you get tired and then you do not focus as much but with the netbooks it is kind of really interesting. It is just new and exciting I guess."

There is agreement from students from School A one of whom says, "Hand writing is boring, but when you type on the netbook it is like okay. You actually look forward to going to school because you get to learn stuff about computers. Netbooks make everything a lot funner, I do not know how but they do. I do not particularly like hand writing because my handwriting is not the neatest so it is easier and funner with a netbook. If you get bored you can look at pictures on the internet which I sometimes do." Meanwhile a student from School E concludes, "Netbooks have made school more fun, especially when you first have it and feels exciting to come to school, that's a good thing. Being able to access resources and information so easily is really good, and there is so many new programs on the netbooks that we have never used before. Being able to learn through games on the internet is something that we would never have done in the past, it would just be a sheet of paper that you get given and you think 'Oh my gosh another one of these, why do we have to do these it is pointless' but now you actually see the value and you get to learn through games at the same time."

6.2.7 Higher order thinking, problem solving and in-depth learning.

Students state that they believe that having 1.1 netbooks has allowed them to explore topics in greater depth. One student from School E comments, "We did use the internet last year, but we didn't really get much time on the school computers, we had to go to the computer lab or all take turns on the class computers. This year having our netbooks it has been much easier to do research because we can get information on the netbooks straight away. We have definitely been able to get more information and learn more because of the netbooks. Sometimes we can use our netbooks for silent reading and that makes me even more keen to read because you have got heaps of choice." One student from School A reflects, "We can explore topics in greater depth and our projects have been better because we have access to more information with netbooks. In the past our teacher used to get a few books from the library for the class to use for research, but now that we have netbooks we can all search up the stuff we need, and whereas a book might not have the information that we needed, now we have the internet or Encarta."

6.2.8 Individualisation of student learning.

Students all agree that the netbooks help them to work better individually. A student from School C states, "You can just go off to your own little spot and get straight into work and not get distracted." A student from School A explains further, "It is easier to do individual work with the netbook because we do not have to go up to someone and ask 'Oh do you know about this?' We can just go look it up on Encarta or the internet. For example if I wanted to find another word for 'cold' I could go to the Encarta Thesaurus, and there would be 'freezing' and other words. It is a lot quicker and it also tells you how to use the words. So if there is a word that you do not know you can write it in and then go onto the verb conjunction part to see how you can use it."

6.2.9 Student responsibility.

Students from School C explain that they have taken more responsibility for their own learning since having a netbook, for example, if they want to find out something then they can look it up on the internet themselves. They also state that they have had to be responsible in their care of the netbook, as one student says, "The netbooks are a big responsibility because they are worth a lot of money, we have to be careful in the way that we look after them." Similarly, a student from School E states, "We have to look after our stuff more now, you cannot just drop your school bag when it has your netbook in it."

6.2.10 Group, cooperative and collaborative learning.

Students from School C believe that participating in group work is easier now that they have netbooks as they can all work on different programs and then combine their ideas and work into the one project. Students from School E also believe that group work is easier since having a netbook. One student illustrates, "You can make a slideshow on one netbook and then you can connect to other people's netbooks. You can all work on it at the same time on different netbooks. When we were doing it on paper you would have to do 2 copies for you and your partner but now you can just save it into both files. Even if you just save it into student shared then you can both be working on it and making changes to it and when you are finished you can save it to your own file instead of having it in the public one." A student from School A makes a similar comment, "Before the netbooks one person used to be on the computer and then you would all have to take turns but with the netbooks we can all use programs like Ether pad so you can all type in stuff. So you write something, they write something, another person writes something, I can be in the classroom, Bella could be in the Library, Beth could be here and Caroline could be out on the oval and we can still talk to each other with Ether Pad."

Students from School E explain how they have learnt new ICT skills from other students. One explains, "Some of us went to Kids' Congress where kids from different schools taught each other different things. Then the kids in our class that went and taught the rest of us. One of them taught us how to use Movie Maker to make more detailed movies, another one taught us how to use Game Maker and we made a game." Students from School A also mention Kids' Congress, as one says, "The best thing this year was Kids' Congress because we got to use the netbooks a fair bit and we got to learn new things off different people. It was like a massive conference for kids where they can teach other kids about netbooks. I taught some kids about Game Maker. Now they are actually making their own games, they have had to go back to their own school and teach, they have told me that they are going really well, so that's good."

6.2.11 Presentation of student work.

Students from all schools state that the 1:1 netbooks have improved the presentation of their work. A student from School E asserts, "Things like projects just seems easier now that we are able to do them on our netbooks. When you have to hand write projects it just seems to take forever and ever and ever to complete, but with the netbooks it is a lot easier and neater to type things. I get more marks for my projects using my netbook than when I used to hand write them." One student from School A comments, "We can add borders, backgrounds and colour to our projects. We can change the fonts and the colour of the text to make it look

pretty. Or we can use Audacity, Debut or digital cameras to make recordings and take digital photos for use in our presentations."

Similarly a student from school C observes, "With the netbooks we can use different programs to improve the presentation of our work, for example in Microsoft Powerpoint you can use coloured backgrounds and different graphics. It is better than just doing it on paper, you can use photos as well to better explain what you mean." And a student from School E adds, "Your work is a lot neater using a netbook because, you do not have any cross outs or mistakes."

6.2.12 Inappropriate use of 1:1 netbooks by students.

Students from School A give this example of how some students at their school had used their netbooks inappropriately. As one explains, "A few people tried to plagiarize some work using their netbooks, but not us we are all very well behaved." There is a pause where the students look at each other. Then one continues, "Well except that we have got this illegal game on our netbooks for stress relief. It's called 'X', and we can just muck around with the screen and stuff using it."

6.2.13 Learning at home.

Students from School C report that the netbooks have enabled them to finish off class work at home. They explain that they can access the class wiki from home and post blogs, pictures, and videos onto it. As one says, "The netbook helps me a lot with my homework because I have a big brother and he uses the computer a lot so it is really hard to use the computer at home when I need it." A student from School E describes a similar situation at her house, "Taking the netbooks home is a big benefit, you kind of get trusted more. At home it is always a battle with my older sister, we both get homework but having the netbook at home now means that we can both be doing our homework and both people can be happy at the same time."

Students from School C and E believe that their parents have looked at their work more often since they take it home on the netbooks. A student from School E explains, "It is easier to show your parents work on the netbook instead of bringing all your books home with you. My mum is a teacher and she does not know about all the new programs, I know more than her, so I can teach her about them. Just being able to pass on all of your knowledge to your other family members is something that you would never ever be able to do unless we had these. So it kind of gets your family connected to your learning."

Students from all schools state that they used their netbooks to complete homework. Students from School A and School E also state that having the netbooks at home makes doing homework easier. A student from School A explains, "Homework is a lot easier because you do not have to take a USB and plug it into a school computer and then take it home, and then sometimes you do not have the Programs that you need on your home computer."

6.2.14 Students' technology skills.

All students think that their technology skills have improved since having the netbooks. Students from all schools are able to give examples of programs such as Audacity, Google Sketch Up, Monkey Jam and Movie Maker which they can use now, but didn't know how to use before getting their netbooks. Students at School C state that they often know more about the netbooks than their teachers, and that they could sometimes help their teachers with technical problems. Similarly a student from School E says, "My teacher said the other day that if she is busy, then other students can see me because, 'He probably knows more than I do.'"

Students from School A believe that the netbooks have improved their touch typing skills. Whilst students from School C find that they can use programs such as Microsoft Word and Power Point better since they got their netbooks. One student from School A explains, "I used to know nothing about computers but now I can help others and fix my problems myself, but not many people are having problems anymore because everybody is starting to work it out for themselves. For example we have learnt that we are not supposed to put the SD cards into the netbooks because they can actually carry viruses, so that is why you have to use the USB cords."

6.2.15 Student attitude toward school.

Students at all schools state that the netbooks have helped them to have a positive attitude to school this year, with a student at School A stating that, "You have so much more to look forward to not just sitting all day doing handwriting and stuff."

6.2.16 Student motivation.

Students from all schools believe that having the 1:1 netbooks makes them want to work harder. A student from School C explains, "Because it is easier and more fun in a way, your hand doesn't get sore from writing with a pen and your grey lead doesn't run out and you do not have to sharpen it and so you do not get

distracted having to go and sharpen it." A student from School A makes a similar comment, "It has made us want to work harder at school because learning's funner with a netbook."

6.2.17 Student engagement.

Students believe that the 1:1 netbooks makes them concentrate better in class. A student from School E states, "The netbook makes me sort of knuckle down to work a bit more. Like some of the kids who normally get distracted easily and just do not want to do their work they are now more engaged to their learning and so instead of them writing but not really writing anything on their page because they do not want to, they now do what they are supposed to be doing on their netbooks." A student from School A reports, "My work effort is probably going to drop next year without the netbook, with it I write about twice as much as I used to. I concentrate more."

6.2.18 Are the affordances offered by the 1:1 netbooks important for student learning?

Students from all schools believe that having a netbook has been important to their learning, and state that they like having a netbook and would not want to go back to not having one. A student from School C explains, "Before the netbook we just usually just did all of the stuff on paper and in our writing books and if we wanted to use the computers we had to go into the computer room and that only gave us 2 hours a week. We have adapted to them really well, it just makes work so much easier, it would be hard to go back to not having them. Netbooks are great for grade 6 students they are really fun and easy and interesting and you learn all kinds of things with them. We have had lots of fun with the netbooks." Similarly a student from School E reports, "We get more privileges with the netbooks, the teachers will give us a task and say 'Okay you have a choice of what program you want to do it on but this is the assessment rubric,' and so you pick the one that suits you best. You may be really really good at using Power Point but maybe you haven't done as much on another program. You might choose to use the program that you haven't done much on or you might choose to do a Power Point and do a really fantastic one. The choice is a benefit." A student from School A agrees, "The netbooks have helped us become better in almost everything. Before the netbooks we had 57 people sharing 8 computers, now you do not have to wait half an hour for the computer you can just hop on it."

Full discussion and analysis of these results can be found in Chapter 8 wherein the results from the student interviews are compared and contrasted with the results from the teacher interviews, teacher and student surveys and the literature which was reviewed in Chapter 2. The next chapter reports on the student surveys.

7. Findings Student Surveys

7.1 Introduction

This chapter reports the findings from the student surveys conducted in February and December 2009. Full discussion and analysis of these results can be found in Chapter 8. Foremost the reader is directed to Appendix 21 which offers all of the following statistical data in table format. The work offered here begins with an overview of the statistical outcome. Each overview is then justified with a reference to the most relevant data.

7.2 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

7.2.1 The Internet.

Students responses as to how frequently they use the Internet remains unchanged across the two surveys, however students do believe that they use computers for researching information more often in a 1:1 environment. Evidence: in the February surveys students were asked how frequently they use the internet 65.8% of respondents answered "Always" or "Almost Always" (M = 3.9, SD = 0.845). In the December surveys 66% of respondents answered "Always" or "Almost Always" (M = 3.8, SD = 0.784). See Appendix 21, Table 119.

Also, in the February surveys students were asked how frequently they use computers/netbooks for researching information 74.1% of respondents answered "Always" or "Almost Always" (M = 4.0 SD = 0.861). In the December surveys 84.7% of respondents answered "Always" or "Almost Always" (M = 4.2 SD = 0.756). The z score (standard score) for the difference between the February and December "Always" and "Almost Always" responses is 5.521 which is statistically significant at a 99% confidence level. See Appendix 21, Table 120.

In addition, students' responses as to how frequently they use the Internet for interactive web learning activities remains unchanged across the two surveys. Evidence: in the February surveys students were asked how frequently they use computers/netbooks for interactive web learning activities 34.4% of respondents answered "Always" or "Almost Always" (M = 3.1, SD = 1.017). Similarly, in the December surveys 34.8% of respondents answered "Always" or "Almost Always" (M = 3.1, SD = 0.949). See Appendix 21, Table 121.

7.2.2 Multimedia.

Students believe that they are more likely to use digital photo, video and music programs in these environments. Evidence: in the February surveys students were asked how frequently they use photo editing/publishing software 16.7% of respondents answered "Always" or "Almost Always" (M = 2.6, SD = 0.845). In the December surveys 18.3% of respondents answered "Always" or "Almost Always" (M = 2.9, SD = 0.852). See Appendix 21, Table 122. Also, in the February surveys students were asked how frequently do they use video editing or publishing software 9.1% of respondents answered "Always" or "Almost Always" (M = 2.3, SD = 0.966). In the December surveys 17.5% of respondents answered "Always" or "Almost Always" (M = 2.8, SD = 0.869). The z score of 3.871 is significant at a 99% confidence level. See Appendix 21, Table 123.

In the February surveys students were asked how frequently they use music editing software 55.3% of respondents answered "Never" or "Almost Never" (M = 2.5, SD = 1.188). But in the December surveys 49.2% of respondents answered "Never" or "Almost Never" (M = 2.5, SD = 1.091). The z score of -1.91 is significant at a 90% confidence level. See Appendix 21, Table 124.

7.2.3 Netbook preloaded software.

Students believe that they are more likely to use netbook productivity tools in these environments. Evidence: in the February surveys students were asked how frequently they use Microsoft Word 73.1% of respondents answered "Always" or "Almost Always" (M = 4.0, SD = 0.853), in the December surveys 79.9% of respondents answered "Always" or "Almost Always" (M = 4.1, SD = 0.758). The z score of 2.507 is significant at a 95% confidence level. See Appendix 21, Table 125. In addition, in the February surveys students were asked how frequently they use Microsoft PowerPoint 49.5% of respondents answered "Always" or "Almost Always" (M = 3.5, SD = 0.896). In the December surveys 53.9% of respondents answered "Always" or "Almost Always" (M = 3.7, SD = 0.835). See Appendix 21, Table 126.

In the February surveys students were asked how frequently they use Microsoft Publisher 23.9% of respondents answered "Always" or "Almost Always" (M = 2.8, SD = 1.020). In the December surveys 27.4% of respondents answered "Always" or "Almost Always" (M = 3.0, SD = 0.988). See Appendix 21, Table 127. Likewise, in the February surveys students were asked how frequently they use animation software 20.1% of respondents answered "Always" or "Almost Always" (M = 2.7, SD = 1.063). In the December surveys 21% of respondents answered "Always" or "Almost Always" (M = 2.8, SD = 1.025). See Appendix 21, Table 128.

In addition, in the February surveys students were asked how frequently they use Microsoft Paint or drawing software 28.9% of respondents answered "Always" or "Almost Always" (*M* = 2.9, *SD* = 1.065). In the December surveys 32.8% of respondents answered "Always" or "Almost Always" (*M* = 3.1, *SD* = 1.043). See Appendix 21, Table 129. Also, in the February surveys students were asked how frequently they use computers/netbooks for educational games 35.7% of respondents answered "Always" or "Almost Always" (*M* = 3.2, *SD* = 0.982). In the December surveys 36.6% of respondents answered "Always" or "Almost Always" (*M* = 3.2, *SD* = 0.922). See Appendix 21, Table 130.

7.2.4 Organising work.

Students are more likely to use a computer as an organisational tool in a 1:1 environment. Evidence: in the February surveys students were asked how frequently do you use computers/netbooks for organising work 34% of respondents answered "Always" or "Almost Always" (*M* = 3.1, *SD* = 1.064). In the December surveys 52.4% of respondents answered "Always" or "Almost Always" (*M* = 3.5, *SD* = 1.001). The z is 5.809 is significant at a 99% confidence level. See Appendix 21, Table 131. Also, in the December surveys students were asked if their netbook has been helpful in organising their work 84.2% of respondents "Strongly Agree" or "Agree" (*M* = 4.2, *SD* = 0.859). See Appendix 21, Table 132.

7.2.5 Student communication.

Students believe that they are less likely to use email or to communicate digitally with their peers, and more likely to use blogs and to communicate digitally with their teachers in a 1:1 environment. Evidence: in the February surveys students were asked how frequently they use computers/netbooks for email 32.1% of respondents answered "Never" or "Almost Never" (*M* = 3.3, *SD* = 1.402). In the December surveys 43.7% of respondents answered "Never" or "Almost Never" (*M* = 2.8, *SD* = 1.249). The z score of 3.739 is significant at a 99% confidence level. See Appendix 21, Table 133.

In the February surveys students were asked how frequently do you use computers/netbooks for communication with peers 43.9% of respondents answered "Always" or "Almost Always" (*M* = 3.2, *SD* = 1.356). However, in the December surveys 32.4% of respondents answered "Always" or "Almost Always" (*M* = 3.0, *SD* = 1.176). The z score of -3.701 is significant at a 99% confidence level. See Appendix 21, Table 136.

In the February surveys students were asked how frequently they use computers/netbooks for blogging 12.9% of respondents answered "Always" or "Almost Always" (*M* = 2.1, *SD* = 1.155). In the December surveys

16.4% of respondents answered “Always” or “Almost Always” (*M* = 2.8, *SD* = 1.206). See Appendix 21, Table 134. In addition, in the February surveys students were asked how frequently do you use computers/netbooks for communication with teachers 4.3% of respondents answered “Always” or “Almost Always” (*M* = 1.8, *SD* = 0.897). In the December surveys 11% of respondents answered “Always” or “Almost Always” (*M* = 2.2, *SD* = 1.021). The z score of 3.946 is significant at a 99% confidence level. See Appendix 21, Table 135.

Also, in the February surveys students were asked how frequently do you use a computer/netbook as a visual or audio aid in class presentations of work 22.6% of respondents answered “Always” or “Almost Always” (*M* = 2.8, *SD* = 1.029). While in the December surveys 38.2% of respondents answered “Always” or “Almost Always” (*M* = 3.3, *SD* = 0.939). The z score of 5.305 is significant at a 99% confidence level. See Appendix 21, Table 137.

7.2.6 Relevance of student learning to the real world.

A majority of students agree that 1:1 netbooks make their learning more relevant to the real world. Evidence: in the December surveys students were asked if netbooks made have their learning more relevant to the real world 68.2% of respondents answered “Strongly Agree” or “Agree” (*M* = 3.9, *SD* = 0.958). See Appendix 21, Table 79.

7.2.7 Interesting and enjoyable learning.

Students agree that these programs make learning more interesting and enjoyable. Evidence: in the February surveys students were asked if the work they do in class is interesting 68.1% of respondents “Agree” or “Strongly Agree” (*M* = 3.7, *SD* = 0.810). In the December surveys 78.2% of respondents “Agree” or “Strongly Agree” (*M* = 3.9, *SD* = 0.707). The z score of 3.562 is significant at a 99% confidence level. See Appendix 21, Table 80. Further, in the December surveys students were asked if netbooks have helped to make learning more interesting 88.9% of respondents “Strongly Agree” or “Agree” (*M* = 4.3, *SD* = 0.746). See Appendix 21, Table 81.

Also, in the February surveys students were asked if Learning is enjoyable 66.1% of respondents “Strongly Agree” or “Agree” (*M* = 3.7, *SD* = 0.896). In the December surveys 70.6% of respondents “Strongly Agree” or “Agree” (*M* = 3.8, *SD* = 0.839). The z score of 3.562 is significant at a 99% confidence level. See Appendix 21, Table 82. Also, in the December surveys students were asked if netbooks have helped to make

learning more enjoyable 86.9% of respondents "Strongly Agree" or "Agree" (*M* = 4.3, *SD* = 0.792). See Appendix 21, Table 83.

7.2.8 Higher order thinking, problem solving and in-depth learning.

Students agree that they can explore topics in greater depth in these environments. Evidence: in the December surveys students were asked if they are able to explore topics in greater depth when using a netbook 87% of respondents "Strongly Agree" or "Agree" (*M* = 4.3, *SD* = 0.798). See Appendix 21, Table 84.

7.2.9 Individualisation of student learning.

Students agree that these environments give them greater choices in what they learn. Evidence: in the December surveys students were asked if having a netbook has given them greater choices in what they learn 76.5% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.923). See Appendix 21, Table 85.

Students are more likely to use a computer for individual learning, and to work individual by more often in a 1:1 environment. In the February surveys students were asked how frequently they use computers/netbooks for individual work 59.7% of respondents answered "Always" or "Almost Always" (*M* = 3.7, *SD* = 0.927). In the December surveys 82.7% of respondents answered "Always" or "Almost Always" (*M* = 4.1, *SD* = 0.700). The z score of 7.936 is significant at a 99% confidence level. See Appendix 21, Table 92. In addition, in the December surveys students were asked if they work individually more often since getting a netbook 55.2% of respondents "Strongly Agree" or "Agree", 34.1% were "Unsure", and 10.7 "Disagree" or "Strongly Disagree" (*M* = 3.6, *SD* = 0.912). See Appendix 21, Table 93.

7.2.10 Projects & assignments.

Students use computers for projects and assignments more often in a 1:1 environment. Evidence: in the February surveys students were asked how frequently they use computers/netbook for projects and assignments 59.9% of respondents answered "Always" or "Almost Always" (*M* = 3.7, *SD* = 0.924). In the December surveys 72% of respondents answered "Always" or "Almost Always" (*M* = 4.0, *SD* = 0.815). The z score of 3.992 is significant at a 99% confidence level. See Appendix 21, Table 86.

7.2.11 Student responsibility.

Students' beliefs about whether they take responsibility for their learning remain unchanged across the two surveys; however students do believe that netbooks have helped them to take greater responsibility for their learning. Evidence: in the February surveys students were asked if they take responsibility for their own learning 87.3% of respondents "Strongly Agree" or "Agree" (M = 4.3, SD = 0.742). In the December surveys 88% of respondents "Strongly Agree" or "Agree" (M = 4.2, SD = 0.667). See Appendix 21, Table 87. In addition, in the December surveys students were asked if having a netbook has helped them to take greater responsibility for their own learning 73.6% of respondents "Strongly Agree" or "Agree" (M = 4.0, SD = 0.902). See Appendix 21, Table 88.

7.2.12 Group, cooperative and collaborative learning.

Students are more likely to use a computer for group or cooperative work. Evidence: in the February surveys students were asked how frequently they use computers/netbooks for group or cooperative work 19.9% of respondents answered "Always" or "Almost Always" (M = 2.9, SD = 0.887). In the December surveys 33.5% of respondents answered "Always" or "Almost Always" (M = 3.2, SD = 0.795). The z score of 4.809 is significant at a 99% confidence level. See Appendix 21, Table 89. Further, in the December surveys students were asked if they participate in group or cooperative work more often since getting a netbook 50.1% of respondents "Strongly Agree" or "Agree", 33% were "Unsure", and 16.9% "Disagree" or "Strongly Disagree" (M = 3.4, SD = 0.981). See Appendix 21, Table 90.

Also, in the December surveys students were asked if they get help with their learning from their classmates more often since getting a netbook 54.8% of respondents "Strongly Agree" or "Agree", 26% were "Unsure", and 19.3% "Disagree" or "Strongly Disagree" (M = 3.5, SD = 1.088). See Appendix 21, Table 91.

7.2.13 Presentation of student work.

Students agree that the presentation of their work is improved in these programs. Evidence: in the December surveys students were asked if their netbook has improved the presentation of their work 83% of respondents "Strongly Agree" or "Agree" (M = 4.2, SD = 0.887). See Appendix 21, Table 94.

7.2.14 Learning at home.

Students are more likely to use a computer for completing homework in these environments. Evidence: in the February surveys students were asked how frequently they use computers/netbooks for homework 32.2% of respondents answered "Always" or "Almost Always" (M = 3.0, SD = 1.119). In the December surveys 42.4% of respondents answered "Always" or "Almost Always" (M = 3.2, SD = 1.069). The z score of 3.299 is significant at a 99% confidence level. See Appendix 21, Table 95. Further, in the December surveys students were asked if they get help with their learning at home more often since getting a netbook 44.2% of respondents "Strongly Agree" or "Agree", 24.6% were "Unsure", and 31.2% "Disagree" or "Strongly Disagree" (M = 3.2, SD = 1.208). See Appendix 21, Table 96.

7.2.15 Students' technology skills.

Students' beliefs about their technology skills remain unchanged across the two surveys. Evidence: in the February surveys students were asked if they are confident using a computer/netbook 95.5% of respondents answered "Strongly Agree" or "Agree" (M = 4.7, SD = 0.589). In the December surveys 93.8% of respondents "Strongly Agree" or "Agree" (M = 4.5, SD = 0.664). See Appendix 21, Table 97. In addition, in the February surveys students were asked if they are able to help others on a computer/netbook 81% of respondents "Strongly Agree" or "Agree" (M = 4.2, SD = 0.842). In the December surveys 81.8% of respondents "Strongly Agree" or "Agree" (M = 4.1, SD = 0.804). See Appendix 21, Table 98.

7.2.16 Student attitude toward school.

Students' attitude toward school remains unchanged across the two surveys, however students do believe that netbooks have helped them to have a positive attitude to school this year. Evidence: in the February surveys students were asked if they feel positive about their school work 84.2% of respondents "Strongly Agree" or "Agree" (M = 4.1, SD = 0.741). In the December surveys 83.9% of respondents "Strongly Agree" or "Agree" (M = 4.1, SD = 0.751). See Appendix 21, Table 110. Also, in the December surveys students were asked if netbooks have helped with their positive attitude to school this year 72.4% of respondents "Strongly Agree" or "Agree" (M = 3.9, SD = 0.868). See Appendix 21, Table 111.

In the February surveys students were asked if they try very hard to do their best at school 91.4% of respondents "Strongly Agree" or "Agree" (M = 4.5, SD = 0.718). In the December surveys 91.5% of

respondents "Strongly Agree" or "Agree" (*M* = 4.4, *SD* = 0.664). See Appendix 21, Table 112. In addition, in the December surveys students were asked if netbooks have helped them to try very hard to do their best at school this year 75.7% of respondents "Strongly Agree" or "Agree" (*M* = 4.0, *SD* = 0.887). See Appendix 21, Table 113.

In the February surveys students were asked if they like writing 61.9% of respondents "Strongly Agree" or "Agree" (*M* = 3.7, *SD* = 1.147). In the December surveys 61.4% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 1.149). See Appendix 21, Table 114. Also, in the December surveys students were asked if netbooks have helped me to like writing this year 58.3% of respondents "Strongly Agree" or "Agree", 22.3% were "Unsure", and 19.4 "Disagree" or "Strongly Disagree" (*M* = 3.5, *SD* = 1.132). See Appendix 21, Table 115.

In the February surveys students were asked if they like Mathematics 63.3% of respondents "Strongly Agree" or "Agree" (*M* = 3.7, *SD* = 1.140). In the December surveys 60.1% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 1.132). See Appendix 21, Table 116. In addition, in the December surveys students were asked if netbooks have helped them to like Mathematics this year 59.1% of respondents "Strongly Agree" or "Agree" (*M* = 3.6, *SD* = 1.137). See Appendix 21, Table 117.

7.2.17 Student motivation.

Half of all students surveyed believe that netbooks have helped them to be more motivated to do well at school. Evidence: in the December surveys students were asked if doing well in school is more important to them since getting a netbook 50.2% of respondents "Strongly Agree" or "Agree", 28.8% were "Unsure", and 21% "Disagree" or "Strongly Disagree" (*M* = 3.4, *SD* = 1.169). See Appendix 21, Table 118.

7.2.18 Are the affordances offered by 1:1 netbooks important to students?

Students' opinions about whether they are good at school work, are a good student and are generally successful at school remain unchanged across the two surveys; however students respond that they like having netbooks. Evidence: in the February surveys students were asked if they are good at school work 75.3% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.765). In the December surveys 75% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.796). See Appendix 21, Table 99. Further, in the December surveys students were asked if netbooks have helped them to be good at school work this year 73.3% of respondents "Strongly Agree" or "Agree" (*M* = 3.9, *SD* = 0.884). See Appendix 21, Table 100.

In the February surveys students were asked if they were a very good student 71.5% of respondents answered "Strongly Agree" or "Agree" (M = 4.0, SD = 0.904). In the December surveys 72.5% of respondents answered "Strongly Agree" or "Agree" (M = 3.9, SD = 0.887). See Appendix 21, Table 103. Also, in the December surveys students were asked if netbooks have helped them to be a very good student this year 53.3% of respondents "Strongly Agree" or "Agree", 34.6 were "Unsure", and 12.2% "Disagree" or "Strongly Disagree" (M = 3.6, SD = 0.958). See Appendix 21, Table 104.

In the February surveys students were asked if they are generally successful at school 80.2% of respondents "Strongly Agree" or "Agree" (M = 4.0, SD = 0.781). In the December surveys 79.9% of respondents "Strongly Agree" or "Agree" (M = 4.1, SD = 0.758). See Appendix 21, Table 105. In addition, in the December surveys students were asked if netbooks have helped them to be generally successful at school this year 68.6% of respondents "Strongly Agree" or "Agree" (M = 3.8, SD = 0.895). See Appendix 21, Table 106.

In the February surveys students were asked if they find it easy to learn new things 65.9% of respondents "Strongly Agree" or "Agree" (M = 3.7, SD = 0.827). In the December surveys 76.7% of respondents "Strongly Agree" or "Agree" (M = 4.0, SD = 0.809). The z score of 3.732 is significant at a 99% confidence level. See Appendix 21, Table 101. Further, in the December surveys students were asked if netbook have made it easy for them to learn new things this year 76.8% of respondents "Strongly Agree" or "Agree" (M = 4.0, SD = 0.856). See Appendix 21, Table 102.

In the February surveys students were asked if they use a computer/netbook at school 68.9% of respondents answered "Always" or "Almost Always" (M = 4.0, SD = 0.968). But in the December surveys students were asked if they use a netbook at school 91.9% of respondents answered "Always" or "Almost Always" (M = 4.6, SD = 0.702). The z score of 9.047 is significant at a 99% confidence level. See Appendix 21, Table 107.

In addition, in the December surveys students were asked if they like having a netbook 92.8% of respondents "Strongly Agree" or "Agree" (M = 4.6, SD = 0.717). See Appendix 21, Table 108. Further, in the December surveys students were asked if having a netbook is important to their learning 72.7% of respondents "Strongly Agree" or "Agree" (M = 4.0, SD = 1.004). See Appendix 21, Table 109.

These findings from the student surveys are compared and contrasted with findings from student interviews, teacher interviews, teacher surveys and current literature in the following chapter. Conclusions drawn from these results are presented in Chapter 9.

8. Discussion

8.1 Introduction

This chapter brings together the quantitative data as presented in Chapter 5 and Chapter 7 with the qualitative data as presented in Chapter 4 and Chapter 6. These findings are discussed by comparing and contrasting each data set with the other data sets. In addition all 4 data sets are compared and contrasted with the review of literature as presented in Chapter 2. At the end of each section the arguments resulting from this thesis are summarised. These summaries form the basis for the conclusions in Chapter 9. Recommendations arising from this study are reported in Chapter 10.

Throughout this thesis, the term affordance refers to the perceived properties of an object that determine how the object could be used to serve a goal. This researcher finds that the affordances of 1:1 netbooks which the teachers and students in this study were able to perceive are the netbook's wireless internet access which offers unlimited access to the activities and information available on the internet and the software programs such as the animation programs, productivity tools and information software which came preloaded onto the netbooks. In addition, the preloaded multimedia applications, such as digital photography, video and music tools, and the netbook's communication tools for example the wireless access to email and interactive web 2.0 applications. This chapter discusses these affordances in relation to teaching practice including the impact of these affordances on teachers, followed by a discussion of these affordances in relation to student learning and the impact of these affordances on students.

8.2 Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers

8.2.1 Lesson planning and preparation.

In the February surveys 89.5% of teachers agreed that they use their own laptops for lesson planning and preparation (See Appendix 21, Table 4). The December surveys showed a slight increase with 92.5% of teachers agreeing to this statement. Likewise Ashmore (2001), Bebell (2008), Bebell and Kay (2010), Newhouse (2008) and TCER (2006) all found that teachers in 1:1 laptop learning schools use ICT more often than their counterparts in non-1:1 laptop learning environments to plan and prepare lessons.

There was a significant increase in the number of teachers using their laptop to access diverse teaching materials from 47.4% in February, to 75% in December. This represents a statistically significant difference with a z value of 2.347 (See Appendix 21, Table 5). This result is in line with the findings of Bebell (2005), Bebell and Kay (2010), Davies (2004) and Silvernail and Lane (2004) who conclude that teachers in 1:1 laptop learning schools are more likely than their non 1:1 laptop learning counterparts to use the internet to access broader and more in-depth information sources for their lessons. However during teacher interviews participating teachers did reflect that incorporating these types of internet resources into their lesson planning has made lesson planning more time consuming, contributing to the change in teacher workload as discussed in Section 8.2.5. Similarly, Zucker et al. (2005) find that teacher planning time is often being crowded out by the demands of the new technology, and that for teachers who are less technologically savvy, integrating laptops into their lesson plans requires more preparation time.

During the interviews all teachers comment favourably on the flexibility which the program offered them in planning to incorporate ICT into their lessons. They note the ease of not having to schedule ICT lessons into a one hour per week computer lab timeslot, but instead being able to have continual netbook access from within the classroom enabled them to include more ICT components into their lessons, this is discussed further in Sections 8.3.1 and 8.3.2. This supports the research of Bateman and Oakley (2009), Bebell (2005; 2008), Bebell and Kay (2010), Davies (2004), Donovan (2006), Jeroski (2003) and Lowther et al. (2003) who observed that teachers in these environments incorporate more ICT into their lessons as they do not have to worry about the availability of the computer laboratory. Teachers also explain in the interviews that one significant change in their lesson planning in the 1:1 laptop learning environment was that they now saved copies of all relevant notes and information to a shared virtual space such as a wiki for students to access both from home and school, this also contributed to the change in teachers workload as discussed in Section 8.2.5.

Teachers commented during interviews that they were able to incorporate many new programs into their lessons now which they would previously not have had time to "tackle" in a pre-allocated one hour computer lab environment. Further, they often realised during planning time that a particular netbook software application would be perfect for teaching a specific concept, and the ease of access to the computers enabled them to readily include this application in their lesson planning.

Teachers commented in interviews that they have had to challenge their planning mindset in order to best take advantage of this resource which is now at their students' fingertips. They reported that they now plan for the incorporation of many more interactive web 2.0 activities such as wikis, blogs and interactive teaching

and learning web sites into their lessons since the introduction of the 1:1 netbook learning program. These teachers were challenging themselves to incorporate the affordances which they had perceived as being present in a 1:1 netbook learning environment into their lessons. However, it could be argued that other affordances not perceived as yet by the teachers were present but were not being incorporated into their lessons due to their lack of awareness of them. Thus teachers can only incorporate the affordances which they perceive as being present. Day and Lloyd (2007) and Webb and Cox (2004) in their articles on affordance theory and classroom pedagogy recognise that in order for teachers to change their pedagogical approach they first need to recognise the educational affordances offered by ICT, and then manipulate the conditions of the learning to incorporate these affordances.

In the December surveys when teachers were asked if they use ICT more often to present information to the class since the introduction of the 1:1 netbooks, 85.4% agreed (See Appendix 21, Table 6). This is consistent with Wijekumar et al. (2006) who state that computers give teachers choices in how they present their lessons to the class, and with Bebell (2005) who found significant increases in teachers using laptop technology to present information and instruction to the class, to model relationships or functions to the class, to research or plan for lessons using the worldwide web and to create assignments, tests or quizzes using technology when they work in a 1:1 laptop learning environment.

During the interviews teachers noted that students in a 1:1 laptop learning environment have greater input into the direction which lessons take as student ideas and suggestions are able to be immediately implemented in the classroom. Teachers made comments such as “lesson planning is not quite so rigid anymore,” “a lesson can end up in lots of places depending on the students,” and “lessons evolve in real time, largely directed by the students.” So too Angelo et al. (2009) and Gaynor and Fraser (2003) reported that teachers in 1:1 laptop learning classrooms start with a base plan for a program and the students then take it in their own individual direction. Likewise, Kennewell (2001) observed that the role of the teacher is to orchestrate the affordances in the setting and that this may be planned in advance (proactive) or may be contingent on the continuous stream of events in the classroom (reactive). It could be suggested that this occurs as the students have perceived an affordance which the teacher has yet to perceive. When the student suggests the affordance to the teacher, the teacher is then able to perceive it and act on it and incorporate it into the lesson. One teacher in this study found that a suggestion from a student, as to the direction a lesson could take, would often result in more suggestions from other students building on previous suggestions. This concept of an affordance being

acted upon, and subsequently leading to new information indicating new affordances is defined as sequential affordances (Gaver, 1991).

In summary, the affordances offered by the 1:1 netbooks offer teachers the opportunity to incorporate more ICT into their lesson planning and preparation. These teachers are significantly more likely to use their laptop to access broader and more in-depth diverse teaching materials on the internet. Teachers in this study incorporated more ICT into their lessons, including interactive web 2.0 applications such as wikis, blogs and interactive teaching and learning web sites, and they used ICT more often to present information to their class. The affordances of a 1:1 learning program offer teachers greater flexibility to include software programs into lessons which previously have not been used due to ICT access constraints. However it should be acknowledged that teachers must be able to recognise the affordances offered by the 1:1 netbooks and then manipulate the learning environment in order to include them.

The affordances offered by the1:1 netbooks also give teachers the ability to use a more flexible, reactive style of lesson planning with students having greater input into the direction of lessons. Students may perceive affordances which the teacher has yet to perceive and it is not until the student suggests the affordance to the teacher, that the teacher is then able to perceive the affordance and act on it, incorporating it into the lesson. Sequential affordances may be revealed in a 1:1 netbook learning environment as one affordance when acted upon, subsequently reveals another affordance. Teachers had the opportunity to "rethink" lesson planning as they tried to incorporate the myriad of affordances the netbooks offered to their students and themselves. As part of their lesson planning teachers are more likely to save copies of relevant information and notes to a shared virtual space for students to access.

Teachers however, acknowledge that they do spend more time on lesson planning and preparation in a 1:1 netbook learning environment and this may be perceived as a negative affordance.

8.2.2 Constructivist teaching.

During interviews teachers stated that 1:1 netbook learning has helped them to facilitate a constructivist approach to their classroom teaching and learning practice. Teachers offered examples whereby the presence of the 1:1 netbooks allowed them to negotiate learning tasks with their students, and other instances whereby they were able to provide individual scaffolding to support student learning. Likewise, in the December surveys when teachers were asked if, since the introduction of 1:1 netbook learning, they more often facilitate a classroom environment which enables the children to create their own knowledge rather than have it explicitly

taught to them, 73.2% of teachers agreed. In addition, researchers in 1:1 learning such as Ashmore (2001), Katz and Kratcoski (2005), Dunleavy et al., (2007), REA. (2004) and Windschitl and Sahl (2002) all assert that 1:1 laptop learning is frequently a catalyst for teachers to become more constructivist in their approach to pedagogy. Also, in their article on the affordances of computers Kreijns and Kirschner (2001) affirm that they support constructivist learning.

McInerney and McInerney (2002) expound that as computers are able to respond interactively with learners that they clearly provide a means by which students can, through exploration and discovery, construct their own knowledge. This research found many examples of this type of constructivist classroom practice occurring in the 1:1 netbook learning environment. During interviews teachers related how they had been able to scaffold student learning through the use of netbook software, multimedia applications and web 2.0 tools. They also reported using negotiated learning in which the students created their own multimedia learning resources, facilitating their own inquiry learning with their netbooks, and constructed knowledge and meaning during "Digital Sandpit" time.

Some teachers in this study observed that netbooks have let students know that teachers are not the "holders of all knowledge," and this has enabled a change in the balance of power in the classroom. These teachers reflected that the netbooks have made it possible for students to take ownership of and to drive their own learning. Similarly, Donovan (2006), Fairman (2004) and Niles (2006) in their studies on 1:1 laptop learning conclude that 1:1 laptop learning environments enable teachers to move away from teacher-directed teaching to student-centred teaching, changing the teacher's role from being the supplier of knowledge to a constructivist role of support and facilitation of the active construction of knowledge by the learner. In addition, Pelech and Pieper (2010) in their book on constructivist teaching practice assert that a constructivist teacher views his role as one of managing the learning environment and acting as a guide, facilitator and coach and not the transmitter of all knowledge in the classroom

However, one teacher in this study reflects that her teaching practice has not changed as much over the year as she had thought it would. She explains, "I still feel like I am the provider of knowledge, the giver of information, but I do not want to be. My battle has been how do I use these netbooks to their best advantage to let the students direct their own learning. I thought my teaching practice would have been completely revolutionised by the end of the year, but I am still learning." So whilst the presence of 1:1 netbooks in the classroom appears to provide the impetus for teachers to change to a more constructivist pedagogy, teachers may require support and time to implement these changes effectively.

To summarise, the affordances offered by the 1:1 netbooks allow teachers the opportunity to develop a constructivist pedagogical approach moving them away from teacher-directed teaching to student-centred teaching. Teachers particularly note the opportunities for negotiated learning and scaffolding individual student learning. In this way the affordances of 1:1 netbooks enable a change in the teacher's role from being the supplier of knowledge, to a constructivist role of support and facilitation of the active construction of knowledge by the learner. The affordances of netbook software, multimedia applications, the internet and web 2.0 tools allow students to construct knowledge and make meaning of the world around them. However, even when teachers recognise these affordances, and feel the motivation to change their teaching practice, in order to successfully implement such change they may require support.

8.2.3 Integration of the affordances offered by 1:1 netbooks.

During interviews most teachers stated that they found it easy to integrate the affordances offered by the netbooks. This was reflected in the December teacher surveys when 90.3% of teachers stated that that they integrate the netbooks into their lessons (See Appendix 21, Table 8). Likewise, Newhouse (2001) observed that the learner-centred integrated programmes in primary schools facilitate the use of 1:1 laptop learning across the curriculum. These findings are in contrast to the TCER (2006) who found only partial integration of 1:1 laptops occurred in the first year of a 1:1 laptop learning program. The TCER (2006) stated that the greatest barrier to 1:1 laptop integration was the different stages of teacher readiness. The greater degree of netbook integration reported in this study may be due to the preparation the teachers received through professional development activities prior to the implementation of the 1:1 netbook learning program (as discussed throughout Chapter 4).

In this study teachers predominantly offered examples of how they had integrated the affordances offered by the 1:1 netbooks into their Literacy, Mathematics and research or inquiry curriculums. So too did REA (1998) find that laptops were used most frequently for research and for writing. One teacher observed that different domains have different ICT needs. She explained that for example in Mathematics her students have been using the netbooks for graphing in Microsoft Excel and using Microsoft Word to create fractions tables, timetables and calendars. Whereas, she reflects Literacy has been better covered with students using their netbooks to research and access samples of different writing genres.

Siemens and Tittenberger (2009) caution that using ICT affordances which are mismatched to the intended learning tasks can be a frustrating experience for learners. However, the teachers in this study were able to give examples of meaningful integration of 1:1 netbook learning across the curriculum matching

affordances with intended learning outcomes, for example, in literature circles, studying current affairs and web based research. This is in line with Newhouse (2002) who suggests that teachers ensure the use of the laptop is meaningful for the students by carefully determining the situations in which the affordances of the laptop are best able to enable their programme of instruction and student learning.

Bernard et al. (2007) cited some teachers' concern that 1:1 netbook learning was being implemented at the cost of instruction on basic literacy and numeracy skills. Whilst one teacher did acknowledge that it has been a challenge to come up with ways to integrate the netbooks into the Literacy and Mathematics curriculums, other teachers offered examples of how they integrated the affordances offered by the 1:1 netbooks into the curriculum, such that basic Literacy and numeracy skills were enhanced and reinforced. For example, reading novels and newspapers online, participating in interactive literature circle discussion groups and creating graphs, timetables and calendars, make use of a wide range of netbook affordances.

Whilst the review of literature produced conflicting findings in the area of integration of 1:1 laptops into the Mathematics curriculum, with some researchers finding 1:1 laptop learning used least in Mathematics (Bebell, 2005, 2008; Christensen, & Knezek, 2006; Donovan, 2006; Grimes & Warschauer, 2008; MEPRI, 2003; Zucker et al., 2005), other studies found that 1:1 laptop learning was most predominant in the Mathematics curriculum (Newhouse & Rennie, 2001; Oliver, & Holcomb, 2008). Zucker et al. (2005) specify that an important factor in determining how students and teachers use the laptops in class is the availability of appropriate computer software. With the abundance of Mathematics teaching and learning resources now available on the Internet, and the software preloaded onto the netbooks, this may be a reason why teachers more recently in this study report using 1:1 netbooks frequently in the Mathematics curriculum.

All teachers provided examples of integrating the affordances offered by the netbooks into inquiry, research and project based learning. Similarly Bebell (2008), Lowther et al. (2008a), Miller (2008) and TCER (2006) all found that teachers in 1:1 laptop learning schools integrate ICT into their lessons by using problem-based or project-based learning and inquiry learning.

Webb and Cox (2004) in their research on ICT affordances in education state that teachers must intensify the students' perceptions of ICT affordances. By integrating the netbooks into the curriculum in a manner which supported the curriculum goals, the teachers in this study were able to heighten student perceptions of the educational affordances offered by the 1:1 netbooks. Teachers most frequently mentioned integrating the netbooks into the curriculum through using the internet, web 2.0 tools, or the netbooks' preloaded software such as Microsoft Powerpoint, Paint, Publisher, or Word, and Multimedia applications such

as Moviemaker, Photostory and Comic Life. Teachers commented that students find using a pen and paper boring and that the netbooks offer the students many more options to research and produce work across the curriculum. Sometimes too much choice can become overwhelming though, as one teacher comments, "It has been easy to implement netbooks into all areas of the curriculum, the difficulty has been in prioritising what programs and activities to include as the netbooks offer so many resources."

Several teachers commented that the integration of 1:1 netbook affordances across the curriculum has had a significant impact on their teaching. Teachers mentioned that just about every part of their teaching and learning practice has been transformed by the variety of possible teaching and learning activities that students can complete with the 1:1 netbooks.

To summarise this discussion, most teachers in this study found that they were able to integrate the affordances offered by the 1:1 netbooks. The greater degree of integration reported in this study may be due to the preparation the teachers received through professional development activities prior to the implementation of the 1:1 netbook learning program. The most frequent curriculum areas in which teachers recognise and integrate the netbooks affordances were Literacy, Mathematics, research, inquiry learning and projects. Teachers were able to integrate the affordances offered by the 1:1 netbooks such that basic literacy and numeracy skills were enhanced by the presence of the netbooks in the classroom. Teachers achieved meaningful integration of the netbooks by ensuring that the netbooks' affordances were matched with intended learning outcomes. They were able to enhance the students' perceptions of the netbooks affordances, frequently through the use of the internet and web 2.0 tools, or the netbooks' preloaded software such as Microsoft Powerpoint, Paint, Publisher, or Word, and Multimedia applications such as Moviemaker, Photostory and Comic Life. Teachers stated that integration of the affordances offered by the 1:1 netbooks transformed their teaching practice as many new possibilities in teaching and learning opened up to them.

8.2.4 Teacher communication.

During interviews teachers commented on how the implementation of the 1:1 netbook learning program has facilitated greater communication between themselves and their colleagues as they attended professional development activities together, shared 1:1 netbook learning resources and teaching ideas with each other and worked together to solve problems. As well as face-to-face communication, teachers also reported that they communicate with colleagues via blogs, wikis and email. In the December surveys 51.2% of teachers agreed that1:1 netbook learning has improved their communication with colleagues (See Appendix 21, Table 9).

Moreover, 87.5% of teachers agreed that their colleagues have assisted them with 1:1 netbook learning in their classroom (See Appendix 21 Table 10).

These findings were in agreement with those of Ashmore (2001), Bebell (2005, 2008), Burns and Polman (2006), CRF and Associates Inc. (2004), Davies (2004), Donovan (2006), Fairman (2004), GMSP (2004), Livingston (2006), Silvernail and Lane (2004), TCER (2006) and Zucker et al. (2005) who all reported that teachers in 1:1 laptop schools develop a community of learners becoming more collegial and communicating with each other more often as they work collaboratively to plan, share knowledge and resources, and solve problems together.

In summary it could be concluded that an impact of the introduction of a 1:1 netbook learning program is increased communication among teachers as they form informal learning communities to assist each other in integrating the affordances offered by the 1:1 netbook learning program into their classrooms. Teachers partake in greater communication both formally within professional development settings, and informally in face-to-face discussions, email, blog and wiki communications as they share netbook teaching resources and work together to solve netbook related problems.

8.2.5 Teacher workload.

Some teachers commented on aspects of 1:1 netbook learning which have resulted in a greater teacher workload, for example, the time it takes to upload information to wikis and search for online support materials (as discussed in Section 8.2.1), replying to student online communications, and the time needed to do the necessary professional reading which is required to implement a new program. However, teachers also countered that in some ways the netbooks saved them time as they did not need to photocopy worksheets anymore. Whilst one teacher observes, “Netbooks probably haven’t reduced the workload, but it has meant that the work that you put in has become more effective. It’s more streamlined, you are not double handling things all of the time.” Another teacher states, “I would say that the netbooks have increased my workload as far as my feeling that I want to get more out of it, I’m still going onto the Netbook Ning to see what else I can do.” Another teacher reflects that she spends a lot of time looking for online resources. She states, “It is not wasted time but it is time consuming. The netbooks haven’t increased our workload, just changed our workload. Like any new program that you introduce, you have just got to change the way that you do things.” December teacher survey results were equally mixed with 50% of teachers agreeing that netbook learning has increased their

workload**,** 25% unsure and 25% disagreeing (See Table 11: "I believe that netbook learning has increased my workload").

Current literature finds that most teachers agree that 1:1 laptop learning has added additional duties to their workload (Davis et al., 2005; Sclater et al., 2006). Teachers report many aspects of the program proliferates the amount of work they must do. For instance, teachers must become more skilled technically in using the laptops, and more skilled pedagogically in integrating the laptops into their instruction (Larkin & Finger, 2011; Silvernail & Lane, 2004; TCER, 2006). Teachers need to understand the various software applications loaded onto the student computers, search the internet to find appropriate resource sites for classroom instruction, and upgrade existing lessons to a format compatible with student centred 1:1 laptop learning (Dinnocenti, 2001; Gaynor & Fraser, 2003, TCER, 2006). There are also increased marking duties due to increased student work output (Jeroski, 2003). Overall, the teachers using the 1:1 laptops for classroom instruction see benefits to the program despite the increase in their workload (Davis et al., 2005).

To summarise, the affordances offered by the1:1 netbooks result in changes to teachers' workloads necessitating that teachers spend time uploading information to wikis, searching for online support materials, doing extra professional reading and learning to use new software and internet applications. Teachers do not see this as wasted time, but did recognise that it was time consuming. This researcher defines a negative affordance as one which precludes the teacher or student from teaching or learning or engaging in particular kinds of interactions (see Definitions). It could be argued that this changed workload is a negative affordance, as the additional time spent by teachers in integrating the 1:1 netbooks into their curriculum may potentially preclude them from participating in other professional and personal activities and interactions.

8.2.6 Classroom management.

Teachers found that some aspects of the 1:1 netbook program required additional classroom management strategies. They gave examples such as students waiting to use equipment like scanners or digital cameras, or where individual netbooks were not able to be used by the student due to technical difficulties or the netbook batteries not being charged. Teachers found that instances such as these required extra negotiation and classroom management skills. However teachers in this study felt that on the whole 1:1 netbooks had not caused difficulties in classroom management. To illustrate, in the December surveys, 77.5% of teachers disagreed that 1:1 netbook learning has caused difficulties in classroom management (See Appendix 21, Table 12). Further to

this, as discussed in Section 8.3.20, most teachers believe that 1:1 netbooks have had a positive impact on student behaviour.

Whereas Donovan (2006), Dunleavy et al. (2007), Rockman (2003) and Zucker et al. (2005) report that classroom management of students in a 1:1 laptop learning environment can become problematic, this study did not repeat these findings.

To summarise this discussion while some teachers in this study did find that some aspects of the 1:1 netbook program required extra or different classroom management skills and strategies, on the whole the majority of teachers felt that changes in classroom management were not necessary.

8.2.7 Teacher energy and enthusiasm.

Authors using an affordance theory framework such as Volet and Wosnitza (2004) and Zhang (2008), have written about the impact of ICT affordances on individuals' motivational states and emotions. This study found that 73.1% of teachers indicated that the introduction of 1:1 Netbook learning had renewed their energy, enthusiasm and engagement with teaching (See Appendix 21, Table 3). In the interviews teachers explained that the introduction of the program was exciting and fun, providing them with an impetus to look at things differently and experiment with new ideas. This is consistent with the findings from Bebell (2005), Burns and Polman (2006), Fairman (2004), GMSP (2004), and TCER (2006) who report changes in teachers such as renewed energy, enthusiasm and engagement in teaching practice after a 1:1 laptop learning program is introduced.

No teachers or students in this study reported initial or ongoing teacher resistance or refusal to using the 1:1 laptops as was reported by Bateman and Oakley (2009) and Niles (2006). This is possibly due to the extensive professional development which teachers received around the introduction of 1:1 laptop learning (see Chapter 4).

In summary the affordances offered in 1:1 netbook learning environments present significant opportunities for pedagogical change in the classroom. This study found that the resultant impact on teachers was that they embraced the changes and reported renewed energy, enthusiasm and engagement with teaching. Some teachers viewed the implementation of the program as an opportunity to effect change in their classroom pedagogical approach.

8.2.8 Are the affordances offered by the 1:1 netbooks important to teachers?

During interviews, without exception all teachers affirmed that they liked their students having 1:1 netbooks and felt that they were important for student learning. One teacher described 1:1 netbook learning as being "Immensely important, providing responsibility, engagement, creativity, variety and a powerful link between home and school." In December 90.3% of teachers agreed that 1:1 netbook learning is beneficial for teaching and learning (See Appendix 21, Table 14). These findings are in accord with Bebell (2005), Donovan (2006), Silvernail and Lane (2004), and Zucker et al. (2005) who all found that teachers in 1:1 laptop learning environments believed that laptops were very important to their teaching practice.

There was an increase from 79.4% in February to 97.5% in December of teachers who liked the students in their classroom having netbooks (See Appendix 21, Table 13). This is statistically significant response at a 90% confidence level. This increase demonstrates how teachers attitudes toward 1:1 netbook learning changes after first-hand experience of it in their classrooms.

Significantly, during interviews teachers questioned how they ever managed without the netbooks, and commented that they hope the 1:1 netbook program continues into the future. Teachers expressed their belief in 1:1 netbook learning through comments such as, "I do not want to go back to not having them", "There is no doubt that the netbooks support learning," and "It would be like chopping an arm off now if the 1:1 netbook program didn't continue." Similarly, Dinnocenti (2001), Donovan (2006), Grimes and Warschauer (2008), and MEPRI (2003) all found that teachers expressed a desire to continue with 1:1 laptop learning after having experienced teaching in this environment.

To summarise, after first-hand experience of 1:1 netbook learning in their classrooms, teachers believe that the affordances offered to them by the netbooks are important for teaching and learning. Teachers mention aspects of the 1:1 program such as student responsibility, engagement, creativity, variety and link between home and school as being immensely important. After teaching in this environment teachers express the view that they would rather teach with the 1:1 netbooks than without them.

8.3 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

8.3.1 The Internet.

All teachers agreed that the ready access to the internet which the 1:1 netbooks have provided has impacted on their teaching practice and student learning. As discussed in Section 8.2.1, teachers noted the ease

of not having to schedule ICT lessons into a one hour per week computer lab timeslot, but instead being able to have continual Internet access from within the classroom. Teachers comment that the 1:1 netbooks have given their students convenient access to unlimited activities, information and resources. They observed that prior to the 1:1 netbook program they had limited computer access which capped the amount of internet activities they could include in lessons. One teacher stated, "1:1 netbooks have given us unlimited access to the internet." Teachers offered many examples of teaching and learning affordances offered through the netbooks ability to access the Internet. These examples included: students re-reading information or re-viewing videos on the internet as often as they need to in order to complete their learning tasks, the inclusion of websites such as Mathletics or Rainforest Maths in their teaching and learning programs to help teach Mathematical concepts to students, and using blogs and wikis with a student audience to facilitate students in expressing themselves through writing.

Teacher surveys supported this finding. In the February surveys 56.7% of teachers used the internet frequently for teaching and learning activities in their classrooms, whereas in December this number rose to 92.1% (See Appendix 21, Table 59). This is a statistically significant response at a 99% confidence level. This indicates that teachers in a 1:1 netbook learning environment use the Internet more frequently than before the netbooks were introduced for teaching and learning activities in the classroom.

During interviews all teachers cited multiple examples of students using their 1:1 netbooks to access information from the internet. One teacher explains, "The netbooks give students accessibility to information that they would not have got without them. It is more convenient, more accessible, and easier for them to find by a long shot." Similarly, in February 21.6% of teachers frequently allowed their students use computers/netbooks for researching information. This figure increased to 58.5% in December (See Appendix 21, Table 60). The z score (standard score) for the difference between the February and December "All the Time" responses is 3.335, which is statistically significant at a 99% confidence level. This indicates that students in a 1:1 netbook learning environment use the Internet to research information more frequently than their non-1:1 netbook learning counterparts. Likewise, Levin and Arafeh (2002) state that virtually all 1:1 laptop learning students use the Internet for researching information.

Similarly, during interviews students from all schools stated that they used their netbooks to access information on the Internet. Students made comments like, "Our projects are better, the netbooks have helped heaps," and "Having access to the internet has helped us with our research." Student survey results were statistically significant with the number of students who frequently used computers/netbooks for researching

information increasing from 74.1% in February to 84.7% in December (See Appendix 21, Table 120). This is a statistically significant difference at a 99% confidence level. Likewise, current literature reports that nearly all students who have a 1:1 laptop computer use it to access information on the internet (Bebell, 2005, 2008; Chamberlain, 2004; Christensen & Knezek, 2006; CRF and Associates Inc., 2004; Davis et al., 2005; Donovan, 2006; Dunleavy et al., 2007; GMSP, 2004; Grimes & Warschauer, 2008; Jeroski, 2003; MEPRI, 2003; Silvernail & Lane, 2004; TCER, 2006; Zucker et al., 2005).

Teachers from all schools were able to name many interactive web sites, which they regularly use for teaching and learning activities, stating that the ease of access has facilitated the use of these web sites. The most frequently named sites were; Superclubs Plus, Smartkiddies, Mathletics, Cool Mathematics, Behind the News, Google Earth, Google Docs, Google Maps, Digilearn, Ether Pad, Survey Monkey and various blogs and wikis. Several teachers commented that they used interactive web 2.0 sites more widely since the introduction of the 1:1 netbooks to reinforce skills and increase engagement. Teacher surveys also showed an increased use of interactive web learning activities from 54% in February to 70.7% in December (See Appendix 21, Table 61).

However, in their affordance theory study of web 2.0 collaborative learning, Kuswara, Cram and Richards (2008) warn that simply making web 2.0 tools available does not guarantee their utilization. Teachers need to use careful planning and have a thorough understanding of the dynamics of these affordances in order to make the most of them in the classroom (McLoughlin & Lee, 2007). The findings from this study indicate that the teachers in this study acknowledged the web 2.0 affordances which a 1:1 netbook learning environment offered, and further that they were able to integrate these affordances into their curriculum.

Chamberlain (2004) found that students' increased use of the Internet to source information raises several concerns for teachers, such as: the credibility of internet information sources, the need for education of students regarding copyright and ethical use of information. Teachers in this study too reported similar concerns regarding students "copying great chunks of information from the internet." Teachers expressed concern that not only was this information not referenced properly, but that the students had not learnt what they were supposed to learn in that lesson. It could therefore be argued that as this affordance potentially precludes the student from learning, that this could be described as a negative affordance. Students' inappropriate use of the netbooks is discussed further in Section 8.3.14.

To summarise this discussion, through 1:1 netbook affordances students have convenient access to the unlimited activities, information and resources which are available on the Internet. Teachers recognise the affordances offered by the netbooks to access the Internet and are significantly more likely to use the Internet

for teaching and learning activities in their classroom. Netbooks allow students convenient access to information on the Internet and students in a 1:1 netbook learning environment use the Internet to research information more frequently than their non-1:1 netbook learning counterparts. Teachers were able to recognise the web 2.0 affordances which a 1:1 netbook learning environment offers and further were able to integrate these affordances into their planning to reinforce skills and increase student engagement. However, 1:1 netbooks offer the negative affordance of enabling students to copy and paste information from the Internet without referencing it correctly, thus students fail to achieve the teachers' intended learning outcomes for that lesson.

8.3.2 Multimedia.

Teachers from all schools reported using the 1:1 netbooks multimedia applications in their teaching and learning programs. As discussed in Section 8.2.1, teachers noted the ease of not having to schedule ICT lessons into a one-hour per week computer lab timeslot, but instead being able to have continual access to multimedia applications from within the classroom. Teachers recognised the multimedia affordances of the netbooks and offered examples of students making movies and short video clips, taking photos, recording interviews, making radio shows, and using music to support their learning. Teacher surveys into the use of multimedia returned several statistically significant outcomes. Across the 2 surveys, teachers use of digital photo editing software for teaching and learning activities increased from 24.3% to 51.2% (z score is 2.458, which is statistically significant at a 95% confidence level, See Appendix 21, Table 62). This indicates that teachers are more likely to use digital photo editing software for teaching and learning activities in a 1:1 netbook learning environment. Similarly, during interviews, students reported using the netbooks to take photographs which they could then use to support their written texts.

In addition there was a statistically significant increase across the two surveys in teachers' use of digital video editing software indicating that teachers are more likely to use digital videos or digital video editing software for teaching and learning activities in a 1:1 netbook learning environment (See Appendix 21, Table 63). During interviews teachers offered examples of this such as students using their netbooks to record their oral presentations so that they could reflect on and improve on their presentation skills, and students using their netbooks to story board, script, film, edit and produce major projects.

Looking at the next result from a different angle, in the February 80.6% of teachers indicated that they did not use digital music or music editing software for teaching and learning activities, whereas in December only 56.1% of respondents gave this response (See Appendix 21, Table 64). This z score is -2.33, which is

statistically significant at a 95% confidence level. During interviews teachers cited examples of students using music and music editing software in the creation of radio shows and Powerpoint presentations.

Students from all schools reported using their netbooks for many multimedia activities such as using 'Movie Maker' to make movies of narrative stories, using 'Audacity' to record interviews and produce radio programs, and using digital cameras to insert photos into their texts. Student survey results also produced statistically significant results demonstrating that students in 1:1 netbook learning environments are more likely to use video editing or publishing software than their non-1:1 netbook learning counterparts.

Likewise current literature finds that students in 1:1 laptop learning classrooms are more likely than their non 1:1 laptop learning peers to receive instruction in multimedia format or use multimedia in their independent research (CRF & Associates Inc., 2004; GMSP, 2004; Swan et al., 2007; TCER, 2006). They are also more likely to use multimedia to present their learning (Grimes & Warschauer, 2008; Swan et al., 2005). In addition, The 2008 Horizon Report (2008) states that video papers and projects are increasingly common assignments in schools. In accord, Bower (2008), Lai et al. (2007) and Webb (2005) in their work on the affordances of computers observe that computers allow the use of photo, video and sound which serve to aid retention of learning.

To summarise these arguments the affordances of 1:1 netbooks provide students the use of multimedia applications to support and enhance teaching and learning in classrooms. Teachers and students are significantly more likely to use multimedia applications such as digital photography, videos, music, to produce products such as radio shows, video clips and animations to support their teaching and learning. These multimedia affordances result in students undertaking complex multi-faceted classroom tasks such as story boarding, scripting, filming, editing and producing major projects on current topics of study. In addition, the affordances offered by the video recording applications give students the opportunity for reflection and improvement on their personal presentation skills when used to record students' oral presentations.

8.3.3 Netbook preloaded software.

During interviews both teachers and students cited many examples of the students using the netbook's preloaded software programs (See Chapter 4). The programs most commonly described were: animation programs such as Kahootz, Scratch, Monkey Jam, Google Sketch Up, Paint, Game Maker and Comic Life; productivity tools such as Onenote, Microsoft Powerpoint, Microsoft Office Word, Microsoft Publisher and

Microsoft Excel; multimedia programs such as Moviemaker, Debut, Audacity and Picassa; and information software such as Encarta Dictionaries and Encyclopaedia and Tux Mathematics.

Likewise, teacher and student surveys showed an increase in frequency of use of Microsoft Word, Microsoft Powerpoint, Microsoft Publisher and Microsoft Paint after the introduction of 1:1 netbook learning. Teacher surveys showed a statistically significant increase in the frequency of use of animation programs and educational games. Teachers did comment during interviews that in order for them to integrate these programs into their curriculum they had to first learn how to use them themselves.

Similarly, Bebell (2005), CRF and Associates Inc. (2004), Dunleavy et al. (2007), Lei and Zhao (2008), Lowther et al. (2003; 2008a), MEPRI (2003), Russell et al. (2004), Sclater et al. (2006), Swan et al. (2005) and TCER (2006) all report that 1:1 laptop learning students most frequently use Microsoft Office Word and Microsoft Office PowerPoint.

To summarise then, 1:1 netbook learning enables the use of the netbooks' preloaded software. In this study the programs which were used the most frequently in the classroom were animation programs, productivity tools, multimedia programs and information software. However, in order for the teachers to incorporate these programs into their curriculum they must first learn how to use the programs, and then recognise the educational affordances of the programs and incorporate them into their curriculum.

8.3.4 Organising work.

Teachers expressed mixed responses during interviews when asked if the students were using their netbooks to help them to organise their work. Some teachers stated that "Students are more organised with their netbooks", "They are not fossicking through their desks and losing things, it is all on their netbooks," however, other teachers find that, "The disorganized students are still disorganized, now they just lose it in their netbook", also "We have encouraged the students to save their work into OneNote and onto the wiki, but a lot of them just want to print it out and be done with it." Teachers from one school mentioned that they need to do more work at the start of the year to assist students in understanding how to organise their work on the netbook.

However in the teacher surveys the results are less divided. In the February surveys 8.1% of teachers agreed that their students frequently use computers/netbooks for organising their work, whereas in the December surveys 63.4% agreed (See Appendix 21, Table 71). This is a statistically significant response at a 99% confidence level. Also, In the December surveys 78.1% of teachers agreed that netbooks have helped their students organise their work this year (See Appendix 21, Table 72).

Student surveys produced similar results with the percentage of students who frequently used computers/netbooks for organising work increasing from 34% in February to 52.4% in December (See Appendix 21, Table 131). The z score for the difference between the February and December responses is 5.809, which is statistically significant at a 99% confidence level. Further, in the December 84.2% of students agreed that their netbook has been helpful in organising their work (See Appendix 21, Table 132).

Current literature reports that both teachers and students indicate that 1:1 laptops make students more efficient and more organised in their work, with one of the most powerful benefits of a laptop being that everything is easily accessible, personally organised, and instantly available, anytime and anywhere (Chamberlain, 2004; Davies, 2004; Davis et al., 2005; Donovan, 2006; GMSP, 2004; Grimes & Warschauer, 2008; Jeroski, 2003; Lowther et al., 2003; MEPRI, 2003;Silvernail & Lane, 2004). Zucker et al. (2005) report that, for some students, the laptops did not help with the organization of their work, and that the teachers reported feeling frustrated when students came to class unorganised because they did not have their laptops with them. No teachers in this study reported students coming to class without their netbooks.

To summarise this discussion affordances provided by the netbooks give students greater ability to organise their work. However students require direction to perceive the affordances available to them in the software of the netbook to save work and maximise the computer's organisational potential.

8.3.5 Student communication.

During interviews teachers stated that their students use their 1:1 netbooks to communicate with each other through wikis, blogs, email or web 2.0 programs such as Epal, Superclubs Plus and Google Docs. In the February surveys 24.3% of teachers indicated that their students frequently use computers/netbooks for communication with peers, however, 61% of teachers indicated this in December (See Appendix 21, Table 75). The z score is 3.289, which is statistically significant at a 99% confidence level. This indicates that students in a 1:1 netbook learning environment digitally communicate with each other more frequently than their non-1:1 netbook learning counterparts.

Students also used their netbooks to facilitate better communication with their peers during class presentations. Teacher survey responses increased over the 2 surveys from 37.8% in February to 78% at the end of the year of students who frequently use computers/netbooks as a visual or audio aid to class presentations of work (See Appendix 21, Table 77). This is a statistically significant difference at a 99% confidence level. Student surveys also presented a statistical significant difference at a 99% confidence level when students were

asked the same question. This demonstrates that students in a 1:1 netbook learning environment are likely to use their netbooks to enhance the audio and visual aspects of their class presentations.

Whilst during interviews students stated that they use their netbooks to communicate with each other, citing email, wiki, Google Docs and instant messaging as being the ways in which they use the 1:1 netbooks to communicate with their peers, the survey results contradicted this finding. In the February surveys 43.9% of students indicated that they frequently use computers/netbooks for communication with peers, whereas in the December surveys only 32.4% of respondents gave this response (See Appendix 21, Table 136). This is statistically significant at a 99% confidence level. The researcher speculates that during the surveys students interpreted "using their netbook to communicate with peers" to mean "communicate through email". During student interviews the researcher was able to unpack aspects of communication with the students and found that they were predominantly using web 2.0 applications in preference to email as a means of communication. Email communication significantly declined after the introduction of the 1:1 netbook program, and web 2.0 communication applications such as blogs and wikis became the more frequently cited means of communication.

Kreijns and Kirschner (2001) and Wijekumar et al. (2006) in their work on the affordances of ICT note that the computer provides tools for communicating with others. Whilst the literature reports that 1:1 laptop learning students communicate with each other through email and video conferencing more often than do non 1:1 laptop students (Dinnocenti, 2001; Dunleavy et al., 2007; GMSP, 2004; Hill, & Reeves, 2004; TCER, 2006), these studies do not mention students' increased use of web 2.0 applications for communication in the 1:1 netbook learning environment.

Teachers also found that students use their 1:1 netbooks to communicate with them through email, wikis, blogs and web 2.0 programs. Teachers affirm that the introduction of 1:1 netbooks has seen a shift in communication between their students and themselves, with class time seeming more "relaxed" which further improves communication between teachers and students. Teachers state that this helps to improve student learning. Survey results support these findings. There was an increase from 2.7% in February to 29.3% in December of teachers who agreed that their students frequently use computers/netbooks for communication with teachers. This is a statistically significant difference at a 99% confidence level (See Appendix 21, Table 76). Also, in the December surveys 61% of teachers agreed that 1:1 netbook learning has improved their communication with the students (See Appendix 21, Table 78). It could be concluded from these results that

students in a 1:1 netbook learning environment digitally communicate with their teachers more frequently than their non-1:1 netbook learning counterparts.

These students are also more likely to communicate with their teachers through a blog or wiki than by email. In teacher surveys when they were asked about how the students use netbooks for communication, the results indicated that the frequency of email use in the classroom had not changed with the introduction of a 1:1 netbook learning program. However there was a statistically significant result in the use of blogs in the classroom shifting from 2.7% in February to 29.3% in December (See Appendix 21, Table 74). During interviews, students too explain that they use their netbooks to communicate with their teachers, citing email and wikis as being the ways in which they use their 1:1 netbooks to communicate with their teachers. This is supported by survey results with 4.3% of students indicating in February that they frequently used computers/netbooks for communication with their teachers and 11% of students indicating this in December (See Appendix 21, Table 135). The z score is 3.946, which is statistically significant at a 99% confidence level.

In addition, survey findings indicate a decline in student use of email for communication. In the February 32.1% of students indicated that they never or almost never use computers/netbooks for email. However, in the December surveys 43.7% of respondents gave this response (See Appendix 21, Table 133). The z score is 3.739, which is statistically significant at a 99% confidence level. However, in the February surveys when students were asked how frequently they use computers/netbooks for blogging, 12.9% of respondents answered always or almost always as compared to 16.4% who gave this response in December (See Appendix 21, Table 134). Thus it can be construed that student use of email for communication declined after the introduction of a 1:1 netbook learning program, and student use of web 2.0 applications such as blogs and wikis for communication increased after the introduction of a 1:1 netbook learning program.

Recent studies also report that 1:1 student laptop use increases the capacity for communication such as email between teachers and students (Bateman & Oakley, 2009; Christensen & Knezek, 2006; CRF and Associates Inc., 2004; Davies, 2004; Dunleavy et al., 2007; Lei & Zhao, 2008; Sclater et al., 2006).

In summary the affordances of 1:1 netbooks allow students increased capacity to communicate digitally with their peers and teachers. These students are more likely to use web 2.0 applications for communication than email. 1:1 netbooks also afford students the ability to use their netbooks to enhance the audio and visual aspects of their class presentations.

8.3.6 Relevance of student learning to the real world.

Teachers believe that 1:1 netbooks have helped their students to link their learning into the real world. Teachers made comments such as, "We live in a technology rich world, students are used to mobile phones, ipods and multimedia, they are enthusiastic about utilising ICT." Teachers also explain that students reading articles on the internet is, "More relevant than some text which has been in the school for 10 years." This opinion was supported in the December survey with 87.8% of teachers believing that 1:1 netbook learning makes student learning more relevant to the real world (See Appendix 21, Table 15). Likewise Lowther et al. (2003), Commission on Behavioral and Social Sciences and Education (2000) and TCER (2006) find that 1:1 laptops add relevancy, authenticity, real world meaning to the students' education by bringing real world problems into the classroom for the children to explore and solve. So too affordance theory authors and researchers such as Anderson (2004) and Lai et al. (2007) state that affordances of computers provide access to information which is real time, expedient, immediate, authentic, accessible, efficient, convenient and up to date.

Students also believe that the 1:1 netbooks have made their learning more relevant to the real world. Students made comments such as, "The world is orientated around computers now and the netbooks have helped us to be up to date with technology," "We can look up the news on the internet, and it helps us to know a bit more about what is going on in the world" and "Just being able to have the internet connects us more with the world." The December student surveys reinforced the earlier figures on students' belief that 1:1 netbooks have made their learning more relevant to the real world with 68.2% of agreeing on this point (See Appendix 21, Table 79).

To summarise, the affordances offered by the 1:1 netbooks enable teaching and learning practices which are more relevant to the real world by bringing real world issues into the classroom through the internet. In addition the 1:1 netbook affordances make provision for the use of ICT in the classroom in an authentic manner that is educationally meaningful and relevant to the way in which ICT is used by students and adults outside of the classroom.

8.3.7 Interesting and enjoyable learning.

During interviews teachers stated that they believe that 1:1 netbooks have made learning more interesting and enjoyable for their students. Teachers made supportive comments such as, "With the netbooks there are different ways to present lessons," "Netbooks can transport the students out of the classroom," "Students can use game formats to learn and practise skills" and "Netbooks give students greater variety and

greater access to ICT." A statistically significant difference was found between the February and the December surveys. In February 7.9% of teachers agreed that students find class work interesting, but in December 29.3% agreed (See Appendix 21, Table 16). More importantly in the December surveys 100% of teachers agreed that netbooks have helped the students to find class work interesting (See Appendix 21, Table 17).

Similarly, across the two surveys, teachers' belief that students find learning enjoyable increased. In February surveys 79% agreed, and in December 87.8% agreed (See Appendix 21). Also, in December, 92.7% of teachers agreed that students having their own netbooks has helped them to find learning more enjoyable (See Appendix 21, Table 19).

Students too believe that the 1:1 netbooks have made their learning more enjoyable and interesting. Students commented that they liked the variety of options for learning which the netbooks offer them, and also that they find learning with the netbooks helps them to concentrate better, and is more engaging. One student explains "Netbooks make everything a lot 'funner', I do not know how but they do." Student surveys support students' interview comments with an increase from 68.1% in February to 78.2% in December of students who find class work interesting (See Appendix 21, Table 80). This difference is statistically significant at a 99% confidence level. When students were asked in the December if netbooks have helped to make learning more interesting 88.9% of respondents agreed (See Appendix 21, Table 81). Thus it could be concluded that as a result of the affordances offered by 1:1 netbooks, students find learning more interesting. Therefore, according to the definition of impact offered in this thesis (see Definitions), this influence or effect on the students resulting from the affordances offered by the netbooks could be described as an impact.

In addition, in the February surveys when students were asked if learning is enjoyable 66.1% of respondents agreed, and in December 70.6% of respondents agreed (See Appendix 21, Table 82). The z score is 3.562, which is statistically significant at a 99% confidence level. Moreover, in the December surveys when students were asked if netbooks have helped to make learning more enjoyable 86.9% of students agreed (See Appendix 21, Table 83). Thus it could be concluded that as a result of the affordances offered by 1:1 netbooks, students find learning more enjoyable. Therefore, this influence or effect on the students resulting from the affordances offered by the netbooks could be described as an impact. Wijekumar et al. (2006) in their study on the affordances of ICT assert that student orientation toward learning is different when computers are present because of their previous experience with computers which prompts them to expect affordances for playing games, chatting with friends, and being entertained. The findings from Wijekumar et al. (2006) may account for why the students in this study found 1:1 netbook learning more enjoyable than non 1:1 netbook learning.

Other 1:1 learning researchers have also found that both teachers and students feel that using 1:1 laptops in class inspires students who subsequently find their schoolwork more interesting and enjoyable (Bebell, 2008; Chamberlain, 2004; CRF and Associates Inc., 2004; Davies, 2004; Dinnocenti, 2001; GMSP, 2004; Grimes & Warschauer, 2008; Lowther et al., 2003; Silvernail & Lane, 2004). However, these findings are in contrast to the findings from Christensen and Knezek (2006) who report that 1:1 laptop learning students did not find using laptops as enjoyable as their non-1:1 laptop learning counterparts. Possibly the teachers in the Christensen and Knezek (2006) study used different strategies in integrating the 1:1 netbooks into the curriculum from those used by the teachers in this study. These variations may have resulted in the greater student levels of interest and enjoyment in 1:1 netbook learning as found in this study.

To summarise this discussion, as a result of the affordances offered by 1:1 netbooks, students find learning more interesting and enjoyable. This influence or effect on the students resulting from the affordances offered by the netbooks could be described as an impact.

8.3.8 Higher order thinking, problem solving and in-depth learning.

During interviews teachers were able to offer many examples of how they had used the netbooks to facilitate higher order thinking activities in the classroom. One teacher explained that students having 1:1 netbooks has facilitated the use of higher order thinking strategies such as analysing, comparing, contrasting, organising, deconstructing, separating, distinguishing, evaluating, checking, critiquing, judging, justifying, hypothesising, ranking, substantiating, arguing, validating and assessing within her classroom. In the December surveys 63.4% of teacher agreed that they use higher order thinking activities in class more since the introduction 1:1 netbook learning (See Appendix 21, Table 20). This is consistent with the findings of Lowther et al. (2008b; 2003) and Windschitl and Sahl (2002) who conclude that the introduction of 1:1 laptop learning programs into classrooms frequently serves as a catalyst encouraging teachers to implement teaching and learning strategies designed to facilitate the development of higher order thinking skills in their students. Therefore, it could be concluded higher order thinking activities in the classroom are promoted due to the affordances provided by the 1:1 netbooks and teachers' adoption of novel teaching approaches.

This is consistent with REA (1998) who find that in 1:1 laptop learning classrooms teachers are able to make lessons more detailed and rigorous which assists the students in reaching a higher level of intellectual complexity. Also, Lowther et al. (2003) suggest that the positive impact on student critical thinking and problem solving skills may be due to 1:1 laptop students' increased engagement in research and inquiry activities.

Certainly this research has shown that in these environments teachers are able to facilitate more higher order thinking activities within the classroom through the use of project, research, inquiry and reflective activities. REA (1998) conclude that teachers believe 1:1 laptop use stimulates students in analytical thinking and improves the complexity and quality of their work. So too do Bower (2008), Conole and Dyke (2004) and Volet and Wosnitza (2004) in their work on ICT affordances for learning, who report that computer supported learning environments provide for the development of in-depth learning, synthesis, metacognition, reflection and higher order thinking.

However, when it came to the use of problem solving activities in the classroom, results in this study were mixed. Whilst during the interviews teachers were able to offer examples of how they had utilised the 1:1 netbooks to engage the students in problem solving activities, the December teacher survey results showed a lesser trend toward the use of problem solving activities in a 1:1 netbook learning classroom. When teachers were asked if they used problem solving activities in class more since the introduction of 1:1 netbook learning 43.9% of teachers agreed, 31.7% were unsure, and 24.4% disagreed (See Appendix 21, Table 21). Thus it could be concluded that some teachers (43.9%) were able to recognise the affordances offered by the 1:1 netbooks for the application of problem solving activities in classroom. However not all the teachers, in fact 56.1% of teachers failed to recognise this affordance offered by the netbooks, or were subsequently unable to incorporate it into their teaching and learning program. It could be argued therefore that teachers themselves require explicit teaching to recognise the problem solving affordances offered by the 1:1 netbooks. As this study examines a 1:1 netbook learning program in the first year after its implementation it may be that over time these teachers would recognise this affordance and begin to implement more problem solving activities in their classrooms.

Most teachers believed that 1:1 netbook learning has enabled students to explore topics in greater depth. One teacher commented “The students are able to instantly get on board with the topic and really take it somewhere. You can discuss a topic all week and set tasks each day that get deeper and deeper.” Other teachers observe that factors such as students researching information at home on their netbooks, not having to wait for your classes one hour per week computer lab time to conduct research, the ability to use internet resources to extend the more capable students and the greater access to information afforded by the netbooks have all facilitated deeper student learning. In the December surveys when teachers were asked if their students are able to explore topics in greater depth when they have their own netbook, 95.1% of respondents agreed (See Appendix 21, Table 22). This is supported by, Bateman and Oakley (2009) who found that 1:1 laptops help students grasp difficult curricular concepts, work harder at their assignments and consequently develop a deeper

understanding of the subject material. Whilst REA (1998) concluded that in 1:1 laptop learning environments teachers were able to make lessons more detailed and rigorous which assisted the students in reaching a higher level of intellectual complexity, contrary to these findings this study found one teacher who during interviews expressed doubts that 1:1 netbook learning does enable the students to achieve deeper learning. The teacher reported, "It gives alternate ways of finding information, but whether they actually go deeper than what they were capable of without netbooks I would not like to say yes or no."

Students stated in their interviews that they believe that having 1.1 netbooks has allowed them to explore topics in greater depth through greater access to the information available on the internet. This was supported by the December surveys, when students were asked if they are able to explore topics in greater depth using a netbook, 87% of respondents agreed (See Appendix 21, Table 84).

Teachers at one school described how they have used the 1:1 netbooks as a tool to assist the students in reflective learning. One teacher stated, "The true value of these netbooks is in their use as a reflective journal. The netbooks help the students to easily pull all their different information documents together, for example they can have photos, text, and videos all recording information. Students can reflect and make explicit connections between one piece of information and another and that that has got to make their understanding deeper. This is one of the reasons why we think that it is important that students have these netbooks in the classroom." Significantly, no other studies reviewed made reference to netbooks being used as reflective journals designed to enable students to make their understandings deeper by making explicit connections between various pieces of information. The multimedia affordances of 1:1 netbooks enable the use of reflective activities in the classroom that support students in developing a deeper understanding of the curriculum.

In summary then, the affordances offered by the 1:1 netbooks facilitate the implementation of activities such as projects, research, inquiry and reflective activities that have the potential to promote higher order thinking in the classroom. Some teachers were able to recognise the affordances offered by the 1:1 netbooks for the application of problem solving activities in classroom. However, not all the teachers participating in this study recognised these affordances. Students have greater ease of access to information available on the Internet which allows them to explore topics in greater depth. As a result of the affordances offered by the netbooks, teachers are able to incorporate reflective classroom activities designed to enable students to make their understandings deeper by making explicit connections between various pieces of information.

8.3.9 Individualisation of student learning.

During interviews teachers offered examples of being able to cater to a greater variety of learning styles and abilities with the netbooks, such as interactivity through the use of video or digital interactive to present information which the students can return to, to watch again and again as often as they need in order to comprehend the content. Likewise, Bebell (2005; 2008), Davies (2004), and Dinnocenti (2001) find that teachers in 1:1 laptop learning classrooms frequently use ICT to present information to the class in a variety of ways to better meet the individual learning needs of each student. Thus it could be concluded that the affordances of 1:1 netbooks enable teachers to present information to students in a manner which better caters to individual students learning styles and abilities.

Teachers also explained that the 1:1 netbooks allowed them to keep all students genuinely engaged in learning whilst they conduct individual conferences or small group teaching sessions. Swan et al. (2007) also report that 1:1 technology keeps the more advanced students engaged with enrichment work so that the teacher can spend more time with students who are having difficulty with fundamental concepts or skills. During interviews teachers gave examples of using interactive web 2.0 applications such as Mathletics to individualise learning tasks to each student's specific requirements. This is supported by Dunleavy et al. (2007) who concluded that in 1:1 laptop learning programs each student is able to proceed through learning tasks at his or her own pace in an engaging, but challenging laptop or web-based program. In addition, Bateman and Oakley (2009), CRF and Associates Inc. (2004), Dunleavy et al. (2007), Silvernail and Lane (2004), and Zucker et al. (2005) all similarly conclude that this environment aids teachers in individualising instruction and curriculum to meet each student's needs. Furthermore, Collins and Halverson (2010), in their discussion of the affordances of digital media in education, agree that ICT affordances help to customise and individualise student learning. It appears there is support in the literature that individualisation of student learning through the use of web 2.0 applications is an affordance of 1:1 netbooks.

Although during interviews teachers were able to offer examples of how they used the netbooks to individualise student learning, survey results were not so clear. In the February surveys when teachers were asked if they individualise the curriculum to meet individual student's needs 79% of respondents agreed (mean score 4.0). However in the December only 72.5% of respondents agreed (mean score 4.1, See Appendix 21, Table 23). Whilst a lower percentage of respondents agreed from February to December, the overall mean score result increased by 0.1 from 4.0 to 4.1. Conversely in the December surveys when teachers were asked if students having their own netbooks have enabled them to more easily individualise the curriculum to meet

individual student learning needs, 89.8% of respondents agreed (See Appendix 21, Table 24). So whilst the 1:1 netbooks had no apparent impact on whether or not teachers individualised the curriculum to meet individual students' needs, 89.8% of teachers did agree or strongly agree that students having their own netbooks has made it easier for them to be able to individualise the curriculum to meet individual student learning needs. It could be concluded that although teachers were able to recognise the 1:1 netbooks' affordances for individualisation of the curriculum to meet individual students' needs, at this stage many teachers were unable to manipulate the learning conditions to include these affordances into their teaching practice. Further research would be required to determine why even though the majority of teachers could recognise these affordances they were unable to modify their teaching practice to take advantage of them.

Teachers from all schools reported that the 1:1 netbooks offered the students more choices in the direction in their learning. Teachers explain that the netbooks, in facilitating a more constructivist approach to their teaching, allow them to give the students greater choices in the direction and extent of their own learning. This finding was also reflected in the surveys. In February 34.2% of respondents gave their students choices in what they learn, whereas December 63.4% answered positively (See Appendix 21, Table 25). This is a statistically significant response at a 99% confidence level.

Further, in December 82.5% of teachers agreed that students having their own netbooks has increased the amount of individual choices they have in their learning (See Appendix 21, Table 26). Similarly when students were asked in December if having a netbook has given them greater choices in what they learn 76.5% of respondents agreed (See Appendix 21, Table 85). Therefore it can be concluded that 1:1 netbooks afford students greater choices in the direction and extent of their own learning.

During interviews teachers expressed the belief that students work better individually in 1:1 netbook classrooms. One teacher commented, "I think this is one of the main successes, students can complete tasks individually and feel success." In December 75% of teachers agreed that students having their own netbooks has increased the amount of individual work which they do in class (See Appendix 21, Table 34). When teachers were asked how frequently their students use computers/netbooks for individual work the results were statistically significant going from 58.3% in February to 95.1% in December. This is a statistically significant response at a 99% confidence level (See Appendix 21, Table 33).

In interviews students all agreed that the netbooks help them to work better individually explaining that they can, "Get straight into work and not get distracted." Student surveys showed that students use computers/netbooks more frequently for individual work since the introduction of the 1:1 netbook learning

program. In February when students were asked how frequently they use computers/netbooks for individual work 59.7% of respondents answered always or almost always. Whereas in December 82.7% gave this response. This is statistically significant at a 99% confidence level (See Appendix 21, Table 92). Thus it can be concluded that a resultant impact of the affordances offered by the 1:1 netbooks is that students are able to work better individually, completing tasks independently without becoming distracted from their learning.

To summarise, the affordances of 1:1 netbooks offer teachers a variety of choices in how to present information to students, enabling teachers to better cater for individual students learning styles and abilities. In addition, 1:1 netbooks enable the use of web 2.0 applications to further individualise student learning. It can be concluded that the affordances offered by the 1:1 netbooks give teachers the ability to individualise the curriculum to meet individual students' learning needs. However, even though most teachers in this study were able to recognise this affordance, many of them did not actually take advantage of this affordance in their teaching practice. Further research is required to determine the reason for this discrepancy. 1:1 netbooks give students greater choices in the direction and extent of their own learning; as a result students are able to work better individually, completing tasks independently without becoming distracted from their learning.

8.3.10 Projects and assignments.

Whilst not all teachers interviewed agreed that they had used more project and assignment work in their classrooms since the implementation of 1:1 netbooks, all teachers did agree that 1:1 netbooks offer students more flexibility and options in how they research and present their projects. This finding is in accord with Tierney and Hunt (2009) who found that the 1:1 laptop learning students in their study did not participate in more project-based instruction than non 1:1 laptop learning students, though the teachers in their study did indicate that the projects which the students had completed had a greater number of references and more information than similar projects completed by their non 1:1 laptop learning counterparts.

In the February surveys, when teachers were asked how frequently their students use computers/netbooks for projects and assignments, 54% of respondents answered all of the time or most of the time, in contrast in December 95.2% gave this response (See Appendix 21, Table 27). This is statistically significant at a 99% confidence level, indicating that students are using netbooks more frequently in their project and assignment work since the introduction of the 1:1 netbook learning program. Similar also are the student survey results going from 59.9% in February to 72% in December (See Appendix 21, Table 86). This too is a statistically significant result at a 99% confidence level.

This research does not support the research findings from Ainley et al., (2000), Davies (2004), Fairman (2004), GMSP (2004), Lowther et al., (2003), Niles (2006) and Sclater et al. (2006) who assert that students in 1:1 netbook classrooms do more projects and assignment work. However, it does concur with their findings that 1:1 netbook learning students are given choices in their project and assignment work about what they will learn, how they will learn it, and how they will represent their learning.

To summarise this discussion, the affordances of 1:1 netbooks offer students more flexibility and options both in how they research and present their projects and assignments. In a 1:1 netbook learning environment students are more likely to use netbooks to complete projects and assignments.

8.3.11 Student responsibility.

Teachers stated during interviews that having 1:1 netbooks has made the students more responsible, both in the context of caring for their netbooks, and in the student's ability to be responsible for their own learning. Teachers gave examples of students being responsible for their own learning by independently finding information which they need, using their netbooks to reflect on their own learning progress, creating their own learning resources and directing their own learning. Teacher surveys supported this belief. In February 47.3% of teachers agreed that students take responsibility for their own learning and in December 65.9% agreed (See Appendix 21, Table 28). This difference is statistically significant at a 90% confidence level. Further in December when teachers were asked if they believed that students having their own netbooks have increased the amount of responsibility they take for their own learning 75.6% of respondents agreed (See Appendix 21, Table 29).

Students also believe that they have taken more responsibility for their own learning since having a netbook, offering examples during interviews of how they had been responsible both for their own learning, and for the care of their netbook. Student survey results supported this finding with 73.6% of students agreeing in the December surveys (See Appendix 21, Table 88).

Likewise Chamberlain (2004), Davies (2004), Dinnocenti (2001), Fairman (2004), GMSP (2004) and Jeroski (2003) found that learning with 1:1 laptops empowers students to take greater pride, ownership and responsibility for their own learning, with students taking a leadership role in directing their own learning. Whilst Tierney and Hunt (2009) report that the grades 1, 2 and 3 1:1 laptop learning students in their study did not direct their own learning, teachers in this study did believe that grade 6 students were more responsible for their own learning and directed their own learning more in a 1:1 netbook learning environment. This researcher

argues that the difference in these findings can be attributed to the greater maturity levels of the grade 6 students in this study, as compared to the grade 1, 2 and 3 students in the Tierney and Hunt (2009) study.

Teachers also commented on the responsibility students took in caring for their netbooks, with one student observing that, "We have to look after our stuff more now, you cannot just drop your school bag when it has your netbook in it." Jeroski (2003) also reports on student respect and responsibility in caring for their laptops, resulting in an extremely low incidence of damage to the laptops. However, Chamberlain (2004) found that some students in his study needed to be taught more about the responsibilities of caring for their laptops. As "The Netbook Project" included student responsibility policy documentation, and student education regarding the care and responsibility of the netbooks, this may account for the difference in findings between the Chamberlain (2004) study and this study.

In summary, as a result of the affordances offered by the 1:1 netbooks, students take greater responsibility for directing their own learning by independently finding information which they need, using their netbooks to reflect on their own learning progress and creating their own learning resources. Students also demonstrated responsibility in the care and maintenance of their netbook.

8.3.12 Group, cooperative and collaborative learning.

Teachers were able to offer many examples of students using the netbooks to participate in group and cooperative learning. For example this occurred during literature circles using the web 2.0 Etherpad application, when using Survey Monkey to gather feedback from staff and students, and in using Google Docs to cooperatively coordinate Kids' Congress. Teachers also cited examples of their students working with students from other schools and from overseas in virtual groups facilitated by the 1:1 netbooks.

Teacher survey results showed a slight increase in the amount of group or cooperative work in which students in 1:1 netbook learning classrooms participate in, going from 76.3% in February to 78.1% in December (See Appendix 21, Table 30). In the December surveys, when teachers were asked if students having their own netbooks have increased the amount of group and cooperative work that they do in class, 68.3% of respondents agreed (See Appendix 21, Table 32). There was also a statistically significant difference when teachers were asked how frequently their students use computers/netbooks for group/cooperative work, going from 33.3% in February to 65.8% in December. This is statistically significant at a 99% confidence level (See Appendix 21, Table 31).

During interviews students stated that participating in group work is easier now that they have netbooks as they can all work on different programs and then combine their ideas and work into the one project. Students made comments such as, "You can make a slideshow on one netbook and then you can connect to other people's netbooks. You can all work on it at the same time on different netbooks. When we were doing it on paper you would have to do 2 copies for you and your partner but now you can just save it into both files."

Student survey results showed that students use their netbooks more frequently for group work since the introduction of the 1:1 netbook program. In the February students 19.9% of student indicated that they use computers/netbooks for group or cooperative work, and in December surveys, 33.5% of respondents indicated this. This is statistically significant at a 99% confidence level (See Appendix 21, Table 89). In addition, a review of current literature shows that students in 1:1 laptop learning environments are frequently involved in collaborative, cooperative group learning situations such as project-based learning and social constructivist learning where discussion and sharing amongst students is encouraged (Bebell, 2005; Davies, 2004; Dunleavy et al., 2007; Fairman, 2004; GMSP, 2004; Jeroski, 2003; Silvernail & Lane, 2004; Swan et al., 2005; TCER, 2006; Tierney & Hunt 2009).

Teachers noticed increased social interactions between students as a result of the 1:1 netbook program and commented that as a result of these increased social interactions in the classroom that some students have been able to improve their communication skills, tolerance, and appreciation of other people. Several teachers commented that the 1:1 netbooks have encouraged students to interact with others with whom they may not normally interact. Teachers explained that the students who have advanced technology skills and are able to assist other students with the netbooks are not necessarily the "popular" or "academically advanced" students. 1:1 netbooks have allowed other students to take leadership roles in the classroom. One teacher states, "The peer coaching and interaction has been the most powerful thing to come out of the 1:1 netbook program." Similarly Angelo et al. (2009), Chamberlain (2004), Dinnocenti (2001), Fairman (2004), Swan et al. (2005) and Windschitl and Sahl (2002) report that 1:1 laptop learning increases social interactions between children as they engage in collaborative learning, and are encouraged to talk, share information and problems they have relating to their learning.

Similarly, Anderson (2004), Conole and Dyke (2004) and Webb and Cox (2004) in their articles on the affordances of ICT in education observe that the communication, collaboration and interactive abilities of ICT and the internet present a key affordance that offers the potential for collaborative learning enriched by engagement with the "other." Furthermore, Volet and Wosnitza (2004) in their article on the social affordances

of online learning state that online learning provides social affordances which build social relationships between participants, and which result in an increase in the individual's enjoyment, engagement and motivation for learning online, as well as providing mutual scaffolding in the construction of knowledge.

However despite the computer supported learning environment's potential to facilitate group collaboration and learning, Kreijns and Kirschner (2001), in their discussion of the social affordances of computer-supported collaborative learning environments, report low rates of group collaboration, indicating that contemporary computer supported learning environments do not completely fulfil the expectations of both educators and learners. Kreijns and Kirschner (2001) report that just because social interaction is technically possible in a computer supported learning environment, it does not automatically mean that it will occur. However the findings of this study indicate that not only did teachers and students recognise the social affordances of a 1:1 netbook learning environment, but that they were also able to manipulate the learning environment to maximise these social affordances. It should also be noted that the social affordances of computers have more recently been greatly enhanced by the introduction of web 2.0 social media.

Teachers observed several examples of a developing culture of students sharing knowledge with each other, teaching each other and building together a collective knowledge base. For example, teaching each other to use various information and communication technologies and programs or connecting their netbooks to the projector in order to teach or share something with their peers. One teacher comments that the "Netbooks have facilitated a type of peer teaching and interaction which did not occur in the computer lab. That's been one of the most powerful things for us". She goes on to explain how students have learnt about a netbook application at home and then come to school and taught the other students. She states, "One of the most powerful things has been what the kids have taught each other." During interviews students also explain that they have learnt new ICT skills from other students and they cite for example Moviemaker, and Game Maker as programs that they learnt to use through other students teaching them.

Current literature supports the finding that students in 1:1 netbook learning environment frequently teach other students (GMSP, 2004). Gaynor and Fraser (2003) assert that a major feature of the 1:1 laptop classroom environment is the large amount of debate, conferencing and peer tutoring that occurs in the classroom. Further, in many cases, students seek support and advice from their peers before seeking help from their teacher, despite the teacher constantly being available and moving around the classroom to assist and help students (Bateman & Oakley, 2009; Gaynor & Fraser, 2003).

To summarise this discussion, the affordances offered by the 1:1 netbooks enable students to participate in group or cooperative work with other students from within their classroom or school, or in virtual groups with students from other schools and other countries. Students in 1:1 netbook learning environments are more likely to use netbooks in group and cooperative work situations than are students in non-1:1 netbook learning environments. 1:1 netbook learning allows students increased social interactions with each other as they engage in collaborative learning, and are encouraged to talk, share information and problems they have relating to their learning. This increased social interaction allows the development of better communication skills, tolerance, and appreciation of other people. Students who would have not previously taken on leadership roles in the classroom often take leadership roles in a 1:1 netbook learning environment. As a result of the affordances offered by the 1:1 netbooks, there occurs the development of a collective intelligence amongst the students. Teachers believe that one of the most powerful things about 1:1 netbook learning is the students teaching each other.

8.3.13 Presentation of student work.

Teachers observed an improvement in the presentation of some of their students' work when they used 1:1 netbooks. Some teachers described the netbooks as benefitting their lower achieving students to improve the presentation of their work the most, with comments like, "They can correct their mistakes on the screen and then when they print out their work it looks neat." However other teachers reflect that it is actually their higher achieving students whose work presentation has benefited the most from the 1:1 netbooks. They made comments such as, "The top achievers still put in that extra bit of work and put it all together better." Teachers also observed that, "There are still those children who will still have spelling and punctuation errors in their work, and some of them struggle with the concept of presentation, they are very messy and so their presentation of work is still very messy." However survey results clearly indicated an improvement in the presentation of student work; in December 85.4% of teachers agreed that students' having their own netbooks has improved the presentation of their work (See Appendix 21, Table 35).

Students from all schools stated that the 1:1 netbooks have improved the presentation of their work. Students made comments such as, "With the netbooks it is a lot easier and neater to type things. I get more marks for my projects using my netbook than when I used to hand write them," and "We can add borders, backgrounds and colour to our projects. We can change the fonts and the colour of the text to make it look pretty. We can use Audacity, Debut or digital cameras to make recordings and take digital photos for use in our

presentations." In the December surveys 83% of students agreed that having a netbook has improved the presentation of their work (See Appendix 21, Table 94).

Similarly, Bebell (2005, 2008), Dinnocenti (2001), Gaynor and Fraser (2003), GMSP (2004), MEPRI (2003), REA (1998), Silvernail and Lane (2004), and Swan et al. (2007) all find that 1:1 laptop learning results in an increase in the quality of presentation of students' work, with students willing to do the editing and reworking that they would otherwise avoid, and with students utilising digital tools to add new creative and artistic dimensions to their work. Likewise Webb and Cox (2004) in their research on the affordances of ICT state that computers afford students opportunities to use many formats including multimedia resources and text to create products and presentations.

In summary, as a result of the affordances offered by the netbooks, students have the opportunity to improve the presentation of their work through the use of multimedia and digital applications and greater ease of editing and proofreading. Teachers specifically mentioned improvements in the presentation of lower achieving students' work, and also in higher achieving students' work.

8.3.14 Inappropriate use of the 1:1 netbooks by students.

In the December surveys when teachers were asked if they had problems with students using their netbook in an inappropriate manner only 14.7% of respondents agreed (See Appendix 21, Table 36). However, during interviews when this question was able to be unpacked in greater detail, all teachers were able to cite examples of individual students using their netbooks in an inappropriate manner. Such inappropriate uses included: cyber bullying, being distracted by the netbooks in class time, viewing inappropriate material, plagiarism (as discussed in Section 8.3.1), downloading illegal or inappropriate material to the netbook, sharing of inappropriate material on the netbook, and using inappropriate chat forums in class. One teacher reflects that the netbooks are, "A powerful toy and we are treading in 'unfamiliar' waters. It made me realise that I needed to become a strong mentor and strongly advocate the development of the 'moral compass'." During interviews the students themselves were also able to offer examples of how some students had used the netbooks inappropriately, such as plagiarism and having illegal software on their netbooks. It is possible that this apparent discrepancy between the teacher survey results and the teacher and student interview results indicates that teachers did not perceive behaviours such as students being distracted in class time, or using chat forums during class time as students using the netbooks inappropriately, but rather as classroom management issues.

Further research is required to clarify the frequency and types of inappropriate student behaviours that result from 1:1 netbook use.

Current literature indicates that 1:1 laptops present a temptation for students to use their laptops in inappropriate ways, for example: instant messaging each other in class time (GMSP, 2004; Jeroski, 2003; Niles, 2006), installing games or software which they do not own onto their laptops (Chamberlain, 2004), and using their laptops for games or other non-educational activities (Chamberlain, 2004; Dunleavy et al., 2007; GMSP, 2004), accessing pornographic or inappropriate web sites (Chamberlain, 2004; Dinnocenti, 2001; Dunleavy et al., 2007; GMSP, 2004; Jeroski, 2003). These uses raise concerns about student safety on the internet, (Donovan, 2006). Concerns about plagiarism and children's attention in the classroom include: copying and pasting information from the internet (Lei & Zhao, 2008), and students getting distracted by Internet sites that are irrelevant to the current topic (Niles, 2006).

To summarise, it is possible to conclude from this research that the affordances of the 1:1 netbooks provide students with the opportunity to use the netbooks inappropriately, for example, of particular concern to teachers in this study, cyber bullying, downloading illegal or inappropriate material to the netbook and using inappropriate chat forums in class. However this study is inconclusive with regard to the frequency with which students act on these affordances. It is possible that these results indicate that whilst affordances for using the netbooks inappropriately are present in a 1:1 netbook learning environment, the majority of students do not perceive these affordances or perceive them but do not act on them. Further research is required to clarify the frequency and types of inappropriate student behaviours that the affordances of 1:1 netbooks allow. These affordances could be regarded as a negative affordance as they decrease the students' ability to engage with learning activities in the classroom.

8.3.15 Learning at home.

During interviews teachers stated that students used their netbooks to continue their learning at home, with comments such as, "That's been one of the most powerful things for us is that often at home the students will keep fiddling with the programs or researching topics that interest them. It is home learning as opposed to just the homework that they have to do." Teachers also state that they often set homework for which the students must use their netbooks to complete. One teacher comments, "We use sites like Digilearn, Mathletics, Superclubs Plus and Smart Kiddies to set homework." Further, teachers at some schools also noticed that

parents and siblings were more involved in helping with homework since the introduction of the 1:1 netbook learning program. Teachers report, "Kids are constantly saying, 'Oh mum and dad were helping me with this'."

In the February surveys, when teachers were asked how frequently their students use computers/netbooks for homework, 18.9% of respondents answered all of the time or most of the time. Significantly in the December surveys 57.5% of respondents gave this response. This is statistically significant at a 99% confidence level (See Appendix 21, Table 37). Student surveys also produced statistically significant result for this question, going from 32.2% in February to 42.4% in December (See Appendix 21, Table 95: "How frequently do you use computers/netbooks for homework?"). This difference is statistically significant at a 99% confidence level.

Students also explain that they use the netbooks to continue their learning at home. They give examples such as: finishing off class work at home, accessing the class wiki and posting blogs, loading pictures and videos onto it, and completing homework. Several students mentioned that completing homework is much easier now that they do not have to "fight over" the home computer with their siblings. Students also believe that their parents have looked at their work more often since they take it home on the netbooks, and that they have been able to teach their parents and siblings things using the netbooks.

However, in the December surveys when students were asked if they get help with their learning at home more often since getting a netbook, 44.2% of respondents agreed, 24.6% were unsure, and 31.2% disagreed (See Appendix 21, Table 96). This question specifically asks the students if they "get help" with their learning at home more often since getting a netbook which is subtly different to what the students reported during interviews when they observed that their parents and siblings "look at their work" on their netbooks, and that they were able to "teach" their parents and siblings using their netbooks at home.

Current literature reveals that 1:1 laptops appear to extend the school day with laptop students spending substantial amounts of out of school time completing schoolwork on their laptop computers (Davis et al., 2005; GMSP, 2004; Lowther et al., 2003; MEPRI, 2003; REA, 1998; Russell et al., 2004; Swan et al., 2005) and with parents spending significantly more time working with their children on their homework and their laptops (Lei & Zhao, 2008). However, although Zucker et al. (2005) found that teachers would prefer that the laptops did not go home with the students, in this research study teachers were supportive of the students taking the netbooks home.

In summary the affordances of the 1:1 netbooks offer students the ability to spend more time using their netbooks at home for self-initiated home learning as well as completing teacher set homework. In addition, 1:1 netbooks invite the involvement of the child's parents and siblings in their homework or home learning.

8.3.16 Students' technology skills.

Most teachers observed that many of their students have developed more proficient ICT skills in relation to the netbooks and the netbook's preloaded software than they have themselves. One teacher states, "The students have become the experts and teachers in relation to technology skills, they teach each other and the staff." Teachers did note though that there are some students who still have not grasped basic netbook skills yet. In the December surveys 100% of teachers agreed that students having their own netbooks have improved their technology skills (See Appendix 21, Table 38).

During interviews all students explained that their technology skills have improved since having the netbooks, giving may examples of programs such as Audacity, Google Sketch Up, Monkey Jam and Movie Maker which they can use now, but didn't know how to use before getting their netbooks. Students were visibly proud of themselves as they explained that they often know more about the netbooks than their teachers, and that they could sometimes help their teachers with technical problems.

However, the student surveys did not support the interview results or teacher survey results. In February 95.5% of students agreed that they are confident using a computer/netbook, but in December only 93.8% agreed (See Appendix 21, Table 97). Thus there was a slight drop in student perception of whether they were confident using a netbook after the introduction of 1:1 netbook learning. Similarly, when asked if they are able to help others on a computer/netbook, the results went from 81% in February to 81.8% in December (See Appendix 21, Table 98). This indicates that student's perception of whether they were able to help others had not changed after the introduction of a 1:1 netbook program.

It would require further research to investigate fully why 100% of teachers agree or strongly agree that student technology skills increase after the implementation of a 1:1 netbook learning program, yet the students themselves, whilst being proud of their many new skills, do not perceive themselves as being any more confident using a netbook, or any more able to help others on a netbook after the implementation of a 1:1 netbook learning program. This researcher speculates that when the students answered these questions in the December surveys in selecting their response they compared themselves with their peers, all of whom have also improved in their ICT skills since February (prior to the 1:1 netbook introduction). Thus their comparative

netbook skill level remained steady. However, had the students compared themselves in December with themselves in February they would have been more aware of their individual improvement. During the student interviews the researcher was able to unpack the students' responses by prompting them to think about skills that they have now, and programs which they can use now, that they could not at the start of the year, thus a different outcome was obtained (See Student Interviews Section 6.2.10).

Current literature shows that students in 1:1 laptop learning programs report an increase in their ability to use technology, particularly for recording and analysing data, creating multimedia presentations, and searching the internet for information (Bebell, 2005; Davies, 2004; Jeroski, 2003; Lowther et al., 2003, 2008a; REA, 1998; TCER, 2006). Further, students frequently have more technical knowledge than their teachers, and as a consequence students are often teaching the teachers (Burns & Polman, 2006; Fairman, 2004; GMSP, 2004; Windschitl, & Sahl, 2002).

To summarise, the affordances offered by the 1:1 netbooks facilitate an increase in students' technology skills, with the students, often becoming the experts and teachers in the classroom when it comes to technology skills, teaching each other and the staff. Further research is required to investigate 1:1 netbook learning students' perceptions of their technology skills.

8.3.17 Student attitude toward school.

During interviews, teachers expressed the belief that the introduction of the 1:1 netbooks had an initial positive impact on their students' attitude to school, commenting that the netbooks had increased students' self-esteem and caused the students to experience a lot less frustration at school thus helping the students in turn to have a more positive attitude to school. However, they did notice that as the novelty of 1:1 netbook learning wore off this positive effect on student attitude to school has dissipated.

Teacher surveys supported the finding that 1:1 netbook learning has improved students' attitude to school going from 26.3% in February to 41.5% in December (See Appendix 21, Table 39). Also, in the December surveys, when teachers were asked if they believe that netbooks have contributed to their students' positive attitude to school this year, 82.9% of respondents agreed (See Appendix 21, Table 40).

Likewise, in the February surveys when teachers were asked if they believe that their students try very hard to do their best at school, 73.7% of respondents agreed, whereas in the December surveys, 78% of respondents agreed (See Appendix 21, Table 41). Further, in the December surveys, when teachers were asked

if they believe that netbooks have contributed to their students trying very hard to do their best at school this year, 68.3% of respondents agreed (See Appendix 21, Table 42).

Teachers were also asked about their students' attitudes to writing and Mathematics. In the February surveys when teachers were asked if they believe that their students like writing, 55.2% of respondents agreed, compared to 67.5% of respondents in December (See Appendix 21, Table 43). In addition, in the December surveys, when teachers were asked if they believe that netbooks have contributed to their students liking writing this year 70.7% of respondents agreed (See Appendix 21, Table 44). Similarly, in the February surveys, when teachers were asked if they believe that their students like Mathematics 57.9% of respondents agreed compared to 65.8% in December (See Appendix 21, Table 45). Also, in the December surveys, when teachers were asked if they believe that netbooks have contributed to their students liking Mathematics this year, 68.3% of respondents agreed (See Appendix 21, Table 46).

In the February surveys, when teachers were asked if they believe that doing well in school is important to their students, 76.3% of respondents agreed and in December 78.1% of respondents agreed (See Appendix 21, Table 47). With 56.1% of respondents agreeing in December that students having their own netbooks has made doing well in school important to them (See Appendix 21, Table 48).

Students at all schools stated in interviews that the netbooks have helped them to have a positive attitude to school this year. However, their survey results produce far less certain findings. In February 83.9% of students agreed that they feel positive about their schoolwork and in December 83.9% of respondents agreed. This indicates that student perception as to if they feel positive about their school work had not changed significantly since the introduction of 1:1 netbook learning (See Appendix 21, Table 110). However, in the December surveys, when students were asked if netbooks have helped with their positive attitude to school this year, 72.4% of respondents agreed (See Appendix 21, Table 111).

This pattern of responses was repeated when students were asked if they try hard to do their best at school, with only a 0.1% difference between the February and December results (See Appendix 21, Table 112). But in December when students were asked if netbooks have helped them to try very hard to do their best at school this year 75.7% of respondents agreed (See Appendix 21, Table 113). Likewise when asked if they like writing and Mathematics, student surveys showed no significant changes between the February and December results (See Appendix 21, Table 114).

While current literature finds that 1:1 laptop learning students have a more positive attitude toward school, and enhanced confidence and self-esteem than their non 1:1 laptop learning peers (Davies, 2004;

Dinnocenti 2001; Fairman, 2004;Zucker et al., 2005), this study finds that although teachers believe 1:1 netbooks improve their students' attitude to school, the student results show no significant difference in attitude toward school after the introduction of a 1:1 netbook learning program.

To summarise then, throughout this study this researcher has defined an impact as the influence or effect exerted as a result of a perceived affordance (See Definitions). According to this definition, the teachers' perceptions of the 1:1 netbooks' affordances for teaching practice and student learning have affected the teachers' perception or beliefs about their students' attitudes toward school. Therefore it could be argued that an impact of 1:1 netbook learning is that teachers working in a 1:1 netbook learning environment are more likely than their non-1:1 netbook learning counterparts to believe that their students have a positive attitude toward school. In addition, these teachers are also more likely to believe that their students try hard to do their best at school, that they like writing and Mathematics, and that doing well in school is important to their students.

However findings from student surveys show that the impact on students' self-perceptions about whether they feel positive about their school work, whether they try hard to do their best at school and whether they like writing and Mathematics, all show no change after the introduction of a 1:1 netbook learning program. Despite this lack of change in students' perception about themselves as learners, students did indicate in the surveys that 1:1 netbooks have been particularly important to them in these aspects.

Whilst teachers believe that 1:1 netbooks improve student attitude to school, and students believe that 1:1 netbooks have a positive influence on their own attitude to school, it cannot be concluded 1:1 netbooks actually impact on students' self-perceptions when it comes to: students feeling positive about their school work, students trying hard to do their best at school, and students liking writing and Mathematics. This study is the first to report on the discrepancy between 1:1 netbook learning students' unchanged perceptions about these aspects, and their belief that 1:1 netbook learning has been particularly important to them in in these areas. Further research is required to investigate this discrepancy.

In summary, the affordances offered in a 1:1 netbook learning environments impact positively upon teachers' perceptions that their students have a positive attitude to school, that their students try hard to do their best at school, that their students like writing and mathematics, and that doing well in school is important to their students. However, a 1:1 netbook learning environment does not appear to impact upon students' self-perceptions of feeling positive about their school work, trying hard to do their best at school and their liking for writing and Mathematics. Further research is required to determine why students believe that 1:1 netbooks have

been important to their positive attitude toward school, because statistically no change has been found in this study regarding these aspects.

8.3.18 Student motivation.

When it came to the impact of the 1:1 netbook program on the students' motivation to learn, nearly all teachers agreed that there was a definite initial positive impact. Teachers made comments such as, "The netbooks have definitely made the students want to come to school, they are proud of using their netbooks." However teachers did reflect that this initial positive impact on student motivation has lessened over time. Teachers also observed that students' increased motivation often did not extend into class times when netbooks were not being used, with students returning to their previous levels of motivation if the lesson did not include netbooks. One teacher however did not agree that the netbooks have increased his students' motivation to learn, and made the comment, "I do not know that students are working harder, I think that they are just trying to work faster."

Teacher survey results indicated a statistically significant difference in teachers' perceptions of their students' motivation to learn between the February surveys and the December surveys. In February 63.2% of respondents agreed that their students are motivated to learn, whereas in December 82.9% of respondents agreed (See Appendix 21, Table 49). This is statistically significant at a 95% confidence level. Further, in December 75.6% of teachers agreed that netbooks have contributed to their students' motivation to learn this year (See Appendix 21, Table 50).

Bateman and Oakley (2009), Bebell (2005; 2008), Davies (2004), Dinnocenti (2001), GMSP (2004), Jeroski (2003), Lowther et al. (2008a), Russell et al. (2004), Swan et al. (2005), and Zucker et al. (2005) all found that both teachers and students believe that students having 1:1 laptops stimulates dramatic changes in student motivation and work habits. Livingston (2006) further asserts that students in 1:1 laptop learning programs become more motivated to complete schoolwork and often go beyond required assignments, thereby improving the quality of their work.

In summary, this study supports the literature that initially the impact of a 1:1 netbook learning environment is to increase students' motivation to learn, although this impact lessens over time.

8.3.19 Student engagement.

In the interviews all teachers stated that the 1:1 netbooks have definitely increased their students' engagement in learning. Teachers made comments such as, "Students are now much more on task," "The students are now more willing to actually get in there and have a go at the work" and "The netbooks definitely keep the students on task." Teachers specifically mention the impact of the 1:1 netbooks on engaging boys with observations like, "We would not have as many boys completing these tasks without the netbooks" and "We have got a couple of boys in particular that if I made them do their work in a workbook then they would not be as engaged."

Teacher surveys showed a significant belief in the positive impact of 1:1 netbooks on student engagement increasing from 76.4% in February to 90.2% in December which is statistically significant at a 90% confidence level (See Appendix 21, Table 51). In addition in December when teachers were asked if they believed that netbooks have contributed to their students' engagement in learning this year, 90.2% of respondents agreed (See Appendix 21, Table 52). Survey results also show that teachers believe that the 1:1 netbooks have positively impacted students' active involvement in learning (See Appendix 21, Table 53, Table 54) and had a positive impact on the amount of time that students spend "on task" (See Appendix 21, Table 55, Table 56).

Students, too, believe that the 1:1 netbooks have made them concentrate better in class, be more actively involved in their learning, and stay "on task" longer. One student explains, "The netbook makes me knuckle down to work a bit more," and another says, "With the netbook I write about twice as much as I used to. I can concentrate more."

Current literature also supports 1:1 laptop learning programs' positive impact on student engagement with Bateman and Oakley (2009), Bebell (2005), Bebell and Kay (2010), CRF and Associates Inc. (2004), Davies (2004), Dunleavy et al. (2007), Fairman (2004), Florida Department of Education (2006-7), Jeroski (2003), Russell et al. (2004), Silvernail and Lane (2004), Swan et al. (2005; 2007), TCER (2006) and Tierney and Hunt (2009) asserting that teachers find that 1:1 laptop learning programs improve student engagement, attentiveness and willingness to work. Dunleavy, Dede and Mitchell (2008) and Volet and Wosnitza (2004) in their studies on the affordances of ICT in education also state that online interactive environments afford engagement in learning.

To summarise, 1:1 netbook learning positively impacts on student engagement with learning, student concentration and ability to remain "on task", the quantity and quality of students' work, and the extent to which

the student is actively involved in learning. There appears to be a particular benefit for boys' concentration and "on task" behaviour.

8.3.20 Student behaviour.

Most teachers agreed that 1:1 netbook learning has had a positive impact on student behaviour. In the February surveys when teachers were asked if their students are generally well behaved 86.8% of respondents agreed and in December surveys 92.7% of respondents agreed (See Appendix 21, Table 57). In addition, in the December surveys, when teachers were asked if netbooks have contributed to their students being generally well behaved this year 65.8% of respondents agreed (See Appendix 21, Table 58). Similarly, Bebell (2008), Dinnocenti (2001), Gaynor and Fraser (2003), Jeroski (2003), Silvernail and Lane (2004) and TCER (2006) reported that teachers believe that 1:1 laptops influence student behaviour in a very positive way. In addition, Dunleavy, Dede and Mitchell (2008) in their study on the affordances of ICT in teaching and learning find that computers can improve student behaviour.

To summarise, there appears to be agreement in the research and literature that 1:1 netbook learning has a positive impact on student behaviour.

8.3.21 Are the affordances offered by the 1:1 netbooks important to students?

During interviews, students from all schools state that having a netbook has been important to their learning and further, they add that they like having a netbook and would not want to go back to not having one. Students made comments such as, "Netbooks are great for grade 6 students; they are really fun and easy and interesting and you learn all kinds of things with them," and "The netbooks have helped us become better in almost everything." Likewise in the December surveys, when students were asked if they like having a netbook, 92.8% of respondents agreed (See Appendix 21, Table 108). In addition, when students were asked in December if having a netbook is important to their learning 72.7% of students agreed (See Appendix 21, Table 109).

However when these beliefs were unpacked further in various survey questions the results became less clear. For example, in the February surveys when students were asked if they are good at school work 75.3% of respondents agreed, similarly in the December surveys 75% of respondents agreed (See Appendix 21, Table 99). These 2 results are almost identical showing that students own perception of whether they were good at their schoolwork had not changed since the introduction of the 1:1 netbook learning program. However when

students were asked if netbooks have helped them to be good at schoolwork this year 73.3% of respondents agreed (See Appendix 21, Table 100).

Student surveys also showed no significant difference between the February and December results in students perceiving themselves as being good students and being generally successful at school (See Appendix 21, Table 103, Table 105). This result indicates that student perceptions were unaffected by the introduction of the 1:1 netbook learning program. However, the December survey results indicate that the students believe that the netbooks have helped them to be a very good student and to be generally successful at school (See Appendix 21, Table 104, Table 106).

However, there were survey results that did indicate the netbooks had an impact on student learning. In the February surveys, when students were asked if they find it easy to learn new things 65.9% of respondents agreed, whereas in December 76.7% of respondents agreed (See Appendix 21, Table 101). The z score is 3.732, which is statistically significant at a 99% confidence level. Similarly, in the December surveys when students were asked if netbook have made it easy for them to learn new things this year 76.8% of respondents agreed (See Appendix 21, Table 102).

Current literature supports the students in the statements which they made during interviews and the finding that, after students have participated in a 1:1 laptop learning environment, the majority of them believed that having a laptop is important to their learning, and that they would not like to go back to learning without one (Christensen & Knezek, 2006; Davies, 2004; Donovan, 2006; Lei & Zhao, 2008; Lowther et al., 2003).

In summary, students in 1:1 netbook learning environments perceive the affordances offered by the 1:1 netbooks in a very positive light stating that they like having a netbook, that the 1:1 netbook has been important to their learning, and that they would not want to go back to not having a 1:1 netbook. However, the students' positive view of the 1:1 netbooks does not translate into their perceptions of themselves as learners with no statistical difference being found in the areas of student self-perception as being good at school work, a very good student, or being generally successful at school, although students did report in the surveys that the netbooks were important factors in how they had performed in these aspects. However student self-perception did show a statistically significant difference in the area of them finding it easy to learn new things. This study is the first to report on the discrepancy of 1:1 netbook learning students' unchanged perceptions of themselves as learners, as opposed to their strongly held view that 1:1 netbooks are important to them as learners. Further research is required to investigate this discrepancy in student perceptions in this population. Whilst the students

like having the 1:1 netbooks it cannot be concluded that they make any difference in the students' perception of themselves as learners.

This chapter has compared and contrasted the qualitative data with the quantitative data and drawn conclusions about the affordances of 1:1 netbooks for teaching practice, student learning. The following chapter presents the conclusions drawn from this study about a population of grade 6 students and their teachers. The conclusions are specific for the first year of the implementation of a 1:1 netbook learning program.

9. Conclusions

9.1 Introduction

This study addresses several gaps in current literature, including students' ability to recognise affordances which the teacher has not recognised, the possibility of sequential affordances in a 1:1 environment and the resultant changes to teachers' lesson planning and preparation. Additionally it explores the affordances of 1:1 learning programs in negotiated learning, teachers' requirements for support in these environments and students' use of multimedia applications to reflect on their learning and improve their oral presentation skills in a 1:1 learning environment. Further, it also addresses students in a 1:1 environment taking responsibility for their learning by creating their own learning resources and whether students' positive view of 1:1 learning translates into a more positive view of themselves as learners in these environments.

In addition, to date this researcher has not been able to locate any other studies of 1:1 learning that have been approached through an affordance theory lens. Thus, this research study provides new information in relation to this topic.

This chapter presents the conclusions of this research study organised under each research question. It begins with the affordances and impacts of a 1:1 netbook learning program on teaching practice, followed by student learning. These conclusions pertain to this population of grade 6 students and their teachers. The research was conducted during the first year of the implementation of the 1:1 netbook program in Victorian state primary schools.

9.2 The Affordances of 1:1 Netbooks for Teaching Practice and How These Impact on Teachers

This researcher finds that the affordances of 1:1 netbooks which the teachers in this study were able to perceive are the netbook's wireless internet access which offers unlimited access to the activities and information available on the internet and the software programs such as the animation programs, productivity tools and information software which came preloaded onto the netbooks. In addition, the preloaded multimedia applications, such as digital photography, video and music tools, and the netbook's communication tools for example the wireless access to email and interactive web 2.0 applications.

The affordances of the 1:1 netbooks offer teachers the opportunity to incorporate more ICT into their lesson planning and preparation, to access broader, or more in-depth, and diverse teaching materials on the

internet and to use ICT more often to present information to their class. In addition, the affordances offered by the 1:1 netbooks provide teachers the opportunity to rethink their lesson planning in order to incorporate the netbook affordances into their lessons, and the opportunity to use a more flexible, reactive style of lesson planning with students having greater input into the direction of lessons. Teachers, however, acknowledge that they do spend more time on lesson planning and preparation in a 1:1 netbook learning environments this may be perceived as a negative affordance.

In order for teachers to allow for the uptake of these affordances in their lessons they must be able to recognise the affordances and then be able to manipulate the learning environment. Students may perceive affordances which the teacher has yet to perceive and it is not until the student suggests the affordance to the teacher that the teacher is then able to perceive the affordance and act on it, incorporating it into the lesson. Sequential affordances may be revealed in a 1:1 netbook learning environment, as one affordance, when acted upon, subsequently reveals another affordance.

The affordances offered by the 1:1 netbooks provide teachers the opportunity to develop a constructivist pedagogical approach, moving them away from teacher-directed teaching to student-centred teaching. Teachers particularly noted the opportunities for negotiated learning and scaffolding individual student learning which the 1:1 netbooks afforded. In this way 1:1 netbooks enable a change in the teacher's role, from being the supplier of knowledge, to a constructivist role of support and facilitation of the active construction of knowledge by the learner. The affordances of netbook software, multimedia applications, the internet and web 2.0 tools allow students to construct knowledge and make meaning of the world around them. However, even when teachers recognise these affordances and feel the motivation to change their teaching practice, they may require support in order to successfully implement such change.

Most teachers in this study found that they were able to integrate the affordances offered by the 1:1 netbooks. The greater degree of integration reported in this study might be due to the preparation the teachers received through professional development activities prior to the implementation of the 1:1 netbook learning program. The most frequent curriculum areas in which teachers recognise and integrate the netbooks affordances were Literacy, Mathematics, research, inquiry learning and projects. Teachers were able to integrate the affordances offered by the 1:1 netbooks such that basic literacy and numeracy skills were enhanced by the presence of the netbooks in the classroom. Teachers achieved meaningful integration of the netbooks by ensuring that the netbooks' affordances were matched with intended learning outcomes. They were frequently able to enhance the students' perceptions of the netbooks' affordances, through the use of the internet and web

2.0 tools, the netbooks' preloaded software such as Microsoft Powerpoint, Paint, Publisher, or Word, and Multimedia applications such as Moviemaker, Photostory and Comic Life. Teachers stated that integration of the affordances offered by the 1:1 netbooks transformed their teaching practice as many new possibilities in teaching and learning opened up to them.

It can also be concluded that an impact of the introduction of a 1:1 netbook learning program is increased communication among teachers as they form an informal learning community to assist each other in integrating the affordances offered by the 1:1 netbook learning program into their classrooms. Teachers partake in greater communication both formally within professional development settings and informally in face-to-face discussions, email, blog and wiki communications as they share netbook teaching resources and work together to solve netbook related problems. The affordances offered in 1:1 netbook learning environments present significant opportunities for pedagogical change in the classroom. This study found that the resultant impact on teachers was that they embraced the changes and reported renewed energy, enthusiasm and engagement with teaching. Some teachers viewed the implementation of the program as an opportunity to effect change in their classroom pedagogical approach.

The affordances offered by the 1:1 netbooks result in changes to teachers' workloads, necessitating that teachers spend time uploading information to wikis, searching for online support materials, doing extra professional reading and learning to use new software and internet applications. Teachers do not see this as wasted time, but do recognise that it was time consuming. It could be argued that this changed workload is a negative affordance, as the additional time spent by teachers in integrating the 1:1 netbooks into their curriculum may potentially preclude them from participating in other professional and personal activities. In addition, while some teachers in this study did find that some aspects of the 1:1 netbook program required extra or different classroom management skills and strategies, on the whole the majority of teachers felt that changes in classroom management were not necessary.

After first-hand experience of 1:1 netbook learning in their classrooms, teachers believe that the affordances offered to them by the netbooks are important for teaching and learning. Teachers mention aspects of the 1:1 program such as student responsibility, engagement, creativity, variety and the link between home and school as being immensely important. After teaching in this environment teachers express the view that they would rather teach with the 1:1 netbooks than without them.

9.3 Affordances of 1:1 Netbooks for Student Learning and How These Impact on Students

This researcher finds that the affordances of 1:1 netbooks which the students in this study were able to perceive are the netbook's wireless internet access which offers unlimited access to the activities and information available on the internet and the software programs such as the animation programs, productivity tools and information software which came preloaded onto the netbooks. In addition, the preloaded multimedia applications, such as digital photography, video and music tools, and the netbook's communication tools for example the wireless access to email and interactive web 2.0 applications.

Through 1:1 netbook affordances students have convenient access to the unlimited activities, information and resources which are available on the Internet. Students in a 1:1 netbook learning environment use the Internet to research information more frequently than their non-1:1 netbook learning counterparts. Teachers recognised the affordances offered by the netbooks for access to the Internet, and were significantly more likely to use the Internet for teaching and learning activities in their classroom. Teachers were able to recognise the web 2.0 affordances offered by a 1:1 netbook learning environment and integrated these into their planning to reinforce skills and increase student engagement. Conversely, 1:1 netbooks offer the negative affordance of enabling students to copy and paste information from the Internet without including correct referencing, thus students failed to achieve the teachers' intended learning outcomes for that lesson.

The affordances of 1:1 netbooks provide students the use of multimedia applications to support and enhance teaching and learning in classrooms. Teachers and students in 1:1 netbook environments are significantly more likely to use multimedia applications such as digital photography, videos and music to produce products such as radio shows, video clips and animations to support their teaching and learning. These multimedia affordances result in students undertaking complex multi-faceted classroom tasks such as storyboarding, scripting, filming, editing and producing major projects on current topics of study. In addition, the affordances offered by the video recording applications gave students the opportunity for reflection and improvement on their personal presentation skills when used to record oral presentations. Further, 1:1 netbook learning enabled the use of the netbooks' other preloaded software. In this study, the programs used most frequently in the classroom were animation programs, productivity tools, multimedia programs and information software. However, in order for the teachers to incorporate these into their curriculum they must first learn how to use the programs, then recognise the programs educational affordances and subsequently incorporate these into their curriculum.

Affordances provided by netbooks gave students greater ability to organise their work. However students required direction to perceive these affordances to save work and maximise the computer's potential to help students to be organised. In addition, the affordances of 1:1 netbooks allow students increased capacity to communicate digitally with peers and teachers. These students are more likely to use web 2.0 applications for communication than email. Students also have the ability to use their netbooks' affordances to enhance the audio and visual aspects of their class presentations.

The affordances offered by the 1:1 netbooks facilitate an increase in students' technology skills, with students often becoming the experts and teachers of technology skills in the classroom, teaching each other and staff. Also, the 1:1 netbooks enable teaching and learning practices which are more relevant to the real world by bringing real world issues into the classroom through the Internet. In addition, the 1:1 netbook affordances make provision for the use of ICT in the classroom in an authentic manner which is educationally meaningful and relevant to the way in which ICT is used by students and adults outside the classroom. As a result, students find learning more interesting and enjoyable. This influence or effect on the students resulting from the affordances offered by the netbooks could be described as an impact.

The affordances of 1:1 netbooks facilitate the implementation of activities such as projects, research, inquiry and reflective activities in the classroom, which have the potential to promote higher order thinking. Some teachers recognised these affordances for the application of problem solving activities in the classroom. However, not all teachers who took part in this study recognised such affordances. Students have greater ease of access to information available on the Internet which allows them to explore topics in greater depth. As a result of the netbook affordances, teachers are able to incorporate reflective classroom activities designed to enable students to make their understandings deeper by making explicit connections between various pieces of information.

The affordances of 1:1 netbooks offer teachers a variety of choices in how present information to students, enabling teachers to better cater for individual students learning styles and abilities. In addition, 1:1 netbooks enable the use of web 2.0 applications to further individualise student learning. It can be concluded that the affordances offered by the 1:1 netbooks give teachers the ability to individualise the curriculum to meet individual students' learning needs. However, even though most teachers in this study recognised this affordance, many did not take advantage of it in their teaching practice.

Netbooks allow students greater choices in the direction and extent of their own learning as a result, students are able to work better individually, completing tasks independently without becoming distracted from

their learning. In addition, the affordances of the 1:1 netbooks offer students the ability to spend more time using netbooks at home for self-initiated home learning, as well as completing teacher-set homework. Further, 1:1 netbooks invite the involvement of the child's parents and siblings in their homework or home learning.

As a result of the affordances offered by the 1:1 netbooks, students take greater responsibility for directing their own learning by independently finding information, using their netbooks to reflect on their own learning progress and creating their own learning resources. Students also demonstrated responsibility in the care and maintenance of their netbooks. The affordances of 1:1 netbooks offer students more flexibility and options both in how they research and present projects and assignments. In a 1:1 netbook environment students are more likely to use their netbooks to complete projects and assignments. In addition, as a result of the affordances of the netbooks, students have the opportunity to improve the presentation of their work through the use of multimedia and digital applications, and greater ease of editing and proofreading. Teachers specifically mentioned improvements in the presentation of lower achieving students' work, and also in higher achieving students' work.

The affordances of 1:1 programs enable students to participate in group or cooperative work with other students from within their classroom or school, or in virtual groups with students from other schools and other countries. Students in 1:1 environments are more likely to use netbooks in group and cooperative work situations than are students in non-1:1 netbook learning environments. The program allows students increased social interactions with each other as they engage in collaborative learning, and are encouraged to talk, share information and problems they have relating to their learning. This increased social interaction allows the development of better communication skills, tolerance, and appreciation of other people. Students who would have not previously taken on leadership roles in the classroom often take leadership roles in a 1:1 netbook learning environment. The development of a collective intelligence amongst the students occurs in a 1:1 netbook environment. Teachers believe that one of the most powerful things about 1:1 netbook learning is the students teaching each other.

It is possible to conclude that affordances of the 1:1 netbooks provide students with the opportunity to use the netbooks inappropriately. For example, and of particular concern to teachers in this study, cyber bullying, downloading illegal or inappropriate material to the netbook and using chat forums inappropriately in class. However, this study is inconclusive with regard to the frequency with which students act on these affordances. It is possible that whilst affordances for using the netbooks inappropriately are present in a 1:1 netbook learning environment, the majority of students do not perceive these affordances, or perceive them but

do not act on them. These affordances could be regarded as a negative affordance as they decrease the students' ability to engage with learning activities in the classroom.

The affordances offered in a 1:1 netbook learning environment impact positively upon teachers' perceptions that their students have a positive attitude to school, that their students try hard to do their best at school, that their students like writing and Mathematics, and that doing well in school is important to their students. However, a 1:1 netbook learning environment does not impact upon students' self-perceptions of feeling positive about their school work, trying hard to do their best at school and their liking for writing and Mathematics. This study supports the literature which found that initially the impact of a 1:1 netbook program is an increase in students' motivation to learn, although this impact lessens over time. 1:1 netbook learning also positively impacts on student engagement with learning, student concentration and ability to remain "on task", the quantity and quality of students' work, and the extent to which the student is actively involved in learning. There appears to be a particular benefit for boys' concentration and "on task" behaviour. Further, it can be concluded that 1:1 netbook learning has a positive impact on student behaviour.

Students in 1:1 netbook learning environments perceive the affordances offered by the 1:1 netbooks in a very positive light stating that they like having a netbook, that the 1:1 netbook has been important to their learning, and that they would not want to go back to not having a 1:1 netbook. However the students' positive view of the 1:1 netbooks does not translate into their perceptions of themselves as learners with no statistical difference being found in the areas of student self-perception as being good at school work, a very good student, or being generally successful at school. Although students did report that they find it easier to learn new things after the introduction of 1:1 netbook learning. This study is the first to report on the discrepancy of 1:1 netbook learning students' unchanged perceptions of themselves as learners, as opposed to their strongly held view that 1:1 netbooks are important to them as learners. Whilst the students like having the 1:1 netbooks it cannot be concluded that they make any difference to the students' perception of themselves as learners.

10. Recommendations

10.1 Introduction

This mixed methods research study investigated the affordances of 1:1 netbook learning and the impacts of these affordances for teaching practice and student learning in grade 6 classrooms. This study used a quantitative survey which was administered to 699 students and 42 teachers prior to the introduction of 1:1 netbook learning and then again at the end of the first year of the 1:1 netbook learning program. In addition qualitative interviews were conducted with 13 students and 11 teachers during the second data collection phase of this research study. Conclusions have been drawn by comparing and contrasting teaching and learning practices prior to the introduction of 1:1 netbook learning with those occurring after the introduction of 1:1 netbook learning.

The findings from this study will enable administrators and educators to use this information to plan and implement 1:1 laptop policy and programs into schools. This study will assist teachers in recognising the affordances offered by 1:1 netbooks and how they can best manipulate the learning environment to maximise the potential benefits of 1:1 netbook learning in their classrooms. Students will benefit from this study as teachers and policy makers equipped with information on the affordances of 1:1 netbook learning are able to implement an efficient and effective program which has been designed to maximize the affordances offered by 1:1 netbook learning and facilitate the best possible student learning outcomes.

This chapter offers recommendations resulting from this research study for teachers and schools implementing a new 1:1 netbook learning program. In addition further research recommendations are made for researchers who are intending to study this topic further. This chapter begins with recommendations for school educators and administrators who are considering implementing a 1:1 netbook learning program. These recommendations are discussed under the headings of teaching practice and student learning. Following this the recommendations for further research are presented.

10.2 Recommendations

10.2.1 Teaching practice.

During the implementation phase of a 1:1 netbook learning program teachers need to be supported to positively manage the changes required in their lesson planning, preparation and implementation. This support

includes access to professional development activities that are designed to assist them in accessing and incorporating digital teaching resources into their lessons. In addition, teachers need to be supported with adequate planning and preparation time to enable them to conduct Internet searches for resources, develop their own skills in using these resources, maintain interactive web 2.0 pedagogical spaces such as wikis and blogs, and develop learning communities to support each other in 1:1 netbook learning practice. Further, teachers may require additional support in implementing more constructivist teaching practices in their classroom, as this study finds that 1:1 programs enable the important shift from teacher-centred teaching to learner-centred teaching. This is an important implication of this research.

10.2.2 Student learning.

Students in 1:1 netbook learning environments predominantly use their netbooks for Internet research, interactive web 2.0 applications, and communicating with their peers and teachers. Therefore teachers need to be educated and experienced through professional development activities in incorporating these applications into their classroom teaching practice in ways that are meaningful to students, add depth and rigor to the curriculum, and ensure the online safety of the students.

Prior to the introduction of a 1:1 netbook learning program, educators and administrators need to ensure that there are adequate policies and procedures in place to cover the use of the 1:1 netbooks by students. These policies would need to judge appropriate and inappropriate use of the netbooks. Inappropriate uses may include: the downloading of applications such as programs and music to the netbook, students accessing inappropriate websites and cyber bullying. Consideration also needs to be given to policy and procedures in the event a netbook is accidently damaged. The finding that students may potentially use the 1:1 netbooks in an inappropriate manner highlights the gap which can exist between the ICT capabilities of students and the "moral compass" with which the students make decisions about their ethical use of ICT, as such, the presence of 1:1 netbooks in the classroom requires teachers to plan and implement a curriculum which includes student and parent education in cyber safety, cyber footprints and the legalities, ethics and morals around the use of ICT. Teachers need to assist students to develop a "moral compass" with which to navigate 1:1 netbook learning in an ethical manner. Further, teachers need to review their classroom management strategies to prevent or manage possible incidents of inappropriate student netbook behaviour effectively.

The implementation of a 1:1 netbook learning program should be considered as a possible solution in schools where low levels of student motivation and engagement in learning has become a problem, or in

instances where student classroom behaviour is challenging due to students' disengagement with learning. The results of this study also point towards the value of these programs for disengaged or under-achieving boys.

10.3 Further Research

The researcher was not able to locate any other studies using the lens of affordance theory to examine the affordances for teaching practice and student learning in a 1:1 netbook learning environment. As a consequence, further studies are required to investigate 1:1 netbook learning programs in the first year of implementation (as in this study) and also in more mature programs to determine the long-term impacts of 1:1 netbook programs on teaching practice. Similarly, with regard to student learning, further study is required to determine long-term impacts. Although the impact of 1:1 netbook learning on students' performance in standardised tests does not fall under the affordance theory theoretical lens employed in this study, and thus was not investigated in this research, further research in this field is required to determine the impact of 1:1 netbook learning on students' outcomes in standardised tests. With regard to student motivation, engagement and behaviour, it is also important to study how students' attitudes to their learning are maintained or change over long term use of 1:1 netbooks. New research will be valuable to map students' usage of the netbooks, both in the short term and the long term including further studies of the shift from email to web 2.0 applications as the preferred means of communication. As well, investigations on how increased web 2.0 usage impacts on students' learning are required. Further research is also required to determine why it is that although most teachers in this study were able to recognise the affordances offered by the 1:1 netbooks to individualise the curriculum to meet individual students' learning needs, many did not actually take advantage of this affordance in their teaching practice. In addition, further research is required to clarify the frequency and types of inappropriate student behaviours that the affordances of 1:1 netbooks allow.

10.4 Conceptual and Methodological Framework Evaluation

As the philosophical foundation of this study, pragmatism has allowed the researcher to choose the research design which served best in answering the research questions. Since pragmatism values both objective and subjective knowledge (Creswell & Plano Clark, 2007), the researcher was able to combine both quantitative and qualitative data in a mixed methods design. The pragmatic view that knowledge is constructed from human experience (Johnson & Christensen, 2008), provided an effective framework permitting the researcher to gather

data from the participants about their experiences and perceptions of 1:1 netbook learning that ultimately enabled the researcher to answer the research questions.

In addition, pragmatism explicates that research always occurs within context therefore, mixed methods research studies which are underpinned by a pragmatic worldview may include a theoretical lens thereby setting the context of the study (Creswell, 2008). This researcher chose affordance theory as the theoretical lens for this study. Gibson (1979) defined affordances as the individual's perceived possibilities for action within their environment, and since that time many authors and researchers have examined the role of ICT in education through the theoretical lens of affordance theory (See Chapter 1). However, the use of the affordance theory theoretical lens to guide this research has enabled this study to provide a unique contribution to the current knowledge around 1:1 netbook learning as to date no other research study that the researcher has been able to find has used affordance theory as a theoretical lens to frame research into 1:1 netbook (or laptop) learning. This is consistent with Verma and Mallick (1999) who assert that a theoretical lens provides an essential tool to stimulate the advancement of new knowledge. This study was able to identify the affordances offered in a 1:1 netbook learning environment.

Further, Creswell (2005, 2009) asserts that a theoretical lens provides a guiding perspective that gives structure to a mixed methods research study. The affordance theory lens of this study has served to successfully provide structure and guidance both in development of the research questions and also the methodology. This mixed methods research study used a triangulation design, convergence model, whereby the quantitative and qualitative data were given equal weighting, concurrently collected and separately analysed prior to the researcher integrating the data by comparing and contrasting the two data sets during the discussion phase of the research.

The triangulation design convergence model is used when a researcher wants to directly compare and contrast quantitative statistical results with qualitative findings (Creswell et al., 2003). This research design is a one-phase design in which the researcher implements quantitative and qualitative methods during the same timeframe and with equal weighting (Creswell & Plano Clark, 2007). This design enabled the researcher to collect both quantitative data from a large population, and additional qualitative data from a smaller group within this population. In this way, potential threats to the validity of the data were reduced (See Chapter 3). This method enabled the researcher to compare and contrast data sets and reduced the likelihood of false conclusions.

In this study, the researcher used a quantitative survey design to collect the quantitative data. This allowed the researcher to collect data which was then statistically analysed to identify trends in attitudes, opinions and behaviours. The researcher took care in ensuring that the instrument was of a high quality (See Chapter 3). 699 grade 6 student participants were asked to complete the survey of these 492 completed and returned the February surveys, giving a response rate of 70.39%. Of the December student surveys, 486 were completed and returned giving a response rate of 69.53%. There were 42 grade 6 teacher participants who were asked to complete the survey, of these 38 completed and returned the February surveys, giving a response rate of 90.48%. Of the December teacher surveys, 41 were completed and returned giving a response rate of 97.62%.

This research took a qualitative phenomenological approach in which the researcher was able to obtain a view of the participant's experiences and beliefs through in-depth small group interviews. Individuals from the quantitative research sample also completed the qualitative research component, which enabled data to be more easily compared than if different individuals had been selected (Creswell & Plano Clark, 2007). The researcher invited all 42 teachers participating in the surveys to also participate in semi structured individual interviews. Of these teachers 11 opted to be included in the research interviews. Student interviews were conducted in the schools in which the grade 6 teachers were participating in both the quantitative questionnaires and the small group teacher interviews. The teachers called for volunteer students to participate in small group interviews to be conducted by the researcher in November during school hours. A total of 13 students participated in these interviews.

The researcher took every precaution to address the potential difficulties in the mixed method triangulation design convergence model research design (See Chapter 3). However, in spite of these precautions, challenges arose in several categories where the quantitative and qualitative results did not correlate (See Chapter 8). When this occurred the original data was reanalysed. Nonetheless, it was not possible to reach substantive conclusions from the conflicting sets of data in these categories. On reflection, rather than collecting qualitative and quantitative data concurrently, it may have been more prudent to initially collect and analyse the quantitative data, and then collect and analyse the qualitative data. This would have enabled the researcher to discuss the quantitative data findings with participants during the qualitative interviews, which would have facilitated better understanding of the quantitative findings. However, despite conflicting results in a small number of categories, this researcher claims triangulation validity as the evidence drawn from the different datasets has provided better results than either dataset alone would have (See Chapter 3).

The pragmatic philosophical foundation and affordance theory lens using a mixed methods triangulation design overall served well in providing structure and focus in this research study, in enabling the researcher to answer the research questions, and to identify the affordances provided in a 1:1 netbook learning environment. Affordance theory has proven to be a particularly valuable framework for considering the important aspects of the 1:1 netbook classroom, teaching practice and student learning. Teaching practice is informed by this study in terms of teachers' perceptions about the value of the diverse affordances of the 1:1 environment with regard to their planning and conduct of lessons, their relationships with students and their commitment to teaching. Importantly, this study concludes that for these teachers the affordances of the 1:1 netbooks allow an important shift in pedagogy from teacher-centred to student-centred teaching, in a more constructivist approach to teaching and learning which is in itself a higher order affordance of the 1:1 environment. For student learning, there is strong evidence that the affordances of the 1:1 netbooks encourage greater responsibility for their own learning, improved communication and collaboration, more independence in their learning, more interesting and authentic learning experiences and increased skills in ICT. The affordances of the netbooks then encourage not only a shift to more constructivist approaches to teaching but also the affordance of increased self-regulation by students in their learning. These are important findings at a time when education is looking for new ways to embrace twenty-first century challenges.

10.5 Concluding Comments

Many issues around 1:1 netbook learning were not addressed in this study as they did not fall under the scope of the affordance theory lens. Issues such as the impact of 1:1 netbook learning on: student outcomes on standardised testing, student physical fitness, student literacy and numeracy standards, funding issues around 1:1 netbook learning, schools' ICT infrastructure requirements and undergraduate teacher education. Research is required in order to fully define, study and discuss the impact of 1:1 netbook learning in these areas.

In addition, since the data for this study was collected in 2009 there has been a significant shift toward the use of tablet computers such as the 'ipad' as 1:1 learning devices in classrooms. As the affordances of tablets may be different from the affordances of netbooks, further research is required to determine the affordances and impacts of 1:1 tablet computers in classrooms.

This study, however, was able to successfully answer the set research questions about the affordances of 1:1 netbook learning for teaching practice and student learning and the impacts resulting from these

affordances. In addition this study was able to provide new knowledge around both 1:1 netbook learning and affordance theory as it relates to 1:1 netbook learning.

References

Ainley, M., Bourke, V., Chatfield, R., Hillman, K., & Watkins, I. (2000). *Computers Laptops and Tools.* Camberwell: The Australian Council for Educational Research.

Aitken, D. (1995). Responses to use of laptops in teaching mathematics. In L. Shears (Ed.), *Computers and Schools* (pp. 32-40). Camberwell: The Australian Council for Educational Research.

Akhras, F. N., & Self, J. A. (2002). Beyond intelligent tutoring systems: Situations, interactions, processes and affordances. *Instructional Science*, *30(1),* 1-30. doi:10.1023/A:1013544300305

Ala-Mutka, K. (2009). *Review of learning in ICT-enabled networks and communities.* Retrieved from European Commission Joint Research Centre webpage: http://ipts.jrc.ec.europa.eu

Allitt, M. D. (1995). *Teacher Concerns in the Implementation of Laptop Computers: Four Case Studies* (Unpublished master's thesis). The University of Melbourne, Melbourne. As cited in Whitefield, A.W. (2004). *Laptop Computers as a Mediating Tool Between Teacher Beliefs and Pedagogy*. (Doctoral Dissertation). Deakin University: Geelong.

Anderson, T. (2004). *Towards a theory of online learning*. Retrieved from http://cde.athabascau.ca/online_book/ch2.html

Angelo, J., Conners, K., & Helkowski, T. (2009). Anywhere Learning. *Educational Leadership, 66(6),* Retrieved from http://www.ascd.org/publications/educational_leadership/mar09/vol66/num06/Anywhere_Learning.aspx

Ashford, K. (1995). A laptop program with year 7 students. In L. Shears (Ed.), *Computers and Schools* (pp. 41-49). Camberwell: The Australian Council for Educational Research.

Ashmore, B. A. (2001). *The relationship between models of student laptop computer use and teacher instructional behaviour* (Doctoral dissertation, University of North Texas). Retrieved from http://www.iittl.unt.edu/iittl/dissertations/ashmore.pdf

A Short Annotated Bibliography on Pragmatism. (2001). *The Hedgehog Review.* Retrieved from Institute for Advanced Studies in Culture website: http://www.iasc-culture.orgf

Australian Bureau of Statistics. (2006). *Children's participation in cultural and leisure activities, Australia, Apr 2006*. Retrieved from http://www.abs.gov.au

Australian Bureau of Statistics. (2010). *People / Population.* Retrieved from www.abs.gov.au

Australian Curriculum, Assessment and Reporting Authority. (2010). *My School.* Retrieved from http://www.myschool.edu.au/

Barnette, J. J. (2000). Effects of stem and Likert response option reversals on survey internal consistency: If you feel the need there is a better alternative to using those negatively worded stems. *Educational and Psychological Measurement*, *60(3),* 361-370. doi:10.1177/00131640021970592

Barrios, T., Ambler, J., Anderson, A., Barton, P., Burnette, S., Feyten, C., … Yahn, C. (2004). *Laptops for learning: Final report and recommendations of the laptops for learning task force.* Retrieved from Educational Technology Clearinghouse website http://etc.usf.edu

Bateman, D., & Oakley, C. (2009). *Research Report: The Classmate PC 1:1 e Learning Project in Australia,* Retrieved from Deakin University Faculty of Arts and Education, Burwood website: http://dro.deakin.edu.au/

Bebell, D. (2005). *Technology promoting student excellence: An investigation of the first year of 1:1 computing in New Hampshire middle schools.* Retrieved from inTASC website: http://www.bc.edu/research/intasc/

Bebell, D. (2008). *Berkshire wireless learning initiative year 2 evaluation report.* Retrieved from inTASC website: http://www.bc.edu/research/intasc/

Bebell, D., & Kay, R. (2010). One to One Computing: A Summary of the Quantitative Results from the Berkshire Wireless Learning Initiative. *Journal of Technology,Learning, and Assessment, 9(2),* Retrieved from http://ejournals.bc.edu/ojs/index.php/jtla/

Bergman, M. M. (2008a). Introduction: Whither mixed methods? In M.M. Bergman (Ed.), *Advances in Mixed Methods Research* (pp. 1-7). London: Sage

Bergman, M. M. (2008b). The straw men of the qualitative-quantitative divide and their influence on mixed methods research. In M. M. Bergman (Ed.), *Advances in Mixed Methods Research* (pp. 1-7). London: Sage

Bernard, R. M., Bethel, E., Abrami, P. C., & Wade, C. A. (2007). *DMI-ELS ETSB laptop research project: Report on the grade three students.* Retrieved from http://www.etsb.qc.ca/en/ EnhancedLearningStrategy/Results/Concordia_2007_04.pdf

Bickhard, M. H., & Richie, D. M. (1983). *On the nature of representation: A case study of James Gibson's theory of perception.* New York: Praeger Publishers.

Bower, M. (2008). Affordance analysis - matching learning tasks with learning technologies. *Educational Media International*, *45(1),* 3-15. Retrieved from http://0-www.tandfonline.com.alpha2.latrobe.edu.au/

Brockett, P., & Levine, A. (1984). Statistics and Probability and their Application. New York: CBS College Publishing.

Brown, G. (1995). Laptops at Korowa: Reactions, experience and learning. In L. Shears (Ed.), *Computers and Schools* (pp. 77-84). Camberwell: The Australian Council for Educational Research.

Brown, J., Stillman, G., & Herbert, S. (2004). *Can the notion of Affordances be of use in the design of a technology enriched Mathematics curriculum.* Retrieved from Mathematics Education Research Group of Australasia website: http://www.merga.net.au/

Bryman, A. (2008). Introduction: Why do researchers integrate/combine/mesh/blend/mix/merge/fuse quantitative and qualitative research?. In M.M. Bergman (Ed.), *Advances in Mixed Methods Research* (pp. 1-7). London: Sage.

Buckenmeyer, J., Freitas, D., & Hixon, E. (2008). Assessing the effects of a 1:1 technology program on student achievement: A viable research design. In K. McFerrin, R. Weber, R. Carlsen, & D. Willis (Eds.), *Proceedings of society for information technology and teacher education international conference 2008* (pp. 1051-1053). Retrieved from Education and Information Technology Digital Library website: http://www.editlib.org

Burns, E. (1995). Response to a restricted usage program. In L. Shears (Ed.), *Computers and Schools* (pp. 110-120). Camberwell: The Australian Council for Educational Research.

Burns, K., & Polman, J. (2006). The impact of ubiquitous computing in the internet age: How middle school teachers integrated wireless laptops in the initial stages of implementation. *Journal of Technology & Teacher Education, 14(2).* 363-386. Retrieved from http://0-proquest.umi.com.alpha2.latrobe.edu.au/

Calnin, G. T. (1998). *Laptop Computers: Changes in Teachers' Practice* (Unpublished doctoral dissertation). The University of Melbourne, Melbourne. As cited in Whitefield, A.W. (2004). *Laptop Computers as a Mediating Tool Between Teacher Beliefs and Pedagogy*. (Doctoral Dissertation). Deakin University: Geelong.

Cavanaugh, C., Dawson, K., & White, S. (2006-7). *Leveraging laptops: Effective models for enhancing student achievement.*

Centre for Digital Education. (2008). *A complete guide to one-to-one computing in the k-12 environment.* Retrieved from http://www.centerdigitaled.com/fileReg.php?pub_id=118

Chamberlain, M. (2004). *Middle school students' perceptions of the teaching and learning initiative: Laptops for every student* (Doctoral Dissertation). Retrieved from http://scholar.lib.vt.edu/theses/

Cherryholmes, C. H. (1992). Notes on pragmatism and scientific realism. *Educational Researcher.* 21(6), 13-17. doi: 10.3102/0013189X021006013

Christensen, R., & Knezek, G. (2006). *Student findings from the spring 2006 Irving laptop survey*. Retrieved from One to One Institute Website: http://www.one-to-oneinstitute.org/

Collins, A., & Halverson, R. (2010). The second educational revolution: Rethinking education in the age of technology. *Journal of Computer Assisted Learning*, 26, 18–27. Retrieved from http://0-onlinelibrary.wiley.com.alpha2.latrobe.edu.au/

Commission on Behavioral and Social Sciences and Education, (2000). *How people learn: Brain, mind, experience and school.* (J. D. Bransford, A. L. Brown, & R. R. Cocking, Eds). Retrieved from The National Academies Press website http://www.nap.edu/

Conole, G., & Dyke, M. (2004). What are the affordances of information and communication technologies?. *Research in Learning Technology, 12(2),* 113-124. doi**:**10.1080/0968776042000216183

Costa, S. (2000). You Want Every Year 5 Student to have Her own Laptop? In J. Little & B. Dixon (Eds.), *Transforming Learning: An Anthology of Miracles in Technology Rich Classrooms.* Port Melbourne: Kids Technology Foundation.

Craig, J. (2002). *Laptop use in K-12 Schools.* Retrieved from http://www.docstoc.com/docs/17943963/Johanna-Craig

Creswell, J. W. (2005). *Educational research: Planning, conducting, and evaluating qualitative and quantitative research.* Upper Saddle River, New Jersey: Pearson Education.

Creswell, J. W. (2008). *Three Components Involved in a Design*. Retrieved from http://www.sagepub.com/upm-data/27395_Pages5_11.pdf

Creswell, J. W. (2009). *Research design: Qualitative, quantitative and mixed methods approaches*. Thousand Oaks, California: Sage Publications.

Creswell, J. W., & Plano Clark, V. L. (2007). *Planning and Conducting Mixed Methods Research.* Thousand Oaks, USA: Sage Publications.

Creswell, J. W., Plano Clark, V. L., & Garrett, A. L. (2008). Methodological issues in conducting mixed methods research designs. In M. M. Bergman (Ed.), *Advances in Mixed Methods Research* (pp. 1-7). London: Sage Publications.

Creswell, J. W., Plano Clark, V. L., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed methods in Social and Behavioural Research.* (pp. 209-240). Thousand Oaks, CA: Sage.

CRF and Associates Inc. (2004). *The impact of plato learning, Inc. technology in Hawthorne Elementary Junior High School.* Retrieved from One to One Institute website http://www.one-to-oneinstitute.org/

Davies, A. (2004). *Finding proof of learning in a one-to-one computing classroom*. Courtenay, Canada: Connections Publishing.

Davis, D. N. (2004). *Why do anything? Emotion, affect and the fitness function underlying behaviour and thought.* Retrieved from University of Hull, Computer Science webpage: http://www2.hull.ac.uk/science/computer_science.aspx

Davis, D., Garas, N., Hopstock, P., Kellum, A., & Stephenson, T. (2005). *Henrico County public schools iBook survey report* (Henrico County Public Schools). Retrieved from http://www.henrico.k12.va.us/

Day, D., & Lloyd, M. (2007). Affordances of online technologies: More than the properties of the technology. *Australian Educational Computing, 22(2),*17-21. Retrieved from http://0search.informit.com.au.alpha2.latrobe.edu.au/

Delbridge, A., Bernard, J. R. L., Blair, D., Peters, P., & Butler, S. (Eds.). (1992). *The Macquarie Dictionary: The National Edition.* Macquarie University, NSW: The Macquarie Library Pty Ltd.
Department of Education and Early Childhood Development. (2008). *2008 Attitudes to School Survey.* Melbourne: Data, Outcomes and Evaluation Division, Department of Education and Early Childhood Development.

Department of Education and Early Childhood Development. (2009). *The Netbook project: Anywhere, anytime access to learning.* Melbourne: Department of Education and Early Childhood Development.

Department of Education and Early Childhood Development. (2010). *Podcasts.* Retrieved from http://www.education.vic.gov.au

Dewey, J. (1997). *How We Think.* (First Published 1910). New York, United States of America: Dover Publications, Inc.

Dinnocenti, S. (2001). Laptop computers in an elementary school: Perspectives on learning environments, from students, teachers, administrators and parents. *Retrieved from Dissertations Collection for University of Connecticut website: http://digitalcommons.uconn.edu/dissertations/*

Dohn, N. B. (2009). Affordances revisited: Articulating a Merleau-Pontian view. *International Journal of Computer-Supported Collaborative Learning, 4(2),* 151-170. doi: 10.1007/s11412-009-9062-z

Donovan, L. (2006). *Fullerton School District Fullerton, California program evaluation laptops for learning year two: 2005-2006.* Retrieved from Fullerton School District website: http://fsd.k12.ca.us/index.html

Dori, Y. J. & Barak, M. (2001). Virtual and physical molecular modeling: Fostering model perception and spatial understanding. *Educational Technology & Society, 4(1),* 61-74. Retrieved from http://www.ifets.info/

Dunleavy, M., Dede, E. C., & Mitchell, R. (2008). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of Science Education and Technology, 18(1),* 7-22. doi: 10.1007/s10956-008-9119-1

Dunleavy, M., Dexter, S., & Heinecke, W. F. (2007). What added value does a 1:1 student to laptop ratio bring to technology-supported teaching and learning?. *Journal of Computer Assisted Learning, 23(5),* 440-452. doi: 10.1111/j.1365-2729.2007.00227.x

Fairman, J. (2004). *Trading roles: Teachers and students learn with technology* (Report No.3). Retrieved from University of Southern Maine website: http://www.usm.maine.edu/

Fallshaw, M. (1995). The use of laptops in senior mathematics. In L. Shears (Ed.), *Computers and Schools* (pp. 91-97). Camberwell: The Australian Council for Educational Research.

Field, R. (2005). John Dewey (1859—1952). *An Internet Encyclopaedia of Philosophy Peer-Reviewed Academic Resource*. Retrieved from http://www.iep.utm.edu/

Florida Department of Education. (2006-7). *Leveraging laptops: Effective models for enhancing student achievement.* Retrieved from http://etc.usf.edu/

Fodor, J. A., & Pylshyn, Z. W. (1981). How direct is visual perception? Some reflections on Gibson's ecological approach. *Cognition*, *9(2),* 139-196. Doi:10.1016/0010-0277(81)90009-3

Fowler, F. J. (2009). *Survey Research Methods.* Los Angeles: Sage

Fox, M., Greenlaw, J., & MacPherson, M. (2007). Student views on the role of dedicated notebook computers in transforming the teaching and learning environment. In C. Montgomerie & J. Seale (Eds.), *Proceedings of world*

conference on educational multimedia, hypermedia and telecommunications 2007 (pp. 48-56). Retrieved February from http://www.editlib.org/

Friedman, T. L. (2005). *The world is flat: The globalized world in the twenty first century.* New York: Penguin Books.

Gaved, M., Collins, T., Mulholland, P., Kerawalla, L., Jones, A., Scanlon, E.,... Twiner, A. (2010). Using Netbooks to support mobile learners' investigations across activities and places, Open Learning. *The Journal of Open, Distance and e-Learning*, *25(3),* 187-200. doi:10.1080/02680513.2010.511949

Gaver, W. W. (1991, April-May). *Technology Affordances*. Proceedings of the SIGCHI conference on human factors in computing systems: Reaching through technology. doi:10.1145/108844.108856

Gaynor, I. W. & Fraser, B. J. (2003, August). *Online collaborative projects: A journey for two year 5 technology rich classrooms.* Paper presented at the Eighteenth Annual Western Australian Institute for Educational Research Forum, Mount Lawley, WA. Retrieved from http://www.waier.org.au/forums/2003/gaynor.html

Gibson, J. J. (1979). *The ecological approach to visual perception*. United States of America: Houghton Mifflin Company.

Goodman, R. (2009). William James. *Stanford Encyclopaedia of Philosophy*. Retrieved from http://plato.stanford.edu/

Great Maine Schools Project. (2004). *One-to-one laptops in a high school environment: Piscataquis community high school study; Final report*. Retrieved from Great Schools Partnership website: http://www.greatschoolspartnership.org/

Greeno, J. G. (1994). Gibson's Affordances. *Psychological Review. 101 (2),* 336-342. Retrieved from http://cm8ek7zy3d.search.serialssolutions.com

Greeno, J. G. (1998). The situativity of knowing, learning and research. *American Psychologist, 53(1),* 5-26. Retrieved from http://0ovidsp.tx.ovid.com.alpha2.latrobe.edu.au/sp-3.4.2a/ovidweb.cgi?

Grimes, D., & Warschauer, M. (2008). Learning with Laptops: A multi-method case study. *Journal of Educational Computing Research, 38(3),* 305-332. Retrieved from http://0-baywood.metapress.com.alpha2.latrobe.edu.au

Gulek, J. C., & Demirtas, H. (2005). Learning with technology: The impact of laptop use on student achievement. *The Journal of Technology, Learning and Assessment, 3(2).* Retrieved from http://ejournals.bc.edu

Hammersley, M. (2008). Troubles with triangulation. In M.M. Bergman (Ed.), *Advances in Mixed Methods Research* (pp. 1-7). London: Sage.

Hammond, M. (2010). What is an affordance and can it help us understand the use of ICT in education? *Education and Information Technologies 15(3),* 205–217. doi: 10.1007/s10639-009-9106-z

Hill, J. & Reeves, T. (2004). *Change takes time: The promise of ubiquitous computing in schools: A report of a four year evaluation of the laptop initiative at Athens Academy.* Retrieved from http://lpsl.coe.uga.edu

Holmes, P. (2008). On Your Bikes. *Teacher: The National Education magazine, August 2008.* Retrieved from http://0-search.informit.com.au.alpha2.latrobe.edu.au

Hookway, C. (2008). Pragmatism. *Stanford Encyclopaedia of Philosophy*. Retrieved from http://plato.stanford.edu/

Howell, C. (1995). Laptops: Presentation, productivity, thinker's toolkit. In L. Shears (Ed.), *Computers and Schools* (pp. 98-109). Camberwell: The Australian Council for Educational Research.

Hutchby, I. (2001). Technologies, texts and affordances. *Sociology*, *35(2)*, 441–456. doi: 10.1177/S0038038501000219

James, W. (1906). *Lecture II, What Pragmatism Means.* Retrieved from http://www.marxists.org/reference/

Jeroski, S. (2003). *Wireless writing project school district no 60 (Peace River North) research report phase II.* Retrieved from Peace River North school district website: http://www.prn.bc.ca/

John, P., & Sutherland, R. (2005). Affordance, opportunity and the pedagogical implications of ICT. *Educational Review, 57(4),* 405 — 413. doi: 10.1080/00131910500278256

Johnson, B., & Christensen, L. (2008). *Educational Research: Quantitative, Qualitative and Mixed Approaches.* Los Angeles: Sage Publications

Johnson, R., & Onwuegbuzie, A. J. (2004). *Mixed methods research: A research paradigm whose time has come*. Retrieved 23 June, 2009, from http://www.ethiopiaed.net/images/1427963976.pdf

Johnson, R., Onwuegbuzie A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research 1(2),* 112-133. doi:10.1177/1558689806298224

Jones, C., Dirckinck-Holmfeld, L. & Lindström, B. (2006). A relational, indirect, meso-level approach to CSCL design in the next decade. *International Journal of Computer-Supported Collaborative Learning, 1(1),* 35–56. doi: 10.1007/s11412-006-6841-7

Katz, K.B., & Kratcoski, A. (2005). Teacher-student interactions in a ubiquitous computing environment: Learning within dyads & triads of interaction. *Journal of the Research Center for Educational Technology, 1(1),* 48-64. Retrieved from http://www.rcetj.org/index.php/rcetj/

Kelso, J. (1995). Introducing laptops into a school program. In L. Shears (Ed.), *Computers and Schools* (pp. 25-31). Camberwell: The Australian Council for Educational Research.

Kennewell, S. (2001). Using affordances and constraints to evaluate the use of information and communications technology in teaching and learning. *Journal of Information Technology for Teacher Education, 10(1-2),* 101 – 116. doi:10.1080/14759390100200105

Kessell, S. R. (2001). *Evaluation of the Personal Laptop Program at Penrhos College (1998-2000).* Perth, Western Australia: Curtin University of Technology. As cited in Whitefield, A.W. (2004). *Laptop Computers as a Mediating Tool Between Teacher Beliefs and Pedagogy*. (Doctoral Dissertation). Deakin University: Geelong.

Koffka, K. (1935). *Principles of Gestalt psychology.* New York, United States of America: Harcourt, Brace and World Inc.

Kreijns, K., & Kirschner, P. A. (2001, October). *The Social Affordances of computer-supported collaborative learning environments.* Paper presented at the Thirty First Frontiers in Education Conference, Reno, NV. doi: 10.1109/FIE.2001.963856

Kuswara, A. Cram, A., & Richards, D. (2008, December). *Web 2.0 supported collaborative learning activities: Towards an affordance perspective.* Paper presented at the 3rd International LAMS & Learning Design Conference, Melbourne, Australia. Retrieved from http://lams2008sydney.lamsfoundation.org/

Lai, C. H., Yang, J. C., Chen, F. C., Ho, C. W., & Chan, T. W. (2007). Affordances of mobile technologies for experiential learning: The interplay of technology and pedagogical practices. *Journal of Computer Assisted Learning,* 23(4), 326-337. doi: 10.1111/j.1365-2729.2007.00237.x

Larkin, K. (2010). *Investigating Student Netbook Usage Using Activity Theory* (Doctoral dissertation). Retrieved from National Library of Australia (38835672)

Larkin, K., & Finger, G. (2011). Netbook computers as an appropriate solution for 1:1 computer use in primary schools. *Australian Educational Computing*, *26(1),* 27-34. Retrieved from http://acce.edu.au/journal/

Lei, J. & Zhao, Y. (2008). One-to-one computing: What does it bring to schools? *Journal of Educational Computing Research, 39(2), 97-122.*

Levin, D., & Arafeh, S. (2002). *The digital disconnect: The widening gap between internet savvy students and their schools.* Retrieved from Pew Research Center website: http://www.pewinternet.org/

Livingston, P. (2006). *1 –to – 1 learning: Laptop programs that work.* Washington: International Society for Technology in Education.

Loader, D.. (1993). Professional development requirements for teachers. In I. Grasso & M. Fallshaw (Eds.), *Reflections of a Learning Community* (pp. 69–75). Kew: Methodist Ladies College.

Loader, D.. (1993). Reconstructing an Australian school. In I. Grasso & M. Fallshaw (Eds.), *Reflections of a Learning Community* (pp. 9–16). Kew: Methodist Ladies College.

Lowther, D. L., Ross, S. M., & Morrison, G. R., (2003). When Each One Has One: The Influence on teaching strategies and student achievement of using laptops in the classroom. *Educational Technology, Research and Development, 51(3),* 23-44. Retrieved from http://0-proquest.umi.com.alpha2.latrobe.edu.au /

Lowther, D. L., Strahl, J. D., Franceschini, L. A., & Zoblotsky, T. A. (2008a). *Michigan freedom to learn program 2006-2007 evaluation report.* Retrieved from One-to-One Institute website: http://www.one-to-oneinstitute.org/

Lowther, D. L., Strahl, J. D., Zoblotsky, T. A., & Huang, Y. (2008b). *Leveraging laptops: effective models for enhancing student achievement.* Retrieved from http://etc.usf.edu/laptops4learning/reports/FL_EETT_Yr2_Final_Report.pdf

Magoon, A. J. (1977). Constructivist approaches in educational research. *Review of Educational Research, 47(4),* 651-693. Retrieved from http://0-www.jstor.org.alpha2.latrobe.edu.au/

Maine Education Policy Research Institute. (2003). *The Maine learning technology Initiative: Teacher, student, and school perspectives mid-year evaluation report.* Retrieved from http://www.state.me.us/mlte/articles/research/

McDonald, H. (1993). MLC initial research report. In I. Grasso & M. Fallshaw (Eds.), *Reflections of a Learning Community* (pp. 45 – 46). Kew: Methodist Ladies College.

McGrenere, J. & Ho, W. (2000, May). *Affordances: Clarifying and evolving a concept.* Proceedings of Graphic Interface 2000, Montreal. Retrieved from http://www.cs.ubc.ca/~joanna/papers/GI2000_McGrenere_Affordances.pdf

McInerney, D. M., & McInerney, V. (2002). *Educational Psychology.* Frenchs Forest: Pearson Education Australia Pty Limited.

McLoughlin, C. & Lee, M. J. W. (2007, December). *Social software and participatory learning: Pedagogical choices with technology affordances in the web 2.0 era.* Paper presented at Australian Society for Computers in Learning in Tertiary Education, Conference 2007, Singapore. Retrieved from http://www.ascilite.org.au/

Mei-Chuen, J., & Wu, Y. J. (2010). Netbooks in sixth grade English language classrooms. *Australasian Journal of Educational Technology*, *26(7),* 1062-1074. Retrieved from http://www.ascilite.org.au/

Methodist Ladies College. (nd). *Laptop program.* Retrieved from http://www.mlc.vic.edu.au

Michaels, C. F. & Carello, C. (1981). *Direct Perception.* Englewood Cliffs: Prentice-Hall Inc.

Miller, R. (2008). Laptop Educators: Identifying Laptop Use and Pedagogical Change. In K. McFerrin, R. Weber, R. Carlsen, & D. Willis (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2008* (pp. 1211-1216). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/

Molnar A. R. (1997). Computers in education: A brief history: Technological Horizons in Education Technological Horizons in Education. *T.H.E. Journal,* 24(11), 63-68. Retrieved from http://0-search.proquest.com.alpha2.latrobe.edu.au/

Narracott, I. (1995). Laptops in school: Response of teachers students and parents. In L. Shears (Ed.), *Computers and Schools* (pp. 50-66). Camberwell: The Australian Council for Educational Research.

Newhouse, C. P. (1994). Creating computer supported learning environments: A three year study. In J. R. Steele, & J. G. Hedberg, (Eds.), *Learning environment technology: selected papers from LETA 94* Belconnen ACT: AJET Publications.

Newhouse, C. P. (1997). *Teachers' responses and classroom learning environments associated with student access to portable computers*. Retrieved from Australasian Digital Theses program website: http://www.caul.edu.au/caul-programs/australasian-digital-theses

Newhouse, C. P. (1999). Examining how teachers adjust to the availability of portable computers. *Australian Journal of Educational Technology, 15(2),* 148-166. Retrieved from http://www.ascilite.org.au/ajet/

Newhouse, C. P. (2001). A follow-up study of students using portable computers at a secondary school. *British Journal of Educational Technology, 32(2), 209-219. doi:* 10.1111/1467-8535.00191

Newhouse, C. P. (2002). *Literature review the impact of ICT on learning and teaching*. (Literature Review for the Western Australian Department of Education). Retrieved from http://www.det.wa.edu.au/

Newhouse, C. P. (2008). Transforming Schooling with Support from Portable Computing. *Australian Educational Computing*, *23(2),* 19-23 Retrieved from http://0-search.informit.com.au.alpha2.latrobe.edu.au/

Newhouse, C. P., & Rennie, L. (2001). A Longitudinal Study of the use of student-owned portable computers in a secondary school. *Computers and Education, 36(3),* 223-243. Retrieved from http://0-www.sciencedirect.com.alpha2.latrobe.edu.au/

Niles, R. (2006). *A study of the application of emerging technology: Teacher and student perceptions of the impact of one-to-one laptop computer access*. (Doctoral Dissertation, Wichita State University). Retrieved from http://www.projectred.org/uploads/Rae_Niles_Abstract.pdf

Norman, D. A. (1988). *The psychology of everyday things*. New York, United States of America: Basic Books.

Norman, D. A. (1999). *The invisible computer: Why good products can fail, the personal computer is so complex, and information appliances are the answer.* Cambridge Massachusetts: MIT Press.

Oliver, K. & Holcomb, L. (2008). Changes in student technology use and skill in the first year of a 1-to-1 computing program. In K. McFerrin, R. Weber, R. Carlsen, & D. Willis (Eds.), *Proceedings of society for information technology and teacher education international conference 2008* (pp. 2154-2160). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/

Owen, J. M. & Lambert, F. C. (1996). The Notebook Curriculum: An Innovative Approach to the Use of Personal Computers in the Classroom*. Australian Educational Computing 11(1)* 26-32. Retrieved from http://0-search.informit.com.au.alpha2.latrobe.edu.au

Owen, J. M., Lambert, F. C., & Hurworth, R. E. (1993). *Notebook Computers in the Curriculum: An Evaluation of the Notebook Initiative at Wesley College.* Centre for program evaluation, The University of Melbourne. As cited in Whitefield, A.W. (2004). *Laptop Computers as a Mediating Tool Between Teacher Beliefs and Pedagogy*. (Doctoral Dissertation). Deakin University: Geelong.

Partnership for 21st Century Skills. (2008*). 21st century skills, education & competitiveness: A resource and policy guide.* Retrieved from http://www.21stcenturyskills.org

Pea, R. D. (1993). Practices of distributed intelligence and designs for education. In G. Salomon (Ed.), Distributed Cognitions: Psychological and Educational Considerations (pp. 47-87). Cambridge: Press Syndicate of the University of Cambridge.

Pelech, J. & Pieper, G. (2010). *The comprehensive handbook of constructivist teaching: From theory to practice.* Charlotte, NC: Information age publishing inc.

Perillo, S. (2003). Laptops. *Educare News, August 2003.* Retrieved from http://0-search.informit.com.au.alpha2.latrobe.edu.au

Piaget, J. (1967). *The Psychology of Intelligence*. London, England: Routledge & Kegan Paul LTD.

Queensland Government Department of Education, Training and the Arts. (2008). *Smart classroom bytes: Elearning for smart classes.* Retrieved from http://education.qld.gov.au

Queensland Department of Education and Training. (2009). *1-to-1 learning.* Retrieved from http://education.qld.gov.aul

Radhakrishna, R. B., Yoder, E. P. & Ewing, J. C. (2007). Strategies for linking theoretical framework and research types. *Proceedings of the 2007 AAAE Research Conference, Vol 34*. Retrieved from http://aged.caf.wvu.edu/Research/NAERC-2007/PosterAbstracts/692-Radhakrishna_etal.pdf

REA (1998). *Powerful tools for schooling: Second year study of the laptop program.* Retrieved from Microsoft in Education website: http://www.microsoft.com/Education/

REA. (2004). *A more complex picture: Laptop use and impact in the context of changing home and school access.* Retrieved from Microsoft in Education website: http://www.microsoft.com/Education/

Rockman, S. (2003). *Learning from laptops.* Retrieved from REA website: http://www.rockman.com/

Rosenberg, M. J. (2001). *E-learning.* United States of America: McGraw Hill.

Rowe, H. A. H. (1993). *Learning with personal computers*. Victoria, Australia: Australian Council for Educational Research.

Russell, M., Bebell, D., & Higgins, J. (2004). *Laptop learning: A comparison of teaching and learning in upper elementary classrooms equipped with shared carts of laptops and permanent 1:1 laptops.* Retrieved from Boston College website: http://www.bc.edu/

Saldana, J. (2009). *The coding manual for qualitative researchers*. London: Sage Publications Ltd.

Sclater, J., Sicoly, F., Abrami, P. C., & Wade, C. A. (2006). Ubiquitous technology integration in Canadian public schools: Year one study. *Canadian Journal of Learning and Technology, 32(1),* 9. Retrieved from http://www.doaj.org/

Sharp, V. F. (2009). *Computer education for teachers* (6th ed.). Hoboken: John Wiley & Sons Inc.

Siemens, G. & Tittenberger, P. (2009). *Handbook of Emerging Technologies for Learning.* Retrieved from University of Manitoba website: http://umanitoba.ca/

Silvernail, D. L., & Lane, D. M. M. (2004). *The impact of Maine's one-to-one laptop program on middle school teachers and students phase one summary evidence research report #1.* Retrieved from Maine.gov website: http://www.maine.gov/portal/

Stager, G. (1993). Computers for kids...Not schools. In I. Grasso & M. Fallshaw (Eds.), *Reflections of a Learning Community* (pp. 45 – 46). Kew: Methodist Ladies College.

State of Victoria, Department of Education. (2006). *E potential: ICT capabilities resource for teachers.* Retrieved from http://epotential.education.vic.gov.au

Stolarchuk, E.O. (1997). *An Evaluation of the Effectiveness of Laptop Computers in Science Classrooms.* (Doctoral Dissertation). Retrieved from Curtin University website: http://espace.library.curtin.edu.au

Swan, K., Kratcoski, A., Van 't Hooft, M., Schenker, J., & Lin, Y. (2005). The changing nature of teaching and learning in a ubiquitous computing classroom. In P. Kommers & G. Richards (Eds.), *Proceedings of world conference on educational multimedia, hypermedia and telecommunications 2005.* Retrieved from Education and Information Technology Digital Library website: http://www.editlib.org/

Swan, K., Van 't Hooft, M., Kratcoski, A., & Schenker, J. (2007). Ubiquitous computing and changing pedagogical possibilities: Representations, conceptualisations and uses of knowledge. *Journal of Educational Computing Research, 36(4),* 481-515.

Tanner, H. & Jones, S. (2000, September). Using ICT to support interactive teaching and learning on a Secondary Mathematics PGCE course. Paper presented at the British Educational Research Association Conference, Cardiff University. Retrieved from http://www.leeds.ac.uk/educol/documents/00001628.htm

Tashakkori, A. & Teddlie, C. (2003). *Handbook of mixed methods in social and behavioural research.* Thousand Oaks, CA: Sage.

Tashakkori, A., & Creswell, J. W. (2007). The new era of mixed methods. *Journal of Mixed Methods Research, 1(1),* 3-7. doi:10.1177/2345678906293042

Task Force on the Maine Learning Technology Endowment. (2001). *Teaching and learning for tomorrow: A learning technology plan for Maine's future.* Retrieved from http://www.maine.gov/

Texas Center for Educational Research. (2006). *Evaluation of the Texas technology immersion pilot: First year results.* Retrieved from http://www.one-to-oneinstitute.org/

The 2008 Horizon Report. (2008). *The new media consortium and the EDUCAUSE learning initiative.* Retrieved from The New Media Consortium website: http://www.nmc.org/

Tierney, S., & Hunt, J. (2009). *Smart Classrooms Netbook Trial 2008 Report.* State of Queensland and Department of Education and Training.

Ullman, S. (1980). Against direct perception. *Behavioural and Brain Sciences*, 3, 373-415

Vera, A. H. & Simon, H. A. (1993). Situated action: A symbolic interpretation. *Cognitive Science*, 17(1), 7-48. Retrieved from http://cm8ek7zy3d.search.serialssolutions.com

Verma, G. K., & Mallick, K. (1999). *Researching education: Perspectives and techniques*. Philiadelphia: Falmer Press.

Victorian Curriculum and Assessment Authority. (2007). *Overview of the Victorian Essential Learning Standards.* Retrieved from http://vels.vcaa.vic.edu.au/

Volet, S. & Wosnitza, M. (2004). Social affordances and students' engagement in cross-national online learning. *Journal of Research in International Education*, *3(1),* 5-29. doi: 10.1177/1475240904041460

Vygotsky, L. S. (1981). *Thought and language.* (E. Hanfmann & G. Vakar, Trans. First Published 1962). Cambridge, Massachusetts: The Massachusetts Institute of Technology Press

Walker, J. (2009). The Way to Sesame Street. *Reason, 41(6),* 60-61. Retrieved from http://0-search.proquest.com.alpha2.latrobe.edu.au/

Webb, M. E. (2005). Affordances of ICT in science learning: implications for an integrated pedagogy. *International Journal of Science Education 27(6),* 705-735. Retrieved from http://0www.tandfonline.com.alpha2.latrobe.edu.au/

Webb, M. & Cox, M. (2004). A Review of pedagogy related to information and communications technology. *Technology, Pedagogy and Education, 13(3),* 235-286. doi: 10.1080/14759390400200183

Wijekumar, K. J., Meyer, B. J. E., Wagoner, D., & Ferguson, L. (2006). Technology affordances: The real story in research with K-12 and undergraduate learners. *British Journal of Educational Technology*, *37(2),* 191-209. doi: 10.1111/j.1467-8535.2005.00528.x

Wilson, J. (1995). Learning through access to a laptop. In L. Shears (Ed.), *Computers and Schools* (pp. 85-90). Camberwell: The Australian Council for Educational Research.

Windschitl, M., & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teachers beliefs, social dynamics, and institutional culture. *American Educational Research Journal, 39(1),* 165-205. Retrieved from http://0-proquest.umi.com.alpha2.latrobe.edu.au/

Whitefield, A.W. (2004). *Laptop Computers as a Mediating Tool Between Teacher Beliefs and Pedagogy*. (Doctoral Dissertation). Deakin University: Geelong.

Woolfolk, A., & Margetts, K. (2007). *Educational Psychology.* Frenchs Forest: Pearson Education Australia.

Yelland, N. (2007). *Shift to the future.* New York: Routledge.

Zhang, P. (2008). Motivational Affordances: Fundamental Reasons for ICT Design and Use, *Communications of the ACM, 51(11),* 145-147. Retrieved from http://0-web.ebscohost.com.alpha2.latrobe.edu.au/ehost/

Zucker, A. A., Hall, C. Y., Hersh, L., Keefe, D., Kim, B., Nielsen, N., & Scott, J. (2005). *A study of one-to-one computer use in Mathematics and science instruction at the secondary level in Henrico County public schools.* Retrieved from Education Development Center, Inc. Raymond McGhee, SRI International website: http://www.sri.com/

Appendices

Appendix 1: Principal Information Sheet (Teacher & Student Surveys, Teacher Interviews)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

Dear Principal,

As a part of my study for Masters of Education by Research I am writing a thesis looking at 1 – 1 Laptop Learning and its impact on grade six students and their teachers in 2009.The purpose of this study is to answer the following research questions:

1. What impact does the 1 – 1 learning program have on:
    a. Teaching practice?
    b. How students learn?
    c. Student learning outcomes?
    d. Student motivation, engagement and learning confidence?
2. How are students using 1 – 1 laptop computers?
3. What factors assist the implementation of a 1 – 1 learning program, and what are the challenges in implementing a 1- 1 program?
4. What are the benefits of the 1 – 1 learning program for teachers and students?

I am requesting to conduct research in your school for this thesis. This would require:

- All grade six students completing a 10 minute survey in February and again in November
- All grade six teachers completing a 10 minute survey in February and again in November
- Myself conducting an individual semi-structured interview with one grade six teacher from your school. The interview would be of approximately one hour duration and would be conducted in June and again in December.

I have attached to this letter a copy of the teacher and student surveys, and the teacher interview questions. There is no right or wrong answers to these questions and the student or teacher may choose not to answer any of the questions without prejudice to themselves.

The students and teachers participation in this study is voluntary, and there is no risk to the students or teachers by participating in this study.

The student surveys will be conducted in class time during February, and again in November. The individual teacher interviews will be conducted at a mutually agreeable time as negotiated between the researcher and the teacher. The interviews will be digitally recorded and then transcribed for analysis as a part of the thesis. The school or teachers will not be identified in any way.

This study has the approval of the Faculty Human Ethics Committee, LaTrobe University Bendigo, and the Department of Education and Early Childhood Development.

The findings of this study will be presented in a thesis, and may possibly be submitted to a journal for publication. As per The Department of Education and Early Childhood Development requirements, a copy of the research findings will be made available to you at the completion of the study. A copy of the research results will also be placed on DEECD Knowledge Bank web site.

Participation in this study will give teachers an opportunity to reflect on, and possibly expand their own conceptions of 1 – 1 Learning. In the future schools may be able to use the information from this research to develop their school's approach to 1 – 1 Learning. Students will benefit as they reflect on 1 – 1 Learning, and the impact it has had on their learning.

If you agree to your schools participation in this research project then please sign the attached 'Informed Consent Form' and return it to me in the envelope provided.

If you have any questions regarding this research project please contact me, the researcher, in the first instance on 5447 7047 (W), 0400 328 659 (M), or email turner.kristina.k@edumail.vic.gov.au , and if necessary the supervisors at LaTrobe University, Dona Martin (email d.martin@latrobe.edu.au), or Jenny Masters (email j.masters@latrobe.edu.au).

If you have any complaints or queries that the researcher or supervisor at LaTrobe University has not been able to answer to you satisfaction you may contact:

The Secretary,
Faculty Human Ethics Committee,
LaTrobe University,
P.O. Box 199, Bendigo, 3552
Email educationethics@latrobe.edu.au

Thank you for your assistance in this study,

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:…….

Name of Supervisor: Dona Martin **Date:**……

Signature:…….

Appendix 2: Principal Informed Consent (Teacher & Student Surveys, Teacher Interviews)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

I……(the Principal) have read and understood the information provided by the researcher about this activity, and any questions have been answered to my satisfaction.

I agree to my school's participation in this research project realizing that I may withdraw at anytime without prejudice to myself or this school.

I agree that the research data collected for the study may be used / published as advised in the information provided to me, on the condition that the school's name, or my name is not used and that myself or this school cannot be identified in any other way.

I agree that all grade six students and all grade six teachers will complete the survey as advised in the information sheet (subject to teacher, parent & child individual informed consent).

I agree to one grade six teacher being invited to be interviewed by the researcher as advised in the information sheet. I agree that the interviews may be digitally taped as advised on the information sheet. (subject to teacher informed consent)

I have been provided with an information sheet regarding this research project.

Name of School……

Names of grade six teachers at this school:

……

……

Approximate number of grade six students in 2009……

Name of Principal:……**Date:**……

Signature:……

Name of Researcher: Kristina Turner **Date:**…… **Signature:**……

Name of Supervisor: Jenny Masters **Date:**…… **Signature:**……

Name of Supervisor: Dona Martin **Date:**…… **Signature:**……

Appendix 3: Principal Information Sheet (Student Interviews)

Project Title: How 1:1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms: A Mixed methods Study
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

Dear Principal,

As a part of my study for Masters of Education by Research I am writing a thesis looking at 1:1 Laptop Learning and its impact on grade six students and their teachers in 2009.The purpose of this study is to answer the following research questions:

1. What impact does the 1:1 learning program have on:
    a. Teaching practice?
    b. How students learn?
    c. Student learning outcomes?
    d. Student motivation, engagement and behaviour?
2. How are students using 1:1 laptop computers?
3. What factors assist the implementation of a 1:1 learning program, and what are the challenges in implementing a 1:1 program?
4. What are the benefits of the 1:1 learning program for teachers and students?

I am requesting to conduct research in your school for this thesis. This would require:

- Myself conducting a semi-structured interview with a small group (4-5) grade six students from your school. The interview would be of approximately one hour duration and would be conducted in late November during school time at the school. These interviews will be digitally recorded for transcription and analysis.

I have attached to this letter a copy of the student interview questions. There is no right or wrong answers to these questions and the students may choose not to answer any of the questions without prejudice to themselves.

The students participation in this study is voluntary, and there is no risk to the students by participating in this study.

I am a fully qualified, working primary school teacher, and hold full registration with the Victorian Institute of Teachers, thus I have completed and passed all the necessary criminal record checks in order to work with children.

This study has the approval of the Faculty Human Ethics Committee, LaTrobe University Bendigo, and the Department of Education and Early Childhood Development.

The findings of this study will be presented in a thesis, and may possibly be submitted to a journal for publication. As per The Department of Education and Early Childhood Development requirements, a copy of the research findings will be made available to you at the completion of the study. A copy of the research results will also be placed on DEECD Knowledge Bank web site.

Participation in this study will give teachers an opportunity to reflect on, and possibly expand their own conceptions of 1:1 Learning. In the future schools may be able to use the information from this research to develop their school's approach to 1:1 Learning. Students will benefit as they reflect on 1:1 Learning, and the impact it has had on their learning.

If you agree to your schools participation in this research project then please sign the attached 'Informed Consent Form' and return it to me in the envelope provided.

If you have any questions regarding this research project please contact me, the researcher, in the first instance on 5447 7047 (W), 0400 328 659 (M), or email turner.kristina.k@edumail.vic.gov.au , and if necessary the supervisors at LaTrobe University, Dona Martin (email d.martin@latrobe.edu.au), or Jenny Masters (email j.masters@latrobe.edu.au).

If you have any complaints or queries that the researcher or supervisor at LaTrobe University has not been able to answer to you satisfaction you may contact:

The Secretary,
Faculty Human Ethics Committee,
LaTrobe University,
P.O. Box 199, Bendigo, 3552
Email educationethics@latrobe.edu.au

Thank you for your assistance in this study,

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:……..

Name of Supervisor: Dona Martin **Date:**……

Signature:……..

Appendix 4: Principal Informed Consent (Student Interviews)

Project Title: How 1:1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

I……(the Principal) have read and understood the information provided by the researcher about this activity, and any questions have been answered to my satisfaction.

I agree to my school's participation in this research project realizing that I may withdraw at anytime without prejudice to myself or this school.

I agree that the research data collected for the study may be used / published as advised in the information provided to me, on the condition that the school's name, or my name is not used and that myself or this school cannot be identified in any other way.

I agree that a small group of grade six students (4-5 students) will be invited to be interviewed by the researcher as advised in the information sheet. I agree that the interviews may be digitally taped as advised on the information sheet. (subject to informed consent from the parents of these grade six students)

I have been provided with an information sheet regarding this research project.

Name of School……

Name of Principal:……..**Date:**……

Signature:…….

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:……..

Name of Supervisor: Dona Martin **Date:**……

Signature:……..

Appendix 5: Teacher Information Sheet (Survey)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

Dear Teacher,

As a part of my study for Masters of Education by Research I am writing a thesis looking at 1 – 1 Laptop Learning and its impact on grade six students and their teachers in 2009. The purpose of this study is to answer the following research questions:

1. What impact does the 1 – 1 learning program have on:
    a. Teaching practice?
    b. How students learn?
    c. Student learning outcomes?
    d. Student motivation, engagement and learning confidence?
2. How are students using 1 – 1 laptop computers?
3. What factors assist the implementation of a 1 – 1 learning program, and what are the challenges in implementing a 1- 1 program?
4. What are the benefits of the 1 – 1 learning program for teachers and students?

I am requesting to conduct research with you for this thesis. This would require:

- You completing a 10 minute survey in February and again in November
- Grade six students in your class completing a 10 minute survey during class time in February and again in November. (Subject to Parent and Student individual informed consent).

There is no right or wrong answers to the survey questions and you may choose not to answer any of the questions without prejudice to yourself.

Your participation in this study is voluntary, and there is no risk to you by participating in this study.

Neither yourself or the school will not be identified in any way.

This study has the approval of the Faculty Human Ethics Committee, LaTrobe University Bendigo, The Department of Education and Early Childhood Development and your School Principal.

The findings of this study will be presented in a thesis, and may possibly be submitted to a journal for publication. As per The Department of Education and Early Childhood Development requirements, a copy of the research findings will be made available to you at the completion of the study. A copy of the research results will also be placed on DEECD Knowledge Bank web site.

Participation in this study will give teachers an opportunity to reflect on and possibly expand their own conceptions of 1 – 1 Learning. In the future schools may be able to use the information from this research to develop their school's approach to 1 – 1 Learning.

If you agree to participate in this research project then please sign the attached 'Informed Consent Form' and return it to me in the envelope provided.

If you have any questions regarding this research project please contact me, the researcher, in the first instance on 5447 7047 (W), 0400 328 659 (M), or email turner.kristina.k@edumail.vic.gov.au , and if necessary the supervisors at LaTrobe University, Dona Martin (email d.martin@latrobe.edu.au), or Jenny Masters (email j.masters@latrobe.edu.au).

If you have any complaints or queries that the researcher or supervisor at LaTrobe University has not been able to answer to you satisfaction you may contact:

The Secretary,
Faculty Human Ethics Committee,
LaTrobe University,
P.O. Box 199, Bendigo, 3552
Email educationethics@latrobe.edu.au

Thank you for your assistance in this study,

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:…….

Name of Supervisor: Dona Martin **Date:**……

Signature:…….

Appendix 6: Teacher Informed Consent (Survey)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

I……(the Participant) have read and understood the information provided by the researcher about this activity, and any questions have been answered to my satisfaction.

I agree to participate in this research project realizing that I may withdraw at anytime without prejudice to myself.

I agree that the research data collected for the study may be used/published as advised in the information provided to me, on the condition that the school's name, or my name is not used and that myself or this school cannot be identified in any other way.

I agree to complete the surveys as advised in the information sheet.

I agree to my grade six students completing the surveys as advised on the information sheet (Subject to parent and student individual informed consent).

I have been provided with an information sheet regarding this research project.

Name of School……

Approximate number of grade six students in my class for 2009……..

Name of Participant:……..**Date:**……

Signature:……

Name of Researcher: Kristina Turner **Date:**……
Signature:……

Name of Supervisor: Jenny Masters **Date:**……
Signature:……..

Name of Supervisor: Dona Martin **Date:**……
Signature:……..

Appendix 7: Teacher Information Sheet (Interview)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

Dear Teacher,

As a part of my study for Masters of Education by Research I am writing a thesis looking at 1 – 1 Learning and its impact on grade six students and their teachers in 2009. The purpose of this study is to answer the following research questions:

1. What impact does the 1 – 1 learning program have on:
    e. Teaching practice?
    f. How students learn?
    g. Student learning outcomes?
    h. Student motivation, engagement and learning confidence?
2. How are students using 1 – 1 laptop computers?
3. What factors assist the implementation of a 1 – 1 learning program, and what are the challenges in implementing a 1- 1 program?
4. What are the benefits of the 1 – 1 learning program for teachers and students?

I am requesting to conduct research in your school for this thesis. This would require:

- Myself conducting an individual semi-structured interview with you. The interview would be of approximately one hour duration and would be conducted in June and December.

There is no right or wrong answers to the interview questions and you may choose not to answer any of the questions without prejudice to yourself.

Your participation in this study is voluntary, and there is no risk to the students or teachers by participating in this study.

The interviews will be conducted at a mutually agreeable time as negotiated between you and the researcher. The interviews will be digitally recorded and then transcribed for analysis as a part of the thesis. The school or teacher will not be identified in any way.

This study has the approval of the Faculty Human Ethics Committee, LaTrobe University Bendigo, The Department of Education and Early Childhood Development and your School Principal.

The findings of this study will be presented in a thesis, and may possibly be submitted to a journal for publication. As per The Department of Education and Early Childhood Development requirements, a copy of the research findings will be made available to you at the completion of the study. A copy of the research results will also be placed on DEECD Knowledge Bank web site.

Participation in this study will give teachers an opportunity to reflect on and possibly expand their own conceptions of 1 – 1 Learning. In the future schools may be able to use the information from

this research to develop their school's approach to 1 – 1 Learning. Students will benefit as they reflect on 1 – 1 Learning, and the impact it has had on their learning.

If you agree to participate in this research project then please sign the attached 'Informed Consent Form' and return it to me in the envelope provided.

If you have any questions regarding this research project please contact me, the researcher, in the first instance on 5447 7047 (W), 0400 328 659 (M), or email turner.kristina.k@edumail.vic.gov.au , and if necessary the supervisors at LaTrobe University, Dona Martin (email d.martin@latrobe.edu.au), or Jenny Masters (email j.masters@latrobe.edu.au).

If you have any complaints or queries that the researcher or supervisor at LaTrobe University has not been able to answer to you satisfaction you may contact:

The Secretary,
Faculty Human Ethics Committee,
LaTrobe University,
P.O. Box 199, Bendigo, 3552
Email educationethics@latrobe.edu.au

Thank you for your assistance in this study,

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:……..

Name of Supervisor: Dona Martin **Date:**……

Signature:……..

Appendix 8: Teacher Informed Consent (Interview)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

I……(the Participant) have read and understood the information provided by the researcher about this activity, and any questions have been answered to my satisfaction.

I agree to participate in this research project realizing that I may withdraw at anytime without prejudice to myself.

I agree that the research data collected for the study may be used/published as advised in the information provided to me, on the condition that the school's name, or my name is not used and that myself or this school cannot be identified in any other way.

I agree that the interviews may be digitally taped as advised on the information sheet.

I have been provided with an information sheet regarding this research project.

Name of School:……..

Name of Participant:……..**Date:**……

Signature:…….

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:…….

Name of Supervisor: Dona Martin **Date:**……

Signature:……

Appendix 9: Parent and Student Information Sheet (Survey)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

Dear Parent and Student,

In 2009 the Department of Education and Early Childhood Development Victoria (DEECD) , Loddon Mallee Region introduced the *'1 – 1 Laptop Learning Program'* into grade six classrooms across the region. This program provides every student in grade six in 2009 with their own personal laptop computer which they have exclusive use of at school. Students are allowed to take their laptop computers home after school, on weekends, and in the school holidays. Students are also encouraged to use their laptop computers at home for home study, and to share their work with their families. The laptop computers are equipped with wireless systems to enable them to connect into the schools internet, intranet, and email programs. Students are also able to use their laptop computers to connect to their home internet provider if they have access to the internet at home.

As a part of my study for Masters of Education by Research I am writing a thesis looking at 1 – 1 Laptop Learning and its impact on grade six students and their teachers in 2009. I am requesting to conduct research with your child for this thesis. This would require your child completing a 10 minute survey in February and again in November during school time. The student's participation in this study is voluntary, and there is no risk to the students by participating in this study.

The student surveys will be conducted in class time, there is no right or wrong answers to these questions and the student may choose not to answer any of the questions without prejudice to themselves. The school or student will not be identified in any way.

The findings of this study will be presented in a thesis, and may possibly be submitted to a journal for publication. This study has the approval of the Faculty Human Ethics Committee, LaTrobe University Bendigo, The Department of Education and Early Childhood Development and your School Principal.

If you agree to your child participating in this research project then please sign the attached 'Informed Consent Form' and return it to your grade six teacher by **Monday 23rd February 2009**.

If you have any questions regarding this research project please contact me, the researcher, in the first instance on 5447 7047 (W), 0400 328 659 (M), or email turner.kristina.k@edumail.vic.gov.au , and if necessary the supervisors at LaTrobe University, Dona Martin (email d.martin@latrobe.edu.au), or Jenny Masters (email j.masters@latrobe.edu.au).

If you have any complaints or queries that the researcher or supervisor at LaTrobe University has not been able to answer to you satisfaction you may contact:

The Secretary,

Faculty Human Ethics Committee,
LaTrobe University,
P.O. Box 199, Bendigo, 3552

Email educationethics@latrobe.edu.au

Thank you for your assistance in this study,

Name of Researcher: Kristina Turner **Date:**……

Signature:…….

Name of Supervisor: Jenny Masters **Date:**……

Signature:…….

Name of Supervisor: Dona Martin **Date:**……

Signature:…….

Appendix 10: Parent and Student Informed Consent (Survey)

Project Title: How 1 – 1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

I……(the Parent) have read and understood the information provided by the researcher about this activity, and any questions have been answered to my satisfaction.

I agree to my child ……participating in this research project realizing that I may withdraw at anytime without prejudice to myself or my child.

I agree that the research data collected for the study may be used / published as advised in the information provided to me, on the condition that the school's name, or my child's name is not used and that my child or this school cannot be identified in any other way.

I agree to my child completing the surveys as advised in the information sheet.

I have been provided with an information sheet regarding this research project.

Name of school……..

Name of Parent:……..**Date:**……

Signature:……

Name of Child:……..**Date:**……

Signature:……

Name of Researcher: Kristina Turner **Date:**……

Signature:……

Name of Supervisor: Jenny Masters **Date:**……

Signature:……..

Name of Supervisor: Dona Martin **Date:**……

Signature:……..

Appendix 11: Parent and Student Information Sheet (Interview)

Project Title: How 1:1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

Dear Parent and Student,

In 2009 the Department of Education and Early Childhood Development Victoria (DEECD) , Loddon Mallee Region introduced the *'1 :1 Laptop Learning Program'* into grade six classrooms across the region. This program provides every student in grade six in 2009 with their own personal laptop computer which they have exclusive use of at school. Students are allowed to take their laptop computers home after school, on weekends, and in the school holidays. Students are also encouraged to use their laptop computers at home for home study, and to share their work with their families. The laptop computers are equipped with wireless systems to enable them to connect into the schools internet, intranet, and email programs. Students are also able to use their laptop computers to connect to their home internet provider if they have access to the internet at home.

As a part of my study for Masters of Education by Research I am writing a thesis looking at 1:1 Laptop Learning and its impact on grade six students and their teachers in 2009. I am requesting to conduct research with your child for this thesis. This would require myself conducting a semi-structured interview with a small group of four or five grade six students from this school, including your child. The interview would be of approximately one hour duration and would be conducted in late November during school time at the school. These interviews will be digitally recorded for transcription and analysis.

There is no right or wrong answers to these questions and the student may choose not to answer any of the questions without prejudice to themselves. These interviews will be digitally recorded for transcription and analysis, however the school or student will not be identified in any way.

I am a fully qualified, working primary school teacher, and hold full registration with the Victorian Institute of Teachers, thus I have completed and passed all the necessary criminal record checks in order to work with children.

The findings of this study will be presented in a thesis, and may possibly be submitted to a journal for publication. This study has the approval of the Faculty Human Ethics Committee, LaTrobe University Bendigo, The Department of Education and Early Childhood Development and your School Principal.

If you agree to your child participating in this research project then please sign the attached 'Informed Consent Form' and return it to your grade six teacher.

If you have any questions regarding this research project please contact me, the researcher, in the first instance on 5447 7047 (W), 0400 328 659 (M), or email turner.kristina.k@edumail.vic.gov.au , and if necessary the supervisors at LaTrobe University, Dona Martin (email d.martin@latrobe.edu.au), or Jenny Masters (email j.masters@latrobe.edu.au).

If you have any complaints or queries that the researcher or supervisor at LaTrobe University has not been able to answer to you satisfaction you may contact:

The Secretary,
Faculty Human Ethics Committee,
LaTrobe University,
P.O. Box 199, Bendigo, 3552
Email educationethics@latrobe.edu.au

Thank you for your assistance in this study,

Name of Researcher: Kristina Turner **Date:**……
Signature:……

Name of Supervisor: Jenny Masters **Date:**……
Signature:…….

Name of Supervisor: Dona Martin **Date:**……
Signature:……

Appendix 12: Parent and Student Informed Consent (Interview)

Project Title: How 1:1 Laptop Learning Impacts on Teaching Practice and Student Learning in Grade Six Classrooms
Researcher: Kristina Turner
Supervisor: Dona Martin & Jenny Masters
Course Currently Being Studied: Masters of Education by Research
FHEC Approval Number: R056/08
DEECD Approval: SOS004056

I……(the Parent) have read and understood the information provided by the researcher about this activity, and any questions have been answered to my satisfaction.

I agree to my child ……participating in this research project realizing that I may withdraw at anytime without prejudice to myself or my child.

I agree that the research data collected for the study may be used / published as advised in the information provided to me, on the condition that the school's name, or my child's name is not used and that my child or this school cannot be identified in any other way.

I agree to my child completing the interviews as advised in the information sheet. I agree that the interviews may be digitally taped as advised on the information sheet.

I have been provided with an information sheet regarding this research project.

Name of school……..

Name of Parent:……..**Date:**……

Signature:……

Name of Child:……..**Date:**……

Signature:……

Name of Researcher: Kristina Turner **Date:**……

Signature:……

Name of Supervisor: Jenny Masters **Date:**……

Signature:……

Name of Supervisor: Dona Martin **Date:**……
Signature:……

Appendix 13: Teacher Survey (February)

	Not at All ← → All the time				
My students have choices in what they learn	1	2	3	4	5
I believe that my students take responsibility for their own learning	1	2	3	4	5
My students participate in group / cooperative work	1	2	3	4	5
My students work individually	1	2	3	4	5

	Strongly Disagree ← → Strongly Agree				
I like the students having netbooks in my classroom	1	2	3	4	5
I individualise the curriculum to meet individual students learning needs	1	2	3	4	5
I use my netbook to access diverse teaching materials	1	2	3	4	5
I use a computer for planning and preparation	1	2	3	4	5
I believe that my students take responsibility for their own learning	1	2	3	4	5
I believe that the students find the work we do in class interesting	1	2	3	4	5
I believe that the students find learning enjoyable	1	2	3	4	5
I believe that doing well in school is important to my students	1	2	3	4	5
I believe that my students feel positive at school	1	2	3	4	5
I believe that my students try very hard to do their best at school	1	2	3	4	5
I believe that my students like writing	1	2	3	4	5
I believe that my students like Mathematics	1	2	3	4	5
I believe that my students are motivated to learn	1	2	3	4	5
I believe that my students are engaged in learning	1	2	3	4	5
I believe that my students are actively involved in learning	1	2	3	4	5
My students are generally well behaved	1	2	3	4	5
My students are generally ‘on task’	1	2	3	4	5

	Not at All ← → All the time				
How frequently do you use the internet for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use the digital photos or photo editing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use digital videos or video editing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use digital music or music editing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft Word for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft PowerPoint for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft Publisher for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Animation programs for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft paint or drawing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use email for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use blogs for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use interactive whiteboard software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use interactive web learning activities for teaching and learning in your classroom?	1	2	3	4	5
How frequently do your students use netbooks or computers for group/cooperative work?	1	2	3	4	5
How frequently do your students use netbooks or computers for individual work?	1	2	3	4	5
How frequently do your students use netbooks or computers for projects/ assignments?	1	2	3	4	5
How frequently do your students use netbooks or computers as a visual audio aid to class presentations of work?	1	2	3	4	5
How frequently do your students use netbooks or computers for homework?	1	2	3	4	5
How frequently do your students use netbooks or computers for communication with peers?	1	2	3	4	5
How frequently do your students use netbooks or computers for communication with teachers?	1	2	3	4	5
How frequently do your students use netbooks or computers for researching information?	1	2	3	4	5
How frequently do your students use netbooks or computers for educational games?	1	2	3	4	5
How frequently do your students use netbooks or computers for saving to the school server?	1	2	3	4	5
How frequently do your students use netbooks or computers for printing work?	1	2	3	4	5
How frequently do your students use netbooks or computers for note taking?	1	2	3	4	5
How frequently do your students use netbooks or computers for organising work?	1	2	3	4	5
How frequently do your students use netbooks or computers for editing work?	1	2	3	4	5
How frequently do you use a netbook or computer at school for teaching and learning activities?	1	2	3	4	5

Appendix 14: Teacher Survey (December)

	Strongly Disagree				Strongly Agree
I like the students having netbooks in my classroom	1	2	3	4	5
I individualise the curriculum to meet individual students learning needs	1	2	3	4	5
Student having their own netbooks has enabled me to more easily individualise the curriculum to meet individual student learning needs	1	2	3	4	5
I use my laptop to access diverse teaching materials	1	2	3	4	5
I use a laptop for planning and preparation	1	2	3	4	5
I believe that my students take responsibility for their own learning	1	2	3	4	5
I believe that the students find the work we do in class interesting	1	2	3	4	5
I believe that students having their own netbooks has helped them to find the work we do in class interesting	1	2	3	4	5
I believe that the students find learning enjoyable	1	2	3	4	5
I believe that students having their own netbooks has helped them to find learning more enjoyable	1	2	3	4	5
I believe that doing well in school is important to my students	1	2	3	4	5
I believe that students having their own netbooks has made doing well in school important to my students	1	2	3	4	5
I believe that my students feel positive at school	1	2	3	4	5
I believe that netbooks have contributed to my students positive attitude to school this year	1	2	3	4	5
I believe that my students try very hard to do their best at school	1	2	3	4	5
I believe that netbooks have contributed to my students trying very hard to do their best at school this year	1	2	3	4	5
I believe that my students like writing	1	2	3	4	5
I believe that netbooks have contributed to my students liking to write this year	1	2	3	4	5
I believe that my students like Mathematics	1	2	3	4	5
I believe that netbooks have contributed to my students liking Mathematics this year	1	2	3	4	5
I believe that my students are motivated to learn	1	2	3	4	5
I believe that netbooks have contributed to my student's motivation to learn this year	1	2	3	4	5
I believe that my students are engaged in learning	1	2	3	4	5
I believe that netbooks have contributed to my student's engagement in learning this year	1	2	3	4	5
I believe that my students are actively involved in learning	1	2	3	4	5
I believe that netbooks have contributed to my students being actively involved in learning this year	1	2	3	4	5
My students are generally well behaved	1	2	3	4	5
Netbooks have contributed to my students being generally well behaved this year	1	2	3	4	5

	Strongly Disagree				Strongly Agree
My students writing ability has improved this year	1	2	3	4	5
Netbooks have contributed to improvement in student writing this year	1	2	3	4	5
Netbooks have helped my students to draft a piece of writing this year	1	2	3	4	5
Netbooks have helped my students to edit their writing this year	1	2	3	4	5
Netbooks have helped my students to improve their spelling this year	1	2	3	4	5
Netbooks have helped my students to improve the content and meaning of their writing this year	1	2	3	4	5
Netbooks have helped my students to improve the grammar in their writing this year	1	2	3	4	5
Netbooks have helped my students to improve their punctuation this year	1	2	3	4	5
My student's reading comprehension has improved this year	1	2	3	4	5
Netbooks have contributed to improvement in my student's reading comprehension this year	1	2	3	4	5
My students Mathematics abilities have improved this year	1	2	3	4	5
Netbooks have contributed to an improvement in my students Mathematics abilities this year	1	2	3	4	5
Netbooks have helped my students to organise their work this year	1	2	3	4	5
Students having their own netbooks has increased the amount of individual work which they do in class	1	2	3	4	5
Students having their own netbooks has increased the amount of group & cooperative work we do in class	1	2	3	4	5
I use ICT more often to present information to the class since the introduction of 1:1 netbooks	1	2	3	4	5
1:1 netbook learning has improved my communication with the students	1	2	3	4	5
1:1 netbook learning as improved my communication with colleagues	1	2	3	4	5
I believe that 1:1 netbook learning is beneficial for teaching and learning	1	2	3	4	5
I believe that 1 :1 netbook learning has increased my workload	1	2	3	4	5
I believe that 1:1 netbook learning has caused difficulties in classroom management	1	2	3	4	5
The professional development which I have attended has assisted me with 1:1 netbook learning in my classroom?	1	2	3	4	5
My students are generally 'on task'	1	2	3	4	5
Netbooks have contributed to my students being generally 'on task' this year	1	2	3	4	5
Students having their own netbooks has increased the amount of responsibility they take for their own learning	1	2	3	4	5
Students having their own netbooks has improved the presentation of their work	1	2	3	4	5
Students having their own netbooks has improved their technology skills	1	2	3	4	5
Students are able to explore topics in greater depth when they have their own netbook	1	2	3	4	5

	Not at All ◄——► All the time				
How frequently do you use the internet for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use the digital photos or photo editing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use digital videos or video editing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use digital music or music editing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft Word for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft PowerPoint for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft Publisher for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Animation programs for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use Microsoft paint or drawing software for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use email for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use blogs for teaching and learning activities in your classroom?	1	2	3	4	5
How frequently do you use interactive web learning activities for teaching and learning in your classroom?	1	2	3	4	5
How frequently do your students use computers/netbooks for group/cooperative work?	1	2	3	4	5
How frequently do your students use computers/netbooks for individual work?	1	2	3	4	5
How frequently do your students use computers/netbooks for projects/ assignments?	1	2	3	4	5
How frequently do your students use computers/netbooks as a visual audio aid to class presentations of work?	1	2	3	4	5
How frequently do your students use computers/netbooks for homework?	1	2	3	4	5
How frequently do your students use computers/netbooks for communication with peers?	1	2	3	4	5
How frequently do your students use computers/netbooks for communication with teachers?	1	2	3	4	5
How frequently do your students use computers/netbooks for researching information?	1	2	3	4	5
How frequently do your students use computers/netbooks for educational games?	1	2	3	4	5
How frequently do your students use netbooks for note taking?	1	2	3	4	5
How frequently do your students use computers/netbooks for organising work?	1	2	3	4	5
How frequently do your students use netbooks for editing work?	1	2	3	4	5
How frequently do you use netbooks at school for teaching and learning activities?	1	2	3	4	5
I use higher order thinking activities in class more since the introduction of 1:1 netbook learning	1	2	3	4	5
I use problem solving activities in class more since the introduction of 1:1 netbook learning	1	2	3	4	5
I have had problems with children using their netbook in an inappropriate manner	1	2	3	4	5
I have had problems with the netbooks which require in-school technical support	1	2	3	4	5

	Not at All ⟷				All the time
My students have choices in what they learn	**1**	**2**	**3**	**4**	**5**
I believe that my students take responsibility for their own learning	**1**	**2**	**3**	**4**	**5**
My students participate in group / cooperative work	**1**	**2**	**3**	**4**	**5**
My students work individually	**1**	**2**	**3**	**4**	**5**
Students having their own netbooks has increased the amount of individual choices they have in their learning	**1**	**2**	**3**	**4**	**5**
The introduction of 1:1 netbook learning has renewed my energy, enthusiasm and engagement in teaching?	**1**	**2**	**3**	**4**	**5**
Since the introduction of 1:1 netbook learning, I more often facilitate a classroom environment which enables the children to create their own knowledge rather than have it explicitly taught to them by me	**1**	**2**	**3**	**4**	**5**
I integrate the netbooks into my lessons	**1**	**2**	**3**	**4**	**5**
1: 1 netbook learning makes student learning more relevant to the real world	**1**	**2**	**3**	**4**	**5**
My colleagues have assisted me with 1:1 netbook learning in my classroom	**1**	**2**	**3**	**4**	**5**

Appendix 15: Student Survey (February)

	Never	Almost Never	Some--times	Almost always	Always
I have choices in what I learn	1	2	3	4	5
I participate in group / cooperative work	1	2	3	4	5
I work individually	1	2	3	4	5
I get help with my learning at home	1	2	3	4	5
I get help with my learning from my classmates	1	2	3	4	5
I get help with my learning from my teachers	1	2	3	4	5
I get help with my homework at home	1	2	3	4	5
	Strongly Disagree	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
The work we do in class is interesting	1	2	3	4	5
Learning is enjoyable	1	2	3	4	5
Doing well in school is important to me	1	2	3	4	5
I am confident using a netbook or computer	1	2	3	4	5
I am able to help others on a netbook or computer	1	2	3	4	5
I feel positive about my school work	1	2	3	4	5
I try very hard to do my best at school	1	2	3	4	5
I like writing	1	2	3	4	5
I like Mathematics	1	2	3	4	5
I am good at my school work	1	2	3	4	5
I find it easy to learn new things	1	2	3	4	5
I am a very good student	1	2	3	4	5
I am generally successful at school	1	2	3	4	5
I take responsibility for my own learning	1	2	3	4	5

	Never	Almost Never	Some--times	Almost always	Always
How frequently do you use the internet?	1	2	3	4	5
How frequently do you use photo editing / publishing software?	1	2	3	4	5
How frequently do you use video editing / publishing software?	1	2	3	4	5
How frequently do you use music editing software?	1	2	3	4	5
How frequently do you use Microsoft Word?	1	2	3	4	5
How frequently do you use Microsoft PowerPoint?	1	2	3	4	5
How frequently do you use Microsoft Publisher?	1	2	3	4	5
How frequently do you use Animation software?	1	2	3	4	5
How frequently do you use Microsoft paint or drawing software?	1	2	3	4	5
How frequently do you use netbooks or computers for notetaking?	1	2	3	4	5
How frequently do you use netbooks or computers for organising work?	1	2	3	4	5
How frequently do you use netbooks or computers for editing work?	1	2	3	4	5
How frequently do you use netbooks or computers for researching information?	1	2	3	4	5
How frequently do you use netbooks or computers for group/cooperative work?	1	2	3	4	5
How frequently do you use netbooks or computers for individual work?	1	2	3	4	5
How frequently do you use netbooks or computers for projects/ assignments?	1	2	3	4	5
How frequently do you use netbooks or computers as a visual audio aid to class presentations of work?	1	2	3	4	5
How frequently do you use netbooks or computers for homework?	1	2	3	4	5
How frequently do you use netbooks or computers for communication with peers?	1	2	3	4	5
How frequently do you use netbooks or computers for communication with teachers?	1	2	3	4	5
How frequently do you use netbooks or computers for interactive web learning activities?	1	2	3	4	5
How frequently do you use netbooks or computers for educational games?	1	2	3	4	5
How frequently do you use netbooks or computers for saving to the school server?	1	2	3	4	5
How frequently do you use netbooks or computers for printing work?	1	2	3	4	5
How frequently do you use netbooks or computers for email?	1	2	3	4	5
How frequently do you use netbooks or computers for blogging?	1	2	3	4	5
I use a computer/netbook at school	1	2	3	4	5

Appendix 16: Student Survey (December)

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
The work we do in class is interesting	1	2	3	4	5
Netbooks have helped to make learning more interesting	1	2	3	4	5
Learning is enjoyable	1	2	3	4	5
Netbooks have helped to make learning more enjoyable	1	2	3	4	5
Doing well in school is important to me	1	2	3	4	5
I am confident using a computer/netbook	1	2	3	4	5
I am able to help others on a computer/netbook	1	2	3	4	5
I feel positive about my school work	1	2	3	4	5
Netbooks have helped with my positive attitude to school this year	1	2	3	4	5
I try very hard to do my best at school	1	2	3	4	5
Netbooks have helped me to try very hard to do my best at school this year	1	2	3	4	5
I like writing	1	2	3	4	5
Netbooks have helped me to like writing this year	1	2	3	4	5
I like Mathematics	1	2	3	4	5
Netbooks have helped me to like Mathematics this year	1	2	3	4	5
I am good at my school work	1	2	3	4	5
Netbooks have helped me to be good at school work this year	1	2	3	4	5
I find it easy to learn new things	1	2	3	4	5
Netbooks have made it easy for me to learn new things this year	1	2	3	4	5
I am a very good student	1	2	3	4	5
Netbooks have helped me to be a very good student this year	1	2	3	4	5
I am generally successful at school	1	2	3	4	5
Netbooks have helped me to be generally successful at school this year	1	2	3	4	5
I take responsibility for my own learning	1	2	3	4	5
I like having a netbook	1	2	3	4	5
Having a netbook is important to my learning	1	2	3	4	5
I am able to explore topics in greater depth when I use a netbook	1	2	3	4	5
Netbooks make our learning more relevant to the real world	1	2	3	4	5
My netbook is important to my success at school	1	2	3	4	5

	Never	Almost Never	Some--times	Almost always	Always
How frequently do you use the internet?	1	2	3	4	5
How frequently do you use photo editing / publishing software?	1	2	3	4	5
How frequently do you use video editing / publishing software?	1	2	3	4	5
How frequently do you use music editing software?	1	2	3	4	5
How frequently do you use Microsoft Word?	1	2	3	4	5
How frequently do you use Microsoft PowerPoint?	1	2	3	4	5
How frequently do you use Microsoft Publisher?	1	2	3	4	5
How frequently do you use Animation software?	1	2	3	4	5
How frequently do you use Microsoft paint or drawing software?	1	2	3	4	5
How frequently do you use netbooks for notetaking?	1	2	3	4	5
How frequently do you use computers/netbooks for organising work?	1	2	3	4	5
How frequently do you use netbooks for editing work?	1	2	3	4	5
How frequently do you use computers/netbooks for researching information?	1	2	3	4	5
How frequently do you use computers/netbooks for group/cooperative work?	1	2	3	4	5
How frequently do you use computers/netbooks for individual work?	1	2	3	4	5
How frequently do you use computers/netbooks for projects/ assignments?	1	2	3	4	5
How frequently do you use computers/netbooks as a visual or audio aid to class presentations of work?	1	2	3	4	5
How frequently do you use computers/netbooks for homework?	1	2	3	4	5
How frequently do you use computers/netbooks for communication with peers?	1	2	3	4	5
How frequently do you use computers/netbooks for communication with teachers?	1	2	3	4	5
How frequently do you use computers/netbooks for interactive web learning activities?	1	2	3	4	5
How frequently do you use computers/netbooks for educational games?	1	2	3	4	5
How frequently do you use computers/netbooks for email?	1	2	3	4	5
How frequently do you use computers/netbooks for blogging?	1	2	3	4	5
I use a computer/netbook at school	1	2	3	4	5

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
My writing has improved this year	1	2	3	4	5
Netbooks have helped with an improvement in my writing this year	1	2	3	4	5
My reading comprehension has improved this year	1	2	3	4	5
Netbooks have helped with an improvement in my reading comprehension this year	1	2	3	4	5
My Mathematics ability has improved this year	1	2	3	4	5
My netbook has helped with improving in my Mathematics ability this year	1	2	3	4	5
My netbook has been helpful in organising my work	1	2	3	4	5
Having a netbook has given me greater choices in what I learn	1	2	3	4	5
Having a netbook has helped me to take greater responsibility for my own learning	1	2	3	4	5
I participate in group / cooperative work more often since getting a netbook	1	2	3	4	5
I work individually more often since getting a netbook	1	2	3	4	5
I get help with my learning at home more often since getting a netbook	1	2	3	4	5
I get help with my learning from my classmates more often since getting a netbook	1	2	3	4	5
Doing well in school is more important to me since getting a netbook	1	2	3	4	5
My netbook has improved the presentation of my work	1	2	3	4	5

Appendix 17: Teacher Interview Schedule

1. How many years have you been teaching?
2. How many years have you been teaching grade 6?
3. How would you rate your ICT skills level:
    a. Foundation (beginning ICT skills)?
    b. Emergent (utilising ICT in the classroom)?
    c. Innovative (innovative use of technology for learning and teaching)?
    d. Transformative (transforming learning and teaching within and beyond the school)?
4. Has 1:1 netbook learning effected your teaching practice? Can you give an example?
5. Has the introduction of 1:1 netbook learning renewed your energy, enthusiasm and engagement in teaching? In what ways?
6. Have you more often created a classroom environment which enables the students to create their own knowledge rather than have it explicitly taught to them by you since the introduction of 1:1 netbook learning? Can you give an example of constructivist activities you have used since the introduction of 1:1 netbook learning?
7. Have you changed the way in which you use your ICT for lesson preparation and planning? For example do you use more online or web 2.0 resources since the introduction of 1:1 netbook learning? Can you give an example?
8. How have you integrated the netbooks into your lessons? Can you give an example?
9. Have the 1:1 netbooks enabled you to do more higher level thinking activities in the classroom? Can you give an example?
10. Do you do more project work in class since the introduction of 1:1 netbooks? Can you give an example of how you integrate 1:1 netbooks with project work?
11. Since the introduction of 1:1 netbook learning, do you use ICT more often to present information to students? Can you give an example?
12. In which areas of the curriculum been easier to implement 1 – 1 learning, e.g. numeracy, Literacy? Where has it been more difficult?
13. Have netbooks enabled you to individualise the curriculum to meet individual student learning needs? In what ways?
14. Has the 1:1 netbooks improved your communication with students? In what ways?
15. Has the 1:1 netbooks improved your communication with colleagues?
16. Do you believe that 1:1 netbook learning is beneficial for teaching and learning?
17. Do you like the students in your classroom having 1:1 netbooks?
18. Has 1:1 netbook learning facilitated cooperative group work in your classroom?
19. Has 1:1 netbook learning facilitated individual student work in your classroom?
20. Has 1:1 netbook learning enabled you to cover topics in greater depth? How?
21. How has 1:1 netbook learning made student learning more relevant to the real world?
22. How has 1:1 netbook learning made learning more interesting for students?
23. How has 1:1 netbook learning made learning more enjoyable for students?
24. Has 1:1 netbook learning encouraged your children to take more responsibility for their own learning? In what ways?
25. Do you use more problem solving activities in class since the introduction of 1:1 netbook learning? Can you give an example?
26. Has 1- 1 learning had an impact on your students learning outcomes in Mathematics? In what way?

27. Has 1- 1 learning had an impact on your students learning outcomes in writing? In what way?
28. Has 1- 1 learning had an impact on your students learning outcomes in reading? In what way?
29. Has 1- 1 learning had an impact on your students learning outcomes in spelling? In what way?
30. In what ways has 1:1 learning improved your students technology skills?
31. Has 1:1 netbook learning effected your students motivation in class?
32. Has 1:1 netbook learning effected your students positive attitude to school?
33. Has 1:1 netbook learning improved student behaviour in your classroom?
34. Has 1:1 netbook learning improved student engagement in learning?
35. What programs on the netbooks are your students using the most?
36. Which web sites are your students using the most?
37. Have you had problems with children using their netbook in an inappropriate manner? Can you give an example?
38. Have the in school technical support you have received this year been adequate?
39. Do you think 1 :1 netbook learning has increased your teaching workload? In what ways?
40. Has 1:1 netbook learning presented any difficulties with classroom management? Can you give an example?
41. Has the professional development which you have attended this year assisted you with 1:1 netbook learning in your classroom?
42. Have your colleagues assisted you with 1:1 netbook learning in your classroom?
43. What are the benefits of 1 -1 netbook learning for the teacher / student?
44. What have you learned this year?
45. What went well?
46. What is your best 1:1 story so far?
47. What is your worst 1:1 story so far?

Appendix 18: Student Interview Schedule

1. Has having your own netbook improved the presentation of your work? Can you give an example?
2. Is having your own netbook important to your learning? In what ways?
3. Do show your family the work you have been doing on your netbook? Do you get help with your learning from your family? Can you give an example?
4. Has your netbook helped you to be a good student? Can you give an example?
5. Has your netbook helped you to be successful at school? Can you give me an example?
6. Do you like having a netbook? Why?
7. Do you use your netbook for school projects? Can you give me an example?
8. Do you use your netbook to communicate with your teacher, for example email? Can you give me any other examples?
9. Do you use your netbook to communicate with your friends, for example email? Can you give me any other examples?
10. Do you think having a netbook has made your learning more relevant to the everyday world outside of school? Why do you think this?
11. Have netbooks made school more interesting? In what ways?
12. Have netbooks made learning more enjoyable? In what ways?
13. Has having your own netbook helped you to be more responsibility for your own learning?
14. Are you able to explore topics in greater depth with a netbook? Explain how?
15. Does having a netbook help you to work better in groups with other students?
16. Does having a netbook help you to work better by yourself?
17. Has your netbook helped you to be better at writing? In what way?
18. Has your netbook helped you to be better at reading In what way?
19. Has your netbook helped you to be better at spelling In what way?
20. Has your netbook helped you to be better at Mathematics In what way?
21. Has your netbook helped your ICT skills In what way?
22. Have netbooks helped you to feel positive about school? In what ways?
23. Have netbooks made you want to work harder and learn more at school? Can you give me an example?
24. What programs do you use most on your netbook? Can you give me an example of how you use them?
25. What web sites do you use the most?
26. Do you use your netbook to help you in class presentations? Can you give me an example?
27. Are you able to help others on the netbook if they are having a problem? Can you give an example?
28. What are the benefits of having your own netbook?
29. What has the netbook helped you to learn this year?
30. What went well with the netbooks this year?
31. What is your best netbook story so far?
32. What is your worst netbook story so far?

Appendix 19: Table 1

Researchers	Name of Study	Year of Study	Research Design	Location of Study	Number of Schools Involved	Student Year Levels
McDonald, H.	*MLC Initial Research Report*	1993	Qualitative	Australia – VIC	1	7
Owen, J.M., Lambert, F.C., & Hurworth, R.E. (as cited in Whitefield, 2004).	*Notebook Computers in the Curriculum: An Evaluation of the Notebook Initiative at Wesley College.*	1993		Australia-Vic	1	5
Rowe, H.A.H	*Learning with Personal Computers*	1993	Qualitative & Quantitative	Australia – QLD	1	6 & 7
Newhouse, C. P.	*Creating computer supported learning environments: A three year study*	1994	Qualitative & Quantitative	Australia WA	State wide	7, 8, 9 & 10 Mathematics Classes
Allitt, M.D. (as cited in Whitefield, 2004).	*Teacher Concerns in the Implementation of Laptop Computers:Four Case Studies*	1995		Australia-Vic	2	7,8,9,10 11,12
Newhouse, C. P.	*Teachers' responses and classroom learning environments associated with student access to portable computers*	1997	Qualitative	Australia – WA	1	7, 8, 9 & 10
Stolarchuk, E.O.	*An Evaluation of the Effectiveness of laptop Computers in Science Classrooms*	1997	Quantitative	Australia -	14	8,9
Calnin, G.T. (as cited in Whitefield, 2004).	*Laptop Computers: Changes in Teachers' Practice*	1998		Australia-Vic	1	10
Ainley, M., Bourke, V., Chatfield, R., Hillman, K., & Watkins, I.	*Computers laptops and Tools*	2000	Qualitative	Australia – VIC	1	7
Newhouse, P. & Rennie	*A longitudingal study of the use of student owned portable computers in a secondary school*	2001	Qualitative & Quantitative	Australia – WA	1	7, 8, 9 & 10
Kessell, S.R. (as cited in Whitefield, 2004).	*Evaluation of the Personal Laptop Program at Penrhos College (1998-2000)*	2001		Australia-WA	1	5,6,7,8, 9,10
Newhouse, C. P.	*A follow-up study of students using portable computers at a secondary school*	2001	Quantitative	Australia – WA	1	8 & 12
Gaynor, I. W. & Fraser, B. J.	*Online collaborative projects: A journey for two year 5 technology rich classrooms.*	2003	Qualitative & Quantitative	Australia – WA	1	5
Whitefield, A.W.	*Laptop Computers as a Mediating Tool Between Teacher Beliefs and Pedagogy*	2004	Qualitative	Australia-Vic	4	11,12
Bateman, D. & Oakley, C.	*Research Report: The classmate PC 1:1 elearning project in Australia*	2009	Qualitative	Australia - VIC, QLD, NSW	6	3,4,5,6
Tierney & Hunt	*Smart Classrooms Netbook Trial 2008*	2009	Qualitative & Quantitative	Australia – QLD	3	1,2,3
Larkin	*Investigating Student Netbook Usage Using Activity Theory*	2010	Mixed Method	Australia-QLD	1	7

Table 1: 'Australian Research Studies Summary'

Appendix 20: Table 2

Author	Report Title	Year of 1:1 Laptop Program	School	Location	Student Year Level
Loader, D.	*Reconstructing an Australian School*	1993	School Evaluation Report Methodist Ladies College	Australia–Vic	5
Loader, D.	*Professional Development Requirements for Teachers*	1993	School Evaluation Report Methodist Ladies College	Australia–Vic	5
Stager, G.	*Computers for Kids...Not Schools*	1993	School Evaluation Report Methodist Ladies College	Australia–Vic	5
Aitken, D	*Responses to Use of Laptops in Teaching Mathematics*	1995	School Evaluation Report Caufield Grammar School	Australia - Vic	7
Ashford, K	*A Laptop Program with Year 7 Students*	1995	School Evaluation Report Frankston High School	Australia - Vic	7
Brown, G.	*Laptops at Korowa: Reactions, Experience and Learning*	1995	School Evaluation Report Korowa Anglican Girls School	Australia - Vic	6
Burns, E.	*Response to a restricted usage program*	1995	School Evaluation Report Xavier College	Australia - Vic	9
Fallshaw, M.	*The Use of laptops in senior Mathematics*	1995	School Evaluation Report MLC	Australia - Vic	11
Howell, C.	*Laptops: Presentation, productivity, thinker's toolkit*	1995	School Evaluation Report Trinity Grammar School	Australia–Vic	5,6,7,8,9, 10,11,12
Kelso, J.	*Introducing Laptops into a School Program*	1995	School Evaluation Report Camberwell Anglican Girls' Grammar School	Australia - Vic	8
Narracott, I.	*Laptops in School: Response of Teachers, Students and Parents*	1995	School Evaluation Report Jamieson Park Secondary College	Australia - Vic	7
Wilson, J	*Learning through access to a laptop*	1995	School Evaluation Report Mallacoota P-12 College	Australia - Vic	10 & 11
Owen, J.M., & Lambert, F.C.	*The Notebook Curriculum: An Innovative Approach to the Use of Personal Computers in the Classroom*	1996	*"Large Australian Private School"* Exact school not specified	Australia-Vic	5
Costa, S.	*You Want Every Year 5 Student to have Her own Laptop?*	2000	Methodist Ladies College	Australia-Vic	5
Perillo, S.	*Laptops*	2003	Kilvington Girls Grammar	Australia-	5,6,7,8,9, 10,11,12
Newhouse, C.P. (2008)	*Transforming Schooling with Support from Portable Computing.*	2004 – 2006	John Willcock College	Australia-WA	8 & 9
Holmes, P.	*On Your Bikes*	2008	Otford Primary School	Australia-NSW	2,3,4,5,6

Table 2: 'Australian School Evaluation Reports Summary'

Appendix 21: Qualitative Results Tables

Response	February 2009	December 2009
5. Strongly Agree	68.4%	75%
4. Agree	21.1%	17.5%
3. Unsure	5.3%	5.0%
2. Disagree	2.6%	2.5%
1. Strongly Disagree	2.6%	0.0%
	Mean 4.5 **Standard deviation** 0.910	**Mean** 4.7 **Standard deviation** 0.691

Table 4: "I use my Laptop for planning and preparation"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	47.7%	73.2%
4. Agree	44.7%	22.0%
3. Unsure	5.3%	4.9%
2. Disagree	2.6%	0.0%
1. Strongly Disagree	0.0%	0.0%
	Mean 4.4 **Standard deviation** 0.704	**Mean** 4.7 **Standard deviation** 0.560

Table 5 "I use my Laptop to access diverse teaching materials"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	56.1%
4. Agree	29.3%
3. Unsure	12.2%
2. Disagree	2.4%
1. Strongly Disagree	0.0%
Mean 4.4	**Standard deviation** 0.793

Table 6: "I use ICT more often to present information to the class since the introduction of 1:1 netbooks"
December surveys n = 41

Response	December 2009
5. All of the Time	24.4%
4. Most of the Time	48.8%
3. Sometimes	22.0%
2. Not Very Often	0.0%
1. Not at All	4.9%
Mean 3.9	**Standard deviation** 0.942

Table7: "Since the introduction of 1:1 netbook learning, I more often facilitate a classroom environment which enables the children to create their own knowledge rather than have it explicitly taught to them by me"
December surveys n = 41

Response	December 2009
5. All of the Time	53.7%
4. Most of the Time	36.6%
3. Sometimes	7.3%
2. Not Very Often	2.4%
1. Not at All	0.0%
Mean 4.4	**Standard deviation** 0.732

Table 8: "I integrate the netbooks into my lessons" December surveys n = 41

Response	December 2009
5. All of the Time	12.2%
4. Most of the Time	39%
3. Sometimes	26.8%
2. Not Very Often	17.1%
1. Not at All	4.9%
Mean 3.4	**Standard deviation** 1.054

Table 9: "1:1 netbooks learning has improved my communication with colleagues" December surveys n = 41

Response	December 2009
5. All of the Time	41.5%
4. Most of the Time	29.3%
3. Sometimes	17.1%
2. Not Very Often	12.2%
1. Not at All	0.0%
Mean 4.0	**Standard deviation** 1.036

Table 10: "My colleagues have assisted me with 1:1 netbook learning in my classroom" December surveys n = 41

Response	December 2009
5. Strongly Agree	20.0%
4. Agree	30.0%
3. Unsure	25.0%
2. Disagree	17.5%
1. Strongly Disagree	7.5%
Mean 3.4	**Standard deviation** 1.198

Table 11: "I believe that netbook learning has increased my workload" December surveys n = 41

Response	December 2009
5. Strongly Agree	7.5%
4. Agree	5.0%
3. Unsure	10.0%
2. Disagree	32.5%
1. Strongly Disagree	45.0%
Mean 2.0	**Standard deviation** 1.193

Table 12: "I believe that 1:1 netbook learning has caused difficulties in classroom management" December surveys n = 41

Response	December 2009
5. All of the Time	34.1%
4. Most of the Time	39%
3. Sometimes	14.6%
2. Not Very Often	9.8%
1. Not at all	2.4%
Mean 3.9	**Standard deviation** 1.045

Table 3: "The introduction of 1:1 netbook learning has renewed my energy, enthusiasm and engagement in teaching?" December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	64.7%	82.9%
4. Agree	14.7%	14.6%
3. Unsure	14.7%	2.4%
2. Disagree	2.9%	0.0%
1. Strongly Disagree	2.9%	0.0%
	Mean 4.4 **Standard deviation** 1.026	**Mean** 4.8 **Standard deviation** 0.454

Table 13: "I like the students having netbooks in my classroom"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	61.0%
4. Agree	29.3%
3. Unsure	4.9%
2. Disagree	2.4%
1. Strongly Disagree	2.4%
Mean 4.4	**Standard deviation** 0.885

Table 14: "I believe that 1:1 netbook learning is beneficial for teaching and learning"
December surveys n = 41

Response	December 2009
5. All of the Time	34.1%
4. Most of the Time	53.7%
3. Sometimes	7.3%
2. Not Very Often	4.9%
1. Not at All	0.0%
Mean 4.2	**Standard deviation** 0.762

Table 15: "1:1 netbook learning makes student learning more relevant to the real world"
December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	24.3%	48.8%
4. Most of the Time	32.4%	43.9%
3. Sometimes	35.1%	2.4%
2. Not Very Often	8.1%	4.9%
1. Not at All	0.0%	0.0%
	Mean 3.7 **Standard deviation** 0.920	**Mean** 4.4 **Standard deviation** 0.757

Table 59: "How frequently do you use the internet for teaching and learning activities in the classroom"

Response	February 2009	December 2009
5. All of the Time	21.6%	58.5%
4. Most of the Time	54.1%	39.0%
3. Sometimes	16.2%	2.4%
2. Not Very Often	8.1%	0.0%
1. Not at All	0.0%	0.0%
	Mean 3.9 **Standard deviation** 0.831	**Mean** 4.6 **Standard deviation** 0.543

Table 60: "How frequently do your students use computers/netbooks for researching information?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	18.9%	34.1%
4. Most of the Time	35.1%	36.6%
3. Sometimes	21.6%	12.2%
2. Not Very Often	13.5%	9.8%
1. Not at All	10.8%	7.3%
	Mean 3.4 **Standard deviation** 1.238	**Mean** 3.8 **Standard deviation** 1.214

Table 61: "How frequently do you use interactive web learning activities for teaching and learning in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	5.4%	19.5%
4. Most of the Time	18.9%	31.7%
3. Sometimes	43.2%	24.4%
2. Not Very Often	24.3%	22.0%
1. Not at All	8.1%	2.4%
	Mean 2.9 **Standard deviation** 0.980	**Mean** 3.4 **Standard deviation** 1.105

Table 62: "How frequently do you use the digital photo editing software for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	0.0%	9.8%
4. Most of the Time	8.3%	29.3%
3. Sometimes	25.0%	29.3%
2. Not Very Often	44.4%	22.0%
1. Not at All	22.2%	9.8%
	Mean 2.2 **Standard deviation** 0.876	**Mean** 3.1 **Standard deviation** 1.135

See Table 63: "How frequently do you use digital videos or digital video editing software for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	0.0%	0.0%
4. Most of the Time	5.6%	12.2%
3. Sometimes	13.9%	31.7%
2. Not Very Often	38.9%	36.6%
1. Not at All	41.7%	19.5%
	Mean 1.8 **Standard deviation** 0.866	**Mean** 2.4 **Standard deviation** 0.931

Table 64: "How frequently do you use digital music or music editing software for teaching and learning activities?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	37.8%	48.8%
4. Most of the Time	43.2%	36.6%
3. Sometimes	13.5%	14.6%
2. Not Very Often	5.4%	0.0%
1. Not at All	0.0%	0.0%
	Mean 4.1 **Standard deviation** 0.843	**Mean** 4.3 **Standard deviation** 0.719

Table 65: "How frequently do you use Microsoft Word for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	27.0%	39.0%
4. Most of the Time	35.1%	36.6%
3. Sometimes	32.4%	14.6%
2. Not Very Often	2.7%	9.8%
1. Not at All	2.7%	0.0%
	Mean 3.8 **Standard deviation** 0.954	**Mean** 4.0 **Standard deviation** 0.961

Table 66: "How frequently do you use Microsoft PowerPoint for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	16.2%	26.8%
4. Most of the Time	27.0%	19.5%
3. Sometimes	29.7%	34.1%
2. Not Very Often	13.5%	19.5%
1. Not at All	13.5%	0.0%
	Mean 3.2 **Standard deviation** 1.249	**Mean** 3.5 **Standard deviation** 1.084

Table 67: "How frequently do you use Microsoft Publisher for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	0.0%	0.0%
4. Most of the Time	13.5%	29.3%
3. Sometimes	13.5%	41.5%
2. Not Very Often	40.5%	24.4%
1. Not at All	32.4%	4.9%
	Mean 2.1 **Standard deviation** 0.997	**Mean** 3.0 **Standard deviation** 0.854

Table 68: "How frequently do you use animation programs for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	0.0%	4.9%
4. Most of the Time	13.5%	14.6%
3. Sometimes	18.9%	46.3%
2. Not Very Often	37.8%	31.7%
1. Not at All	29.7%	2.4%
	Mean 2.2 **Standard deviation** 1.000	**Mean** 2.9 **Standard deviation** 0.861

Table 69: "How frequently do you use Microsoft Paint or drawing software for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	13.5%	36.6%
4. Most of the Time	64.9%	41.5%
3. Sometimes	13.5%	19.5%
2. Not Very Often	8.1%	2.4%
1. Not at All	0.0%	0.0%
	Mean 3.8 **Standard deviation** 0.754	**Mean** 4.1 **Standard deviation** 0.802

Table 70: "How frequently do your students use computers/netbooks for educational games?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	2.7%	29.3%
4. Most of the Time	5.4%	34.1%
3. Sometimes	32.4%	22.0%
2. Not Very Often	37.8%	12.2%
1. Not at All	21.6%	2.4%
	Mean 2.3 **Standard deviation** 0.955	**Mean** 3.8 **Standard deviation** 1.077

Table 71: "How frequently do your students use computers/netbooks for organising their work?"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	36.6%
4. Agree	41.5%
3. Unsure	17.1%
2. Disagree	2.4%
1. Strongly Disagree	2.4%
Mean 4.1	**Standard deviation** 0.921

Table 72: "Netbooks have helped my students organise their work this year"
December surveys n = 41

Response	December 2009
5. Strongly Agree	22.0%
4. Agree	39.0%
3. Unsure	22.0%
2. Disagree	14.6%
1. Strongly Disagree	2.4%
Mean 3.6	**Standard deviation** 1.054

Table 78: "1:1 netbooks learning has improved my communication with the students"
December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	13.5%	24.4%
4. Most of the Time	29.7%	19.5%
3. Sometimes	13.5%	24.4%
2. Not Very Often	13.5%	24.4%
1. Not at All	29.7%	7.3%
	Mean 2.8 **Standard deviation** 1.461	**Mean** 3.3 **Standard deviation** 1.273

Table 73: "How frequently do you use email for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	0.0%	9.8%
4. Most of the Time	2.7%	19.5%
3. Sometimes	16.2%	22.0%
2. Not Very Often	24.3%	31.7%
1. Not at All	56.8%	17.1%
	Mean 1.6 **Standard deviation** 0.845	**Mean** 2.7 **Standard deviation** 1.230

Table 74: "How frequently do you use blogs for teaching and learning activities in your classroom?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	2.7%	17.1%
4. Most of the Time	21.6%	43.9%
3. Sometimes	29.7%	22.0%
2. Not Very Often	32.4%	17.1%
1. Not at All	13.5%	0.0%
	Mean 2.7 **Standard deviation** 1.041	**Mean** 3.6 **Standard deviation** 0.960

Table 75: "How frequently do your students use computers/netbooks for communication with peers?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	0.0%	7.3%
4. Most of the Time	2.7%	22.0%
3. Sometimes	21.6%	26.8%
2. Not Very Often	27.0%	34.1%
1. Not at All	48.6%	9.8%
	Mean 1.8 **Standard deviation** 0.874	**Mean** 2.8 **Standard deviation** 1.102

Table 76: "How frequently do your students use computers/netbooks for communication with teachers?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	10.8%	39.0%
4. Most of the Time	27.0%	39.0%
3. Sometimes	32.4%	14.6%
2. Not Very Often	21.6%	7.3%
1. Not at All	8.1%	0.0%
	Mean 3.1 **Standard deviation** 1.110	**Mean** 4.1 **Standard deviation** 0.905

Table 77: "How frequently do your students use computers/netbooks as a visual or audio aid to class presentations of work?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	7.9%	29.3%
4. Agree	73.7%	63.4%
3. Unsure	15.8%	7.3%
2. Disagree	2.6%	0.0%
1. Strongly Disagree	0.0%	0.0%
	Mean 3.9 **Standard deviation** 0.570	**Mean** 4.2 **Standard deviation** 0.564

Table 16: "I believe that the students find the work we do in class interesting"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	41.5%
4. Agree	58.5%
3. Unsure	0.0%
2. Disagree	0.0%
1. Strongly Disagree	0.0%
Mean 4.4	**Standard deviation** 0.493

Table 17: "I believe that students having their own netbooks has helped them to find the work we do in class interesting"
December surveys n = 41

Response	December 2009
5. Strongly Agree	53.7%
4. Agree	39.0%
3. Unsure	4.9%
2. Disagree	2.4%
1. Strongly Disagree	0.0%
Mean 4.4	**Standard deviation** 0.700

Table 19: "I believe that students having their own netbooks has helped them to find learning more enjoyable"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	15.8%	24.4%
4. Agree	63.2%	63.4%
3. Unsure	21.1%	9.8%
2. Disagree	0.0%	2.4%
1. Strongly Disagree	0.0%	0.0%
	Mean 3.9 **Standard deviation** 0.605	**Mean** 4.1 **Standard deviation** 0.655

Table 18: "I believe that the students find learning enjoyable"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	17.1%
4. Agree	46.3%
3. Unsure	19.5%
2. Disagree	14.6%
1. Strongly Disagree	2.4%
Mean 3.6	**Standard deviation** 1.009

Table 20: "I use higher order thinking activities in class more since the introduction 1:1 netbook learning"
December surveys n = 41

Response	December 2009
5. Strongly Agree	24.4%
4. Agree	19.5%
3. Unsure	31.7%
2. Disagree	19.5%
1. Strongly Disagree	4.9%
Mean 3.4	**Standard deviation** 1.187

Table 21: "I use problem solving activities in class more since the introduction of 1:1 netbook learning "
December surveys n = 41

Response	December 2009
5. Strongly Agree	68.3%
4. Agree	26.8%
3. Unsure	4.9%
2. Disagree	0.0%
1. Strongly Disagree	0.0%
Mean 4.6	**Standard deviation** 0.574

Table 22: "Students are able to explore topics in greater depth when they have their own netbook"
December surveys n = 41

Response	December 2009
5. Strongly Agree	43.6%
4. Agree	46.2%
3. Unsure	7.7%
2. Disagree	2.6%
1. Strongly Disagree	0.0%
Mean 4.3	**Standard deviation** 0.722

Table 24: "Students having their own netbooks has enabled me to more easily individualise the curriculum to meet individual student learning needs"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	23.7%	37.5%
4. Agree	55.3%	35.0%
3. Unsure	15.8%	25.0%
2. Disagree	5.3%	2.5%
1. Strongly Disagree	0.0%	0.0%
	Mean 4.0 **Standard deviation** 0.778	**Mean** 4.1 **Standard deviation** 0.848

Table 23: "I individualise the curriculum to meet individual student's needs"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	2.6%	7.3%
4. Most of the Time	31.6%	56.1%
3. Sometimes	57.9%	34.1%
2. Not Very Often	5.3%	0.0%
1. Not at All	2.6%	2.4%
	Mean 3.3 **Standard deviation** 0.714	**Mean** 3.7 **Standard deviation** 0.719

Table 25: "My students have choices in what they learn"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. All of the Time	15.0%
4. Most of the Time	67.5%
3. Sometimes	10.0%
2. Not Very Often	2.5%
1. Not at All	5.0%
Mean 3.9	**Standard deviation** 0.882

Table 26: "Students having their own netbooks has increased the amount of individual choices they have in their learning"
December surveys n = 41

Response	December 2009
5. Strongly Agree	37.5%
4. Agree	37.5%
3. Unsure	10.0%
2. Disagree	12.5%
1. Strongly Disagree	2.5%
Mean 4.0	**Standard deviation** 1.094

Table 34: "Students having their own netbooks has increased the amount of individual work which they do in class"
December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	19.4%	61.0%
4. Most of the Time	38.9%	34.1%
3. Sometimes	27.8%	2.4%
2. Not Very Often	11.1%	2.4%
1. Not at All	2.8%	0.0%
	Mean 3.6 **Standard deviation** 1.008	**Mean** 4.5 **Standard deviation** 0.666

Table 33: "How frequently do your students use computers/netbooks for individual work"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	24.3%	65.9%
4. Most of the Time	29.7%	29.3%
3. Sometimes	27.0%	4.9%
2. Not Very Often	18.9%	0.0%
1. Not at All	0.0%	0.0%
	Mean 3.6 **Standard deviation** 1.052	**Mean** 4.6 **Standard deviation** 0.579

Table 27: "How frequently do your students use computers/netbooks for projects/ assignments?"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	5.3%	9.8%
4. Agree	31.6%	48.8%
3. Unsure	50.0%	39.0%
2. Disagree	10.5%	0.0%
1. Strongly Disagree	2.6%	2.4%
	Mean 3.3 **Standard deviation** 0.817	**Mean** 3.6 **Standard deviation** 0.757

Table 28: "I believe that my students take responsibility for their own learning"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	17.1%
4. Agree	58.5%
3. Unsure	19.5%
2. Disagree	0.0%
1. Strongly Disagree	4.9%
Mean 3.8	**Standard deviation** 0.881

Table 29: "Students having their own netbooks has increased the amount of responsibility they take for their own learning"
December surveys n = 41

Response	December 2009
5. Strongly Agree	29.3%
4. Agree	39.0%
3. Unsure	17.1%
2. Disagree	12.2%
1. Strongly Disagree	2.4%
Mean 3.8	**Standard deviation** 1.064

Table 32: "Students having their own netbooks has increased the amount of group and cooperative work we do in class"
December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	18.4%	24.4%
4. Most of the Time	57.9%	53.7%
3. Sometimes	21.1%	19.5%
2. Not Very Often	2.6%	2.4%
1. Not at All	0.0%	0.0%
	Mean 3.9 **Standard deviation** 0.703	**Mean** 4.0 **Standard deviation** 0.733

Table 30: "My students participate in group/cooperative work"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	11.1%	26.8%
4. Most of the Time	22.2%	39.0%
3. Sometimes	16.7%	24.4%
2. Not Very Often	38.9%	9.8%
1. Not at All	11.1%	0.0%
	Mean 2.8 **Standard deviation** 1.213	**Mean** 3.8 **Standard deviation** 0.934

Table 31: "How frequently do your students use computers/netbooks for group/cooperative work?"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	36.6%
4. Agree	48.8%
3. Unsure	12.2%
2. Disagree	0.0%
1. Strongly Disagree	2.4%
Mean 4.2	**Standard deviation** 0.824

Table 35: "Students having their own netbooks has improved the presentation of their work"
December surveys n = 41

Response	December 2009
5. Strongly Agree	9.8%
4. Agree	4.9%
3. Unsure	26.8%
2. Disagree	46.3%
1. Strongly Disagree	12.2%
Mean 2.5	**Standard deviation** 1.084

Table 36: "I had problems with students using their netbook in an inappropriate manner"
December surveys n = 41

Response	February 2009	December 2009
5. All of the Time	2.7%	17.5%
4. Most of the Time	16.2%	40.0%
3. Sometimes	27.0%	27.5%
2. Not Very Often	21.6%	7.5%
1. Not at All	32.4%	7.5%
	Mean 2.4 **Standard deviation** 1.167	**Mean** 3.5 **Standard deviation** 1.095

Table 37: "How frequently do your students use computers/netbooks for homework"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	70.7%
4. Agree	29.3%
3. Unsure	0.0%
2. Disagree	0.0%
1. Strongly Disagree	0.0%
Mean 4.7	**Standard deviation** 0.455

Table 38: "Students having their own netbooks has improved their technology skills"
December surveys n = 41

Response	December 2009
5. Strongly Agree	34.1%
4. Agree	48.8%
3. Unsure	14.6%
2. Disagree	2.4%
1. Strongly Disagree	0.0%
Mean 4.1	**Standard deviation** 0.751

Table 40: "I believe that netbooks have contributed to my students positive attitude to school this year"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	26.3%	41.5%
4. Agree	63.2%	53.7%
3. Unsure	7.9%	4.9%
2. Disagree	2.6%	0.0%
1. Strongly Disagree	0.0%	0.0%
	Mean 4.1 **Standard deviation** 0.656	**Mean** 4.4 **Standard deviation** 0.574

Table 39: "I believe that my students feel positive at school"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	15.8%	26.8%
4. Agree	57.9%	51.2%
3. Unsure	23.7%	19.5%
2. Disagree	2.6%	2.4%
1. Strongly Disagree	0.0%	0.0%
	Mean 3.9 **Standard deviation** 0.695	**Mean** 4.0 **Standard deviation** 0.749

Table 41: "I believe that my students try very hard to do their best at school"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	26.8%
4. Agree	41.5%
3. Unsure	22.0%
2. Disagree	9.8%
1. Strongly Disagree	0.0%
Mean 3.9	**Standard deviation** 0.926

Table 42: "I believe that netbooks have contributed to my students trying very hard to do their best at school this year"
December surveys n = 41

Response	December 2009
5. Strongly Agree	19.5%
4. Agree	51.2%
3. Unsure	26.8%
2. Disagree	0.0%
1. Strongly Disagree	2.4%
Mean 3.9	**Standard deviation** 0813.

Table 44: "I believe that netbooks have contributed to my students liking writing this year"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	2.6%	12.5%
4. Agree	52.6%	55.0%
3. Unsure	39.5%	27.5%
2. Disagree	2.6%	2.5%
1. Strongly Disagree	2.6%	2.5%
	Mean 3.5 **Standard deviation** 0.716	**Mean** 3.7 **Standard deviation** 0.806

Table 43: "I believe that my students like writing"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	2.6%	7.3%
4. Agree	55.3%	58.5%
3. Unsure	39.5%	34.1%
2. Disagree	2.6%	0.0%
1. Strongly Disagree	0.0%	0.0%
	Mean 3.6 **Standard deviation** 0.591	**Mean** 3.7 **Standard deviation** 0.585

Table 45: "I believe that my students like Mathematics"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	19.5%
4. Agree	48.8%
3. Unsure	19.5%
2. Disagree	7.3%
1. Strongly Disagree	4.9%
Mean 3.7	**Standard deviation** 1.018

Table 46: "I believe that netbooks have contributed to my students liking Mathematics this year"
December surveys n = 41

Response	December 2009
5. Strongly Agree	22.0%
4. Agree	34.1%
3. Unsure	29.3%
2. Disagree	14.6%
1. Strongly Disagree	0.0%
Mean 3.6	**Standard deviation** 0.982

Table 48: "I believe that students having their own netbooks has made doing well in school important to my students"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	26.3%	22.0%
4. Agree	50.0%	56.1%
3. Unsure	21.1%	19.5%
2. Disagree	0.0%	2.4%
1. Strongly Disagree	2.6%	0.0%
	Mean 4.0 **Standard deviation** 0.843	**Mean** 4.0 **Standard deviation** 0.715

Table 47: "I believe that doing well in school is important to my students"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	5.3%	19.5%
4. Agree	57.9%	63.4%
3. Unsure	31.6%	12.2%
2. Disagree	2.6%	4.9%
1. Strongly Disagree	2.6%	0.0%
	Mean 3.6 **Standard deviation** 0.745	**Mean** 4.0 **Standard deviation** 0.715

Table 49: "I believe that my students are motivated to learn"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	34.1%
4. Agree	41.5%
3. Unsure	19.5%
2. Disagree	4.9%
1. Strongly Disagree	0.0%
Mean 4.0	**Standard deviation** 0.854

Table 50: "I believe that netbooks have contributed to my students' motivation to learn this year"
December surveys n = 41

Response	December 2009
5. Strongly Agree	46.3%
4. Agree	43.9%
3. Unsure	9.8%
2. Disagree	0.0%
1. Strongly Disagree	0.0%
Mean 4.4	**Standard deviation** 0.654

Table 52: "I believe that netbooks have contributed to my students' engagement in learning this year"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	5.3%	26.8%
4. Agree	71.1%	63.4%
3. Unsure	18.4%	7.3%
2. Disagree	5.3%	2.4%
1. Strongly Disagree	0.0%	0.0%
	Mean 3.8 **Standard deviation** 0.626	**Mean** 4.1 **Standard deviation** 0.646

Table 51: "I believe that my students engaged in learning"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	10.5%	24.4%
4. Agree	65.8%	65.9%
3. Unsure	21.1%	4.9%
2. Disagree	2.6%	4.9%
1. Strongly Disagree	0.0%	0.0%
	Mean 3.8 **Standard deviation** 0.629	**Mean** 4.1 **Standard deviation** 0.692

Table 53: "I believe that my students are actively involved in learning"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	39.0%
4. Agree	46.3%
3. Unsure	14.6%
2. Disagree	0.0%
1. Strongly Disagree	0.0%
Mean 4.2	**Standard deviation** 0.691

Table 54: "I believe that netbooks have contributed to my students being actively involved in learning this year"
December surveys n = 41

Response	December 2009
5. Strongly Agree	26.8%
4. Agree	48.8%
3. Unsure	12.2%
2. Disagree	9.8%
1. Strongly Disagree	2.4%
Mean 3.9	**Standard deviation** 0.993

Table 56: "Netbooks have contributed to my students being generally 'on task' this year"
December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	26.3%	31.7%
4. Agree	55.3%	61.0%
3. Unsure	18.4%	4.9%
2. Disagree	0.0%	2.4%
1. Strongly Disagree	0.0%	0.0%
	Mean 4.1 **Standard deviation** 0.664	**Mean** 4.2 **Standard deviation** 0.644

Table 55: "My students are generally 'on task'"
February surveys n = 38, December surveys n = 41

Response	February 2009	December 2009
5. Strongly Agree	36.8%	48.8%
4. Agree	50.0%	43.9%
3. Unsure	10.5%	2.4%
2. Disagree	2.6%	4.9%
1. Strongly Disagree	0.0%	0.0%
	Mean 4.2 **Standard deviation** 0.731	**Mean** 4.4 **Standard deviation** 0.757

Table 57: "My students are generally well behaved"
February surveys n = 38, December surveys n = 41

Response	December 2009
5. Strongly Agree	19.5%
4. Agree	46.3%
3. Unsure	9.8%
2. Disagree	9.8%
1. Strongly Disagree	14.6%
Mean 3.5	**Standard deviation** 1.308

Table 58: "Netbooks have contributed to my students being generally well behaved this year"
December surveys n = 41

Response	February 2009	December 2009
5. Always	24.9%	20.7%
4. Almost Always	40.9%	45.3%
3. Sometimes	30.5%	31.9%
2. Almost Never	3.1%	1.4%
1. Never	0.6%	0.6%
	Mean 3.9 **Standard deviation** 0.845	**Mean** 3.8 **Standard deviation** 0.784

Table 119: "How frequently do you use the internet?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	30.7%	39.2%
4. Almost Always	43.4%	45.5%
3. Sometimes	21.8%	13.2%
2. Almost Never	3.1%	1.9%
1. Never	1.0%	0.2%
	Mean 4.0 **Standard deviation** 0.861	**Mean** 4.2 **Standard deviation** 0.756

Table 120: "How frequently do you use computers/netbooks for researching information?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	8.9%	6.9%
4. Almost Always	25.5%	27.9%
3. Sometimes	40.0%	42.3%
2. Almost Never	19.7%	18.3%
1. Never	6.0%	4.6%
	Mean 3.1 **Standard deviation** 1.017	**Mean** 3.1 **Standard deviation** 0.949

Table 121: "How frequently do you use computers/netbooks for interactive web learning activities?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	3.9%	4.6%
4. Almost Always	12.8%	13.7%
3. Sometimes	38.9%	54.5%
2. Almost Never	33.1%	22.6%
1. Never	11.3%	4.8%
	Mean 2.6 **Standard deviation** 0.972	**Mean** 2.9 **Standard deviation** 0.852

Table 122: "How frequently do you use photo editing/publishing software?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	2.5%	2.7%
4. Almost Always	6.6%	14.8%
3. Sometimes	31.3%	48.2%
2. Almost Never	37.4%	27.7%
1. Never	22.2%	6.7%
	Mean 2.3 **Standard deviation** 0.966	**Mean** 2.8 **Standard deviation** 0.869

Table 123: "How frequently do you use video editing/ publishing software?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	7.4%	4.2%
4. Almost Always	13.2%	14.2%
3. Sometimes	24.1%	32.5%
2. Almost Never	32.7%	28.8%
1. Never	22.6%	20.4%
	Mean 2.5 **Standard deviation** 1.188	**Mean** 2.5 **Standard deviation** 1.091

Table 124: "How frequently do you use music editing software?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	29.6%	30.8%
4. Almost Always	43.5%	49.1%
3. Sometimes	22.8%	18.0%
2. Almost Never	3.3%	1.9%
1. Never	0.8%	0.2%
	Mean 4.0 **Standard deviation** 0.853	**Mean** 4.1 **Standard deviation** 0.758

Table 125: "How frequently do you use Microsoft Word?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	15.6%	19.0%
4. Almost Always	33.9%	34.9%
3. Sometimes	41.7%	41.5%
2. Almost Never	7.2%	4.4%
1. Never	1.6%	0.2%
	Mean 3.5 **Standard deviation** 0.896	**Mean** 3.7 **Standard deviation** 0.835

Table 126: "How frequently do you use Microsoft PowerPoint?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	7.2%	7.9%
4. Almost Always	16.7%	19.5%
3. Sometimes	37.4%	42.8%
2. Almost Never	31.3%	24.1%
1. Never	7.4%	5.6%
	Mean 2.8 **Standard deviation** 1.020	**Mean** 3.0 **Standard deviation** 0.988

Table 127: "How frequently do you use Microsoft Publisher?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	6.0%	6.7%
4. Almost Always	14.1%	14.3%
3. Sometimes	34.2%	40.0%
2. Almost Never	32.4%	29.1%
1. Never	13.3%	9.9%
	Mean 2.7 **Standard deviation** 1.063	**Mean** 2.8 **Standard deviation** 1.025

Table 128: "How frequently do you use animation software?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	8.8%	10.6%
4. Almost Always	20.1%	22.2%
3. Sometimes	35.5%	39.4%
2. Almost Never	27.9%	22.0%
1. Never	7.6%	5.8%
	Mean 2.9 **Standard deviation** 1.065	**Mean** 3.1 **Standard deviation** 1.043

Table 129: "How frequently do you use Microsoft Paint or drawing software?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	9.7%	8.3%
4. Almost Always	26.0%	28.3%
3. Sometimes	43.2%	43.7%
2. Almost Never	16.3%	16.8%
1. Never	4.8%	2.9%
	Mean 3.2 **Standard deviation** 0.982	**Mean** 3.2 **Standard deviation** 0.922

Table 130: "How frequently do you use computers/netbooks for educational games?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	11.6%	17.5%
4. Almost Always	22.4%	34.9%
3. Sometimes	40.2%	34.1%
2. Almost Never	19.0%	10.2%
1. Never	6.7%	3.3%
	Mean 3.1 **Standard deviation** 1.064	**Mean** 3.5 **Standard deviation** 1.001

Table 131: "How frequently to you use computers/netbooks for organising work?"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	39.0%
4. Agree	45.2%
3. Unsure	10.7%
2. Disagree	3.9%
1. Strongly Disagree	1.2%
Mean 4.2	**Standard deviation** 0.859

Table 132: "My netbook has been helpful in organising my work"
December surveys n = 486

Response	February 2009	December 2009
5. Always	27.3%	10.8%
4. Almost Always	20.9%	18.4%
3. Sometimes	19.7%	27.1%
2. Almost Never	17.8%	25.1%
1. Never	14.3%	18.6%
	Mean 3.3 **Standard deviation** 1.402	**Mean** 2.8 **Standard deviation** 1.249

Table 133: "How frequently do you use computers/netbooks for email?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	4.7%	5.8%
4. Almost Always	8.2%	10.6%
3. Sometimes	19.8%	24.4%
2. Almost Never	28.0%	24.6%
1. Never	39.3%	34.6%
	Mean 2.1 **Standard deviation** 1.155	**Mean** 2.3 **Standard deviation** 1.206

Table 134: "How frequently do you use computers/netbooks for blogging?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	1.0%	1.5%
4. Almost Always	3.3%	9.5%
3. Sometimes	16.5%	25.3%
2. Almost Never	34.2%	32.9%
1. Never	44.9%	30.8%
	Mean 1.8 **Standard deviation** 0.897	**Mean** 2.2 **Standard deviation** 1.021

Table 135: "How frequently do you use computers/netbooks for communication with teachers?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	24.1%	13.4%
4. Almost Always	19.8%	19.0%
3. Sometimes	22.6%	32.6%
2. Almost Never	20.6%	24.7%
1. Never	13.0%	10.3%
	Mean 3.2 **Standard deviation** 1.356	**Mean** 3.0 **Standard deviation** 1.176

Table 136: "How frequently do you use computers/netbooks for communication with peers?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	6.6%	10.6%
4. Almost Always	16.0%	27.6%
3. Sometimes	43.5%	43.4%
2. Almost Never	23.2%	15.9%
1. Never	10.7%	2.5%
	Mean 2.8 **Standard deviation** 1.029	**Mean** 3.3 **Standard deviation** 0.939

Table 137: "How frequently do you use a computer/netbook as a visual / audio aid in class presentations of work?"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	27.7%
4. Agree	40.5%
3. Unsure	24.2%
2. Disagree	5.4%
1. Strongly Disagree	2.3%
Mean 3.9	**Standard deviation** 0.958

Table 79: "Netbooks made have our learning more relevant to the real world"
December surveys n = 486

Response	December 2009
5. Strongly Agree	46.1%
4. Agree	42.8%
3. Unsure	8.8%
2. Disagree	1.9%
1. Strongly Disagree	0.4%
Mean 4.3	**Standard deviation** 0.746

Table 81: "Netbooks have helped to make learning more interesting"
December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	10.8%	13.0%
4. Agree	57.3%	65.2%
3. Unsure	24.5%	17.5%
2. Disagree	5.3%	3.5%
1. Strongly Disagree	2.0%	0.8%
	Mean 3.7 **Standard deviation** 0.810	**Mean** 3.9 **Standard deviation** 0.707

Table 80: "The work we do in class is interesting"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	16.6%	17.3%
4. Agree	49.5%	53.3%
3. Unsure	25.1%	23.3%
2. Disagree	6.6%	4.3%
1. Strongly Disagree	2.3%	1.9%
	Mean 3.7 **Standard deviation** 0.896	**Mean** 3.8 **Standard deviation** 0.839

Table 82: "Learning is enjoyable"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	47.5%
4. Agree	39.4%
3. Unsure	10.6%
2. Disagree	1.7%
1. Strongly Disagree	0.8%
Mean 4.3	**Standard deviation** 0.792

Table 83: "Netbooks have helped to make learning more enjoyable"
December surveys n = 486

Response	December 2009
5. Strongly Agree	46.1%
4. Agree	40.9%
3. Unsure	10.3%
2. Disagree	1.7%
1. Strongly Disagree	1.0%
Mean 4.3	**Standard deviation** 0.798

Table 84: "I am able to explore topics in greater depth when I use a netbook"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	35.3%
4. Agree	41.2%
3. Unsure	17.7%
2. Disagree	3.9%
1. Strongly Disagree	1.9%
Mean 4.0	**Standard deviation** 0.923

Table 85: "Having a netbook has given me greater choices in what I learn"
December surveys n = 486

Response	December 2009
5. Strongly Agree	17.3%
4. Agree	37.9%
3. Unsure	34.1%
2. Disagree	9.9%
1. Strongly Disagree	0.8%
Mean 3.6	**Standard deviation** 0.912

Table 93: "I work individually more often since getting a netbook"
December surveys n = 486

Response	February 2009	December 2009
5. Always	19.8%	28.1%
4. Almost Always	40.1%	43.9%
3. Sometimes	30.8%	24.9%
2. Almost Never	7.9%	2.9%
1. Never	1.4%	0.2%
	Mean 3.7 **Standard deviation** 0.924	**Mean** 4.0 **Standard deviation** 0.815

Table 86: "How frequently do you use computers/netbook for projects and assignments?"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	41.4%	36.2%
4. Agree	45.9%	51.8%
3. Unsure	11.1%	11.4%
2. Disagree	1.0%	0.6%
1. Strongly Disagree	0.6%	0.0%
	Mean 4.3 **Standard deviation** 0.742	**Mean** 4.2 **Standard deviation** 0.667

Table 87: "I take responsibility for my own learning"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	33.3%
4. Agree	40.3%
3. Unsure	21.6%
2. Disagree	3.3%
1. Strongly Disagree	1.5%
Mean 4.0	**Standard deviation** 0.902

Table 88: "Having a netbook has helped me to take greater responsibility for my own learning"
December surveys n = 486

Response	December 2009
5. Strongly Agree	12.7%
4. Agree	37.4%
3. Unsure	33.0%
2. Disagree	13.8%
1. Strongly Disagree	3.1%
Mean 3.4	**Standard deviation** 0.981

Table 90: "I participate in group/ cooperative work more often since getting a netbook"
December surveys n = 486

Response	February 2009	December 2009
5. Always	3.9%	5.2%
4. Almost Always	16.0%	28.3%
3. Sometimes	49.7%	51.8%
2. Almost Never	24.3%	13.2%
1. Never	6.1%	1.5%
	Mean 2.9 **Standard deviation** 0.887	**Mean** 3.2 **Standard deviation** 0.795

Table 89: "How frequently do you use computers/netbooks for group/cooperative work?"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	18.0%
4. Agree	36.8%
3. Unsure	26.0%
2. Disagree	14.5%
1. Strongly Disagree	4.8%
Mean 3.5	**Standard deviation** 1.088

Table 91: "I get help with my learning from my classmates more often since getting a netbook " December surveys n = 486

Response	December 2009
5. Strongly Agree	41.6%
4. Agree	41.4%
3. Unsure	11.5%
2. Disagree	3.9%
1. Strongly Disagree	1.4%
Mean 4.2	**Standard deviation** 0.887

Table 94: "My netbook has improved the presentation of my work" December surveys n = 486

Response	February 2009	December 2009
5. Always	19.8%	26.7%
4. Almost Always	39.9%	56.0%
3. Sometimes	31.2%	15.4%
2. Almost Never	7.5%	1.9%
1. Never	1.7%	0.0%
	Mean 3.7 **Standard deviation** 0.927	**Mean** 4.1 **Standard deviation** 0.700

Table 92: "How frequently do you use computers/netbooks for individual work?" February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	9.5%	10.6%
4. Almost Always	22.7%	31.8%
3. Sometimes	36.7%	31.4%
2. Almost Never	20.0%	20.2%
1. Never	11.1%	6.0%
	Mean 3.0 **Standard deviation** 1.119	**Mean** 3.2 **Standard deviation** 1.069

Table 95: "How frequently do you use computers/netbooks for homework?" February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	15.7%
4. Agree	28.5%
3. Unsure	24.6%
2. Disagree	22.1%
1. Strongly Disagree	9.1%
Mean 3.2	**Standard deviation** 1.208

Table 96: "I get help with my learning at home more often since getting a netbook"
December surveys n = 486

Response	December 2009
5. Strongly Agree	26.5%
4. Agree	45.9%
3. Unsure	22.0%
2. Disagree	4.5%
1. Strongly Disagree	1.0%
Mean 3.9	**Standard deviation** 0.868

Table 111: "Netbooks have helped with my positive attitude to school this year"
December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	75.1%	57.6%
4. Agree	20.4%	36.2%
3. Unsure	3.7%	5.2%
2. Disagree	0.6%	0.6%
1. Strongly Disagree	0.2%	0.4%
	Mean 4.7 **Standard deviation** 0.589	**Mean** 4.5 **Standard deviation** 0.664

Table 97: "I am confident using a computer/netbook"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	44.1%	35.6%
4. Agree	36.9%	46.2%
3. Unsure	16.0%	14.7%
2. Disagree	2.5%	3.1%
1. Strongly Disagree	0.6%	0.4%
	Mean 4.2 **Standard deviation** 0.842	**Mean** 4.1 **Standard deviation** 0.804

Table 98: "I am able to help others on a computer/netbook"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	27.9%	28.2%
4. Agree	56.3%	55.7%
3. Unsure	13.6%	13.2%
2. Disagree	1.2%	2.1%
1. Strongly Disagree	1.0%	0.8%
	Mean 4.1 **Standard deviation** 0.741	**Mean** 4.1 **Standard deviation** 0.751

Table 110: "I feel positive about my school work"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	57.9%	50.5%
4. Agree	33.5%	41.0%
3. Unsure	7.2%	8.0%
2. Disagree	0.8%	0.2%
1. Strongly Disagree	0.6%	0.2%
	Mean 4.5 **Standard deviation** 0.718	**Mean** 4.4 **Standard deviation** 0.664

Table 112: "I try very hard to do my best at school"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	30.2%
4. Agree	45.5%
3. Unsure	18.2%
2. Disagree	4.8%
1. Strongly Disagree	1.2%
Mean 4.0	**Standard deviation** 0.887

Table 113: "Netbooks have helped me to try very hard to do my best at school this year"
December surveys n = 486

Response	December 2009
5. Strongly Agree	21.5%
4. Agree	36.8%
3. Unsure	22.3%
2. Disagree	14.0%
1. Strongly Disagree	5.4%
Mean 3.5	**Standard deviation** 1.132

Table 115: "Netbooks have helped me to like writing this year"
December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	28.5%	21.9%
4. Agree	33.4%	39.5%
3. Unsure	22.5%	19.9%
2. Disagree	10.0%	12.0%
1. Strongly Disagree	5.5%	6.6%
	Mean 3.7 **Standard deviation** 1.147	**Mean** 3.6 **Standard deviation** 1.149

Table 114: "I like writing"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	29.6%	22.6%
4. Agree	33.7%	37.5%
3. Unsure	21.6%	20.9%
2. Disagree	10.1%	12.4%
1. Strongly Disagree	5.1%	6.6%
	Mean 3.7 **Standard deviation** 1.140	**Mean** 3.6 **Standard deviation** 1.159

Table 116: "I like Mathematics"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	24.2%
4. Agree	34.9%
3. Unsure	22.7%
2. Disagree	13.0%
1. Strongly Disagree	5.2%
Mean 3.6	**Standard deviation** 1.137

Table 117: "Netbooks have helped me to like Mathematics this year"
December surveys n = 486

Response	December 2009
5. Strongly Agree	21.8%
4. Agree	28.4%
3. Unsure	28.8%
2. Disagree	14.4%
1. Strongly Disagree	6.6%
Mean 3.4	**Standard deviation** 1.169

Table 118: "Doing well in school is more important to me since getting a netbook"
December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	20.5%	23.4%
4. Agree	54.8%	51.6%
3. Unsure	21.4%	21.3%
2. Disagree	2.5%	2.9%
1. Strongly Disagree	0.8%	0.8%
	Mean 3.9 **Standard deviation** 0.765	**Mean** 3.9 **Standard deviation** 0.796

Table 99: "I am good at my school work"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	25.4%
4. Agree	47.9%
3. Unsure	20.5%
2. Disagree	4.5%
1. Strongly Disagree	1.7%
Mean 3.9	**Standard deviation** 0.884

Table 100: "Netbooks have helped me to be good at school work this year"
December surveys n = 486

Response	December 2009
5. Strongly Agree	29.4%
4. Agree	47.4%
3. Unsure	18.0%
2. Disagree	4.1%
1. Strongly Disagree	1.0%
Mean 4.0	**Standard deviation** 0.856

Table 102: "Netbook have made it easy for me to learn new things this year"
December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	16.2%	24.0%
4. Agree	49.7%	52.7%
3. Unsure	28.4%	18.6%
2. Disagree	4.3%	3.9%
1. Strongly Disagree	1.4%	0.8%
	Mean 3.7 **Standard deviation** 0.827	**Mean** 4.0 **Standard deviation** 0.809

Table 101: "I find it easy to learn new things"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	33.6%	27.7%
4. Agree	37.9%	44.8%
3. Unsure	24.0%	22.3%
2. Disagree	3.3%	3.5%
1. Strongly Disagree	1.2%	1.7%
	Mean 4.0 **Standard deviation** 0.904	**Mean** 3.9 **Standard deviation** 0.887

Table 103: "I am a very good student"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	16.9%
4. Agree	36.4%
3. Unsure	34.6%
2. Disagree	9.9%
1. Strongly Disagree	2.3%
Mean 3.6	**Standard deviation** 0.958

Table 104: "Netbooks have helped me to be a very good student this year"
December surveys n = 486

Response	December 2009
5. Strongly Agree	22.5%
4. Agree	46.1%
3. Unsure	24.4%
2. Disagree	5.4%
1. Strongly Disagree	1.7%
Mean 3.8	**Standard deviation** 0.895

Table 106: "Netbooks have helped me to be generally successful at school this year"
December surveys n = 486

Response	February 2009	December 2009
5. Strongly Agree	27.8%	29.8%
4. Agree	52.4%	50.1%
3. Unsure	16.9%	17.4%
2. Disagree	1.8%	2.7%
1. Strongly Disagree	1.0%	0.0%
	Mean 4.0 **Standard deviation** 0.781	**Mean** 4.1 **Standard deviation** 0.758

Table 105: "I am generally successful at school"
February surveys n = 492, December surveys n = 486

Response	February 2009	December 2009
5. Always	40.9%	67.3%
4. Almost Always	28.0%	24.6%
3. Sometimes	27.2%	6.8%
2. Almost Never	1.8%	0.6%
1. Never	2.0%	0.6%
	Mean 4.0 **Standard deviation** 0.968	**Mean** 4.6 **Standard deviation** 0.702

Table 107: "I use a computer/netbook at school"
February surveys n = 492, December surveys n = 486

Response	December 2009
5. Strongly Agree	75.0%
4. Agree	17.8%
3. Unsure	5.0%
2. Disagree	1.4%
1. Strongly Disagree	0.8%
Mean 4.6	**Standard deviation** 0.717

Table 108: "I like having a netbook"
December surveys n = 486

Response	December 2009
5. Strongly Agree	34.8%
4. Agree	37.9%
3. Unsure	18.8%
2. Disagree	5.8%
1. Strongly Disagree	2.7%
Mean 4.0	**Standard deviation** 1.004

Table 109: "Having a netbook is important to my learning"
December surveys n = 486