Avondale College of Higher Education

School of Education

A QUALITATIVE INVESTIGATION OF ENGAGEMENT IN ONE MATHEMATICS CLASSROOM

An Honours Thesis

Presented in Partial Fulfilment of the Requirements of the Degree of

Bachelor of Education (Primary)(Honours)

by

Paul Joseph Goossens

October 2013

Statement of Original Authorship

The work contained in this thesis has not been submitted previously for a degree or diploma at any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signed: _____ Date: _____

Statement of Copyright

I grant Avondale College the rights to archive and to make available my thesis in whole or in part for study purposes in the College Library, now and in the future. I retain all propriety rights. I also retain the right to use in future works all or part of this thesis.

Signed _____ Date _____

Acknowledgements

I would like to begin by offering endless thanks and gratitude to Phil and Edie, my supervisors in this research, for all of the time and effort you have put in for me throughout the past two years. Thank you so much for the encouragement and support you have given me, and for guiding me during such a valuable and meaningful experience. I look forward to staying in touch with you both in the future, and continuing to see you as a source of inspiration.

To my loving wife, Stefanie, I thank you so much for all of your unconditional love and support during this journey. The time you put into offering me advice and encouragement throughout this research was truly a blessing, and I am thankful for all that you do for me.

I would also like to express gratitude to those who took the time to read my work and offer their valuable advice. First of all to my mother, Carol, I just want to say how much I appreciated your support and willingness to help where you could in my research (and for pointing out all of the grammar errors I made!). Thank you so much for reading over everything I wrote and providing such valuable insights and suggestions. Also, a big thanks to both Tabitha and Tieren for your assistance in proof reading and offering valuable suggestions for improving my thesis before it was submitted.

The participants in this investigation also deserve special mention, as this research simply would not have occurred without them. In particular, I would like to express thankfulness for the teacher respondent in this investigation, for inspiring me to learn more about engagement and providing me with an initial glimpse of how this can occur in a classroom.

Of the upmost importance, I would like to thank Jesus Christ, my Lord and Saviour, for guiding me in my life and being the reason behind any and every success that I have. As I go now from here into the 'real world' of teaching, I pray that I can use what I have learnt from this research to share your love with children and bring them closer to you.

Abstract

This qualitative investigation was designed to explore the concept of 'engagement' in learning as it appeared in one middle school mathematics class. This involved using Cambourne's (1995) Conditions of Learning as a theoretical lens to gather evidence from the teacher and students of this class using the methods of interviews, observations and a reflective journal. Although this particular case revealed a somewhat hindered form of engagement, the result of this investigation was to elaborate on the existing model of the Conditions of Learning and reveal important factors for promoting engagement in classrooms. In particular, this involved re-defining the role and description that each of the existing conditions in this model (immersion, demonstration, expectation, response, employment, approximation and responsibility) have in authentic learning; and also resulted in offering two new conditions (fascination and social-emotional learning) as key aspects in providing students with engaging and authentic learning.

Keywords: Engagement, mathematics, authentic learning, social-emotional learning

Table of Contents

Statement of Original Authorship i
Statement of Copyright ii
Acknowledgements ..... **iii**
Abstract ..... **iv**
Table of Contents ..... **v**
List of Tables viii
List of Diagrams ix
List of Images x

PROLOGUE – THE DETECTIVE'S BACKGROUND **1**
Engagement and the Conditions of Learning **1**
Practicum Experience **2**
The Teaching of Rocketry 2
The Conditions of Learning as a Theoretical Lens **3**

CHAPTER ONE – BACKGROUND TO THE INVESTIGATION **5**
Investigation Questions **5**
Engagement Defined and Introduced **5**
Rationale **6**
The Choice of Engagement 6
The Choice of Mathematics 7
The Choice of Grade Six 8
The Choice of Qualitative Research 8
Research Design **9**
Methodology 9
Location and Participants 10
Data Collection 12
Data Analysis 13
Assumptions and Limitations **13**
Thesis structure **14**

CHAPTER TWO – INVESTIGATING THE LITERATURE **16**
Introduction **16**
Cambourne's Conditions of Learning and Engagement **18**
Conditions of Learning 18
Analysing the Conditions of Learning *20*
Processes Which Enable Learning *21*
Cambourne's Perceptions of Engagement 22
Engagement and Mathematics Education in Middle School **24**
Issues in Mathematics Education 24
Issues in Middle School Engagement 25
Exploration of the Research on Engagement **26**
The Development of the Concept of Engagement 27
Related Concepts – Confusion of Terms 28
The Theory of Flow *29*
Student Involvement *31*
Motivation *31*
Social-Emotional Learning 33
Neuroscience Regarding Engagement 34
Self-Efficacy 36
Teacher Ideology 37
Reflection 39
Fascination 40
Authentic Learning 41
A Working Personal Definition of Engagement **43**

Dictionary Definitions of Engagement 43
Concluding Thoughts and Definition of Engagement 44
Gaps in the Research 45
Methodological Deficiencies 45
The Unclear Definition and Description of Engagement 47

CHAPTER THREE – METHODOLOGY OF THE INVESTIGATION 49
Introduction 49
Entry Conditions 51
The Site and Respondents 52
Transparency as an Entry Condition 53
The Conditions of Learning as a Theoretical Lens 53
Transparency as Trustworthiness 54
Tacit Knowledge as an Entry Condition 57
Guiding Assumptions 58
Ethical Considerations 59
Design of the Investigation 60
Research Question 60
Qualitative Investigation 63
Detective Role in Research 66
Elements of Case Study 66
Researcher as Detective 66
Methods of Gathering Evidence 68
Observations 73
Interviews 75
Reflective Journal 78
Analysing and Reporting the Findings 79
Investigation Analysis 79
The Process of Coding 81
Open Coding 83
Axial Coding 84
Selective Coding 86
Outcomes of the Investigation 86
Representing the Findings 86
Towards a Theory of Optimal Learning Conditions 87

CHAPTER FOUR – INVESTIGATION REPORT 88
Introduction 88
Aim of this Chapter 88
Revisiting the Conditions of Learning 88
Structure of this Chapter 90
A Look into the Past – the Teaching of 'Rocketry' 91
Case Study of a Teacher – Episodes of Education 93
Schooling Experiences 94
High School Specific Experiences 96
Teacher Training and Practicum Experiences 100
Tertiary Education 100
Practicum Experiences 106
Experiences and Beliefs as a Qualified Teacher 111
Development as a teacher 111
Ideology, Knowledge and Practice as a Teacher 117
Attitude towards Teaching 117
Attitude towards Theory 119
Role of a Teacher 121
Student Case Study 128
Perception of Interesting Learning 128
Perception of Achievement 132

Perception of Collaboration 134
Conclusion 138

CHAPTER FIVE: INVESTIGATION DEBRIEFING 140
The 'Revised' Conditions of Learning 140
Conditions for Optimal Learning Experiences 142
Engagement 143
Immersion 144
Demonstration 147
Expectation 149
Response 152
Employment 155
Approximation 157
Responsibility 159
Fascination 161
Social-Emotional Learning 164
An Overview of the Revised Conditions of Learning 167
Reflection and Teacher Ideology 169

CHAPTER SIX – INVESTIGATION RECOMMENDATIONS 172
Practices to Improve Engagement 172
Implications for Middle School Education 172
Implications for Tertiary Education 173
Further Research towards a Theory of Optimal Learning 174

EPILOGUE – THE DETECTIVE'S EXPERIENCE 177

REFERENCES 178

APPENDICES 185
Appendix A – Student Information Letter 185
Appendix B – Parent/Teacher/Principal Information Letter 187
Appendix C – Student Consent Form 189
Appendix D – Teacher Consent Form 190
Appendix E – Principal Consent Form 191
Appendix F – Parent Consent Form 192
Appendix G – Sample of Observation Data 193
Observation 3 193
Appendix H – Sample of Memoed Observation Data 194
Appendix I – Schedule for First Interview with Mr Jackson 195
Core Questions 195
Further Questions 195
Appendix J – Sample of Notes Taken During Second Interview with Mr Jackson 196
Appendix K – Sample Transcription of Interview with Mr Jackson 197
Appendix L – Sample of Memoed Interview Transcription 198
Appendix M – Sample of Reflective Journal Entry 199
Appendix N – Mr Jackson's Ideology, Knowledge and Practice 200
Appendix O – Sample of Emergent Themes from Interview 201
Appendix P – Sample of Categorising Data 202
Appendix Q – Initial Codes 203
Appendix R – Categorising Codes 204
Appendix S – Initial Coding Diagram – The Flow of Learning 205
Appendix T – Development of the 'Figure Eight Diagram' 206
14th August 2013 206
27th August 2013 206
30th August 2013 206

List of Tables

Table 2.1: Summarising the Conditions of Learning 20
Table 2.2: Summarising the Processes Which Enable Learning 22
Table 3.1: Strategies to Enhance Trustworthiness 55
Table 3.2: Reflective Journal Excerpt #1 – Development of the Research Question 56
Table 3.3: Key Characteristics of Qualitative Research 65
Table 3.4: Reflective Journal Excerpt #2 – Reflective Thoughts on Student Interview 67
Table 3.5: Observation Schedule 73
Table 3.6: Reflective Journal Excerpt #3 – Observations' Role of Informing Interviews 74
Table 3.7: Interview Schedule 75
Table 3.8: Reflective Journal Excerpt #4 – Following up Themes Arising in Interviews 76
Table 3.9: Highlighted Sample of Questions for Initial Teacher Interview 77
Table 3.10: Corbin & Strauss' (2008) approach to coding qualitative data 83
Table 3.11: Initial Codes 85
Table 5.1: Evidence to Develop the Condition of Immersion 144
Table 5.2: Further Evidence to Develop the Condition of Immersion 145
Table 5.3: Evidence to Develop the Condition of Demonstration 147
Table 5.4: Further Evidence to Develop the Condition of Demonstration 148
Table 5.5: Evidence to Develop the Condition of Expectation 150
Table 5.6: Further Evidence to Develop the Condition of Expectation 151
Table 5.7: Evidence to Develop the Condition of Response 153
Table 5.8: Further Evidence to Develop the Condition of Response 155
Table 5.9: Evidence to Develop the Condition of Approximation 157
Table 5.10: Further Evidence to Develop the Condition of Approximation 159
Table 5.11: Evidence to Develop the Condition of Fascination 161
Table 5.12: Further Evidence to Develop the Condition of Fascination 162
Table 5.13: Evidence to Develop the Condition of Social-Emotional Learning 165
Table 5.14: An Overview of the Revised Conditions of Learning 168

List of Diagrams

Diagram 0.1: Reflection on the Conditions of Learning in the Teaching of 'Rocketry' 4
Diagram 2.1: The Structure of Chapter Two 17
Diagram 2.2: Cambourne's (1995) Conditions of Learning 19
Diagram 2.3: Maslow's Heirarchy of Needs 27
Diagram 2.4: 'Flow' as the Balance between Skill and Challenge 29
Diagram 3.1: The Research Process 50
Diagram 3.2: Structure for the 'Entry Conditions' Section 51
Diagram 3.3: Structure for the 'Design of the Investigation' Section 60
Diagram 3.4: The Interactive Relationship between the Research Question and Design 62
Diagram 3.5: The Iterative Process of Qualitative Research 63
Diagram 3.6: Processes of Data Collection and Analysis 68
Diagram 3.7: Triangulation as Constant Comparison between Respondents 70
Diagram 3.8: Structure for the 'Methods of Gathering Evidence' Section 71
Diagram 3.9: Triangulation as Constant Comparison across Methods 72
Diagram 3.10: Structure for the 'Analysing and Reporting Findings' Section 79
Diagram 3.11: Revisiting the Process for Data Collection and Analysis Diagram 80
Diagram 3.12: The Iterative Process of Analysing Qualitative Data 81
Diagram 3.13: Collaborating between Methods to Develop Themes 82
Diagram 3.14: The Flow of Learning 85
Diagram 3.15: The Result of Coding – A Model of Optimal Learning Conditions 86
Diagram 4.1: Reviewing the Conditions of Learning 89
Diagram 4.2: Mini-Analysis One – Reflecting on Schooling 99
Diagram 4.3: Mini-Analysis Two – Reflecting on Tertiary Education 105
Diagram 4.4: Mini-Analysis three – Reflecting on Practicums 110
Diagram 4.5: Mini-Analysis Four – Reflecting on Development 116
Diagram 4.6: Mini-Analysis Five – Reflecting on Ideology 127
Diagram 4.7: Mini-Analysis Six – Reflecting on Students' Perspectives 137
Diagram 4.8: The Hindered Conditions of Learning in this Classroom 138
Diagram 5.1: Updating the CoL - A Model of Optimal Learning Conditions 141
Diagram 6.1: Triangulation as Further Investigation with Varied Context 175

List of Images

Image 0.1: Processes Involved in the Teaching of 'Rocketry' 3
Image 3.1: Excerpt of the Processing of Memoing and Highlighting Evidence 84
Image 4.1: Processes Involved in the Teaching of 'Rocketry' 91

Prologue – The Detective's Background

Before diving into this thesis, I would like to briefly tell what led me into this investigation in narrative form (Graziano & Raulin, 2013) so that you, the reader, may better understand my intention and motivation as I delve into exploring educational engagement.

Engagement and the Conditions of Learning

The journey for this research began with my interest into the field of engagement. With the initial teaching experience and knowledge under my belt arising from several practicums and three years of study, I became aware that something was often amiss in children's experiences of learning as I had observed and experienced it. I soon came to believe that something was 'engagement', the need to experience learning in a meaningful, authentic and relevant way. Although often talked about, this process was not something I perceived as actually occurring enough in schooling.

My interest in 'engagement' also stemmed from my practices of using my skills with guitar playing, technology and magic tricks as tools to generate interest in the classroom. But I became curious as to what factors and circumstances actually provided students with engaging educational experiences, particularly as I felt I lacked experience, knowledge and understanding of how engagement really 'works'.

While reflecting on all of this, my initial readings into engagement led to Cambourne's (1995) Conditions of Learning, which describe the essential conditions that need to be set up for engagement to occur in a literacy learning context. These will be referred to as the CoL throughout this thesis and will be treated as plural, given that it denotes a set of multiple conditions. Reading about the CoL spurred my curiosity for discovering more about how this model can be applied in other learning contexts. In particular, I was interested in how these conditions could be present in the learning of mathematics, an area in which I was (and still am) becoming increasingly skilled and passionate about.

Practicum Experience

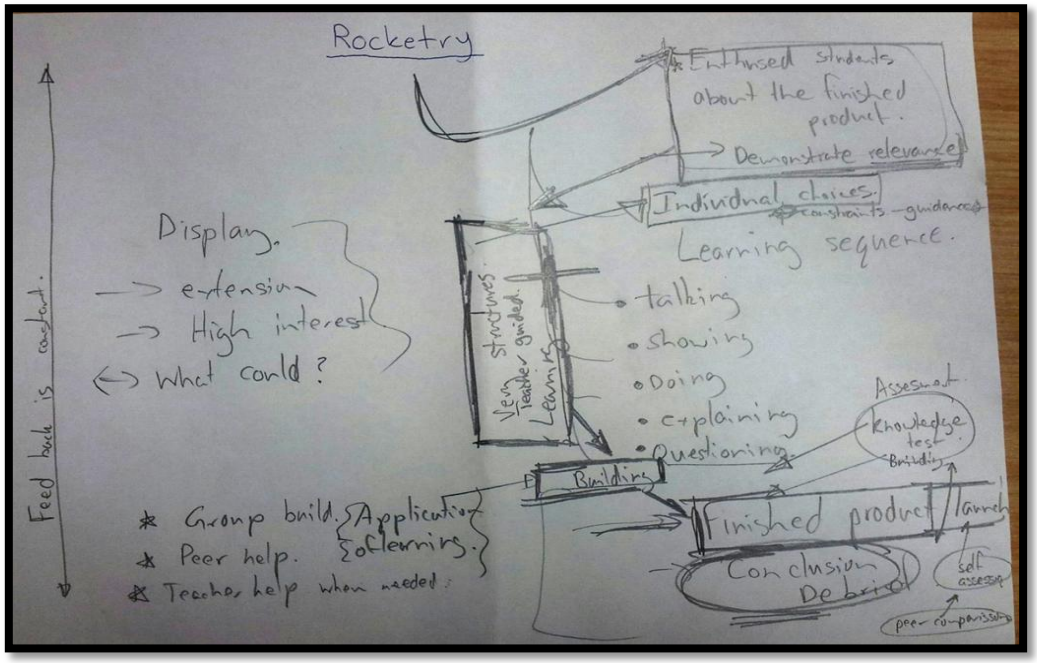
Leading on from this discovery, I embarked on my final practicum, which occurred in a grade six class with a teacher named Mr Jackson. When I came to Mr Jackson, he had been teaching grade six in this school for several years and was somewhat considered to be the 'maths guru' due to his enjoyment and skill in this subject area. I very much enjoyed my practicum in Mr Jackson's class, because he not only gave me a better understanding of how a male teacher functions (something which I felt I hadn't been exposed to enough), but demonstrated to me what engaging lessons (in both mathematics and other areas) can look like and involve. His planned and intentional use of games and other enjoyable learning experiences spurred my interest into finding out more about how this teacher actually achieved engagement in his classroom. It was this reason, as well as the reason highlighted below, that led to my decision to investigate this teacher and his classroom in my research of exploring the CoL and engagement.

The Teaching of Rocketry

For several years before taking on his current role, Mr Jackson taught a rocketry unit to his grade 6 class which he also shared with his fellow grade 6 teachers. This topic was directly linked to Mr Jackson's personal interests and it was in observing and learning about this (during my six week practicum in his class) that I also observed a passionate teacher who shared engagement with his students. This was another factor which made me want to investigate this teacher in my research of engagement and the CoL.

The diagram on the following page demonstrates Mr Jackson's understanding of the factors that were involved in the teaching of this rocketry unit. This was obtained through a discussion with him, in which he revealed his thoughts on how engaging learning occurs in this process.

Image 0.1: Processes Involved in the Teaching of 'Rocketry'

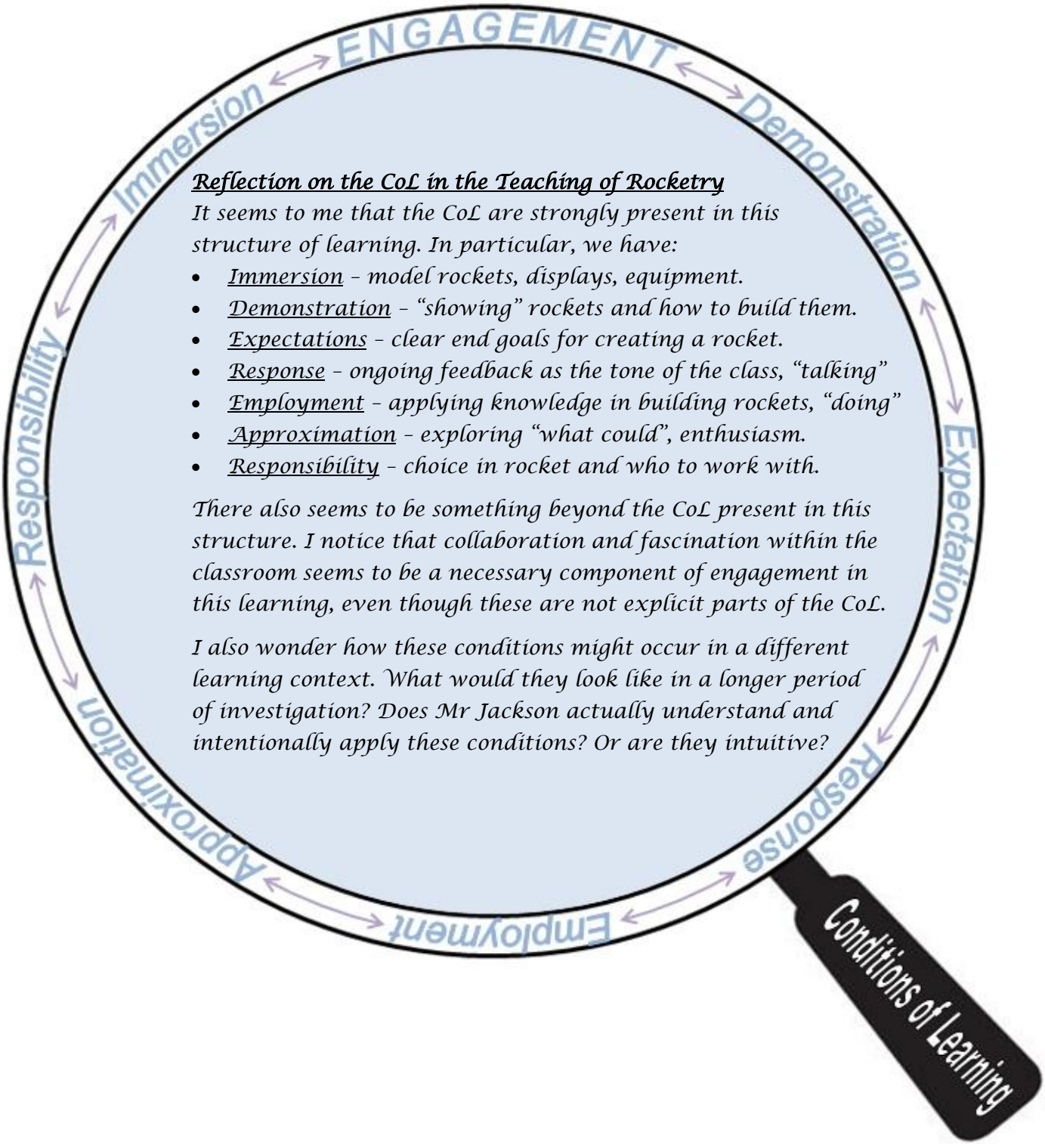


As I had observed and was now even more enlightened to, the processes involved in this sequence seemed to provide an authentic, hands-on and engaging learning experience.

The Conditions of Learning as a Theoretical Lens

Through reflection, I also came to have thoughts on how the CoL were present during this learning experience. I will now share these with you using a diagram I have developed to show how the CoL have been the driving force for all aspects of my research (the focus question, the structure, the methods and the analysis), which will become apparent as you read on. Although the CoL have not yet been fully explained, the diagram I have developed provides a simple overview of these conditions as they are displayed as the frame of a magnifying glass with the central condition of engagement clearly indicated. This magnifying glass represents my 'detective like' role (Merriam, 1998) in this research, in which I aim to investigate engagement through the lens of the CoL. However, for the moment, I would like to use this lens to share my initial thoughts on the CoL as they appeared in the teaching of rocketry which I observed, which was the initial appearance of tacit knowledge in this investigation (Churchill, et al., 2011).

Diagram 0.1: Reflection on the Conditions of Learning in the Teaching of 'Rocketry'



From here on in, you as the reader will see this magnifying glass throughout this thesis as I invite you to peer over my shoulder to share my investigative thoughts in exploring the CoL as well as to indicate the structure of the writing in most chapters of this thesis.

Chapter One – Background to the Investigation

Having told the story (in the Prologue) of how I began this investigation, I would now like to invite you, the reader, to embark on a journey of exploring the collaborative components of this qualitative investigation of student engagement in mathematics. This journey begins here, in this chapter, which is intended to summarise what was involved in this investigation and outline the structure of this thesis.

Investigation Questions

The primary question which acted as a driving force in this investigation was:

> ***"What is the relationship between one teacher's understanding of engagement and his students' experience of this understanding in a middle school mathematics class?"***

In exploring this, I also investigated the following sub-questions:

1. Do the 'Conditions of Learning' play a role in the teaching of mathematics?
2. Are there any further aspects related to the 'Conditions of Learning' that promote engagement in mathematics?

Engagement Defined and Introduced

Engagement is a concept which has been defined in educational contexts as the level of interest and involvement students have in learning (Axelson & Flick, 2010; Rotgans & Schmidt, 2011). The perceived academic, behavioural and emotional improvements associated with promoting active engagement has designated it as the key factor of learning (Cambourne, 1995), which has caused it to become the basis for several recent

investigations (Doll, Spies, LeClair, Kurien, & Foley, 2010; Elias, Mustafa, Roslan, & Noah, 2011; Green, Martin, Marsh, & McInerney, 2006). The outcome of these studies indicates that engagement is influenced by self-efficacy [defined as students' self-belief of their capabilities] (Elias, et al., 2011; Hughes & Riccomini, 2011; Jameson, 2009), relevancy of learning content (Arends & Kilcher, 2010; Borich, 2011; Rotgans & Schmidt, 2011), as well as positive relationships between students and their teacher (Doll, et al., 2010).

However, despite these research projects revealing the perceived benefits of engagement and factors that can promote it, students are evidently struggling to engage, experience success and see meaning in the subject of mathematics (Klein, 2010; Rowan-Kenyon, Swan, & Creager, 2012; Sousa, 2008). Furthermore, many of these prior investigations occurred in the quantitative domain (Fast, et al., 2010; Hughes & Riccomini, 2011), which does not seem to facilitate the need to explore and understand the perceptions of engagement (Appleton, Christenson, Kim, & Reschly, 2006; Rowan-Kenyon, et al., 2012). Also, the emerging research revealing social-emotional learning as an important facet in creating authentic learning environments has also identified emotion to be in a state of distress in the classroom (Fitzsimmons & Lanphar, 2011; Kohn, 2011), hence negatively impacting engagement. This all indicates the need for further research in this area to improve practices of promoting engagement, as I intend to achieve in this investigation.

Rationale

The Choice of Engagement

The choice of engagement as the focus of this investigation relates to the need to refine this concept as well as my professional interest in engagement's impact in classroom contexts, as discussed in the Prologue. Despite engagement being the subject of some recent investigation, as mentioned earlier, it has been noted both historically and currently that this has somewhat failed to precisely describe and evaluate engagement

effectively (Appleton, et al., 2006; Astin, 1999; Elias, Mustafa, Roslan, & Noah, 2010). Furthermore, engagement appears to often be neglected in classrooms due to teachers being more focussed on curriculum constraints and behaviour management (Rowan-Kenyon, et al., 2012) rather than providing their students with an authentic learning environment. This appears to be particularly true in mathematics, indicating one of the reasons I focussed on this particular learning area in this investigation.

The Choice of Mathematics

The area of mathematics has been chosen for this investigation, again because of my personal interest in this domain, as well as the perceived need to improve both the quality and outcomes of mathematics in an educational context (McAteer, 2012). Furthermore, despite the proven significance that mathematics holds in both educational and employment prospects, it is commonly seen as the most difficult and abstract subject in the curriculum (McAteer, 2012). This perception also relates to the recurring problems occurring in this subject area related to negative attitudes, a focus on rote learning and bland learning experiences (Klein, 2010; Rowan-Kenyon, et al., 2012; Sousa, 2008). These factors have in turn contributed to Australian students' knowledge and abilities in mathematics to 'deteriorate to a dangerous level' (Klein, 2010, p. 1, citing Brown, 2009), which indicates the need for action to improve educational practices in this area.

Furthermore, while the area of mathematics has been somewhat explored in relation to student engagement (Klein, 2010, p. 1, citing Brown, 2009), this appears to require further investigation to distinctly explore engagement and what it is influenced by. This has been said to most effectively occur through a qualitative inquiry (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012) and, in particular, by basing research on specific questions such as "what are the factors affecting student engagement in a particular type of learning process?" (Axelson & Flick, 2010, p. 5). This suggestion has influenced not only

my choice to investigate mathematics specifically, but also to focus this research on a specific age group that seem to particularly struggle with engaging in learning.

The Choice of Grade Six

A grade six classroom has been chosen as the focus for this study, as it has been noted that negative attitudes toward mathematics seem to become particularly prominent during middle school, where students struggle with increasingly abstract concepts, rote learning and lack of variety in educational experiences (Attard, 2012; Klein, 2010; Rowan-Kenyon, et al., 2012). This indicates the benefits of a focussed investigation of the perceptions relating to these negative attitudes, which will facilitate the improvement of educational practices and therefore prevent such issues early in the life of students. However, such an investigation of participants' perceptions appears to initially require the use of a qualitative approach.

The Choice of Qualitative Research

The choice of a qualitative paradigm for research in this study was primarily driven by the apparent need to explore the perceptions and actions of individuals (Graziano & Raulin, 2013) regarding engagement in mathematics through my role of 'researcher as detective' (Merriam, 1998). This decision was also influenced by the 'intangible nature of engagement' (Borich, 2011, p. 13), making it difficult to quantitatively measure, as well as the research question being the driving force in this investigation (Graziano & Raulin, 2013). Therefore, as characterised by qualitative research, this investigation was "inductive, emerging and shaped by the researcher's experience in collecting and analysing data" (Creswell, 2013, p. 22).

Another aspect affecting the choice of methodology is that of the gaps in the research. As mentioned earlier, there seems to have been several quantitative studies attempting to measure engagement in both mathematical (Fast, et al., 2010; Hughes & Riccomini, 2011) and more general constraints (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012).

However, it appears necessary to broaden the methodology of these investigations into the qualitative domain in order to gain a clearer perception of the factors impacting engagement and allow this concept to be refined (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012). While some constrained qualitative inquiry relating to mathematical engagement has recently occurred (Attard, 2012; Rowan-Kenyon, et al., 2012), this area appears to require further exploration and to precede quantitative studies. Although one study resulted in the development of a framework for engagement in mathematics (Attard, 2012), data for this investigation was collected primarily through observation, which indicates the need for further exploration of actual perceptions on engagement in mathematics and triangulation (McMillan & Schumacher, 2010) across methodologies and participants. This directly relates to the way in which I have designed this specific investigation, which will be explored below.

Research Design

Methodology

The aim of this investigation was to gain understandings of the perceptions and actions of respondents regarding engagement. This occurred through developing relationships with the participants and conducting the investigation within their natural setting using face-to-face interactions (Christensen, Johnson, & Turner, 2011; Creswell, 2013; Graziano & Raulin, 2013; Jackson, 2012), which was indicative of the appropriateness of a qualitative approach (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012). In particular, this investigation was grounded in emergent design (Creswell, 2013), in that everything within it was responsively developed according to what was found during the process of data collection and analysis (Wolcott, 2009).

During this investigation I also took on a ‘detective like’ role (Merriam, 1998) as a metaphor for the tools I used to uncover and analyse clues related to the understandings

of engagement and the CoL in this mathematics class. This involved investigating engagement in mathematics by using a variety of methods to gather evidence (Denzin & Lincoln, 2005, p. 384; 2011, p. 168) and conducting multiple levels of triangulation (Luttrell, 2010; Punch, 2009) by constantly comparing between the sources and modes of data collection, which will be described later on in this chapter. In particular, this involved the use of Cambourne's (1995) CoL as a theoretical lens to inform and drive the processes involved in this investigation. Not only was this used as a tool of gathering and analysing data, it has also been used throughout this thesis to provide structure or offer further insights where necessary (as evident in the Prologue).

Furthermore, this detective like role also relates to the idea of transparency (Yun, 2011) as a means for potraying the 'trustworthiness' processes in this investigation. This required me to clearly express the presence and impact of the motives, assumptions, interests and values that were apparent in this investigation (Flick, 2009; McMillan & Schumacher, 2010; Scott & Garner, 2013), which occured in the Prologue to this thesis but will also be made explicit later on in this chapter and throughout Chapter Three.

In further following on with this detective role, a case study approach was used as both a method and a product of inquiry (Creswell, 2013) in this investigation in which I explored the respondents' perceptions of engagement. This also facilitated comparison both within different sections of each case and between the individual cases (Creswell, 2013) in order to gain a better understanding of the respondents' perceptions of engagement. These respondents and the setting they were investigated in are further described below.

Location and Participants

This research was conducted in a Christian primary school in Australia in which I investigated the students and teacher of a combined grade five and six mathematics class. This particular group of students were considered to be in the 'Mathematics Support Class' and therefore only met together with their mathematics teacher for 45 minutes each day.

As outlined in the prologue, this group was chosen as a combination of factors relating to my own personal interest in this age group as well as my observations of the teacher of this group constructing engaging learning experiences and his reputation of being an effective mathematics teacher.

All 18 students in this class became participants in terms of the observations that occurred during this investigation. Initially, it was intended to interview four students (two male and two female) in this investigation and conduct at least two sessions with each. However, the constraints of this research, which will be described later on in this chapter, as well as the aspect of emergent design (Creswell, 2013), led to the focus of this investigation shifting more onto the teacher participant. Therefore, this investigation instead involved interviews with two male students, whom provided their perceptions of engagement in separate sessions (one per student) of about 30 minutes each.

This teacher respondent had been teaching upper primary classes for several years at this school. However, in the year this investigation occurred he had taken on a new role of being the computer teacher for all students in the primary school as well as teaching the mathematics support class which was the subject of this investigation. As mentioned above, this teacher became somewhat of the key participant in this investigation, in which he participated by allowing me to explore his understandings of engagement in mathematics in the context of observations and four interview sessions.

The final respondent for this study was myself, the researcher. As mentioned earlier, I had previously met the classroom teacher, however this was not perceived to greatly affect this investigation. The primary way in which I contributed to this investigation involved the use of a reflective journal (Lichtman, 2013), which will be further described below. However, my ‘detective like’ role (Merriam, 1998) also indicated my participation in this investigation through being a presence during observations and collaboratively constructing meaning by negotiating with participants during interviews (Creswell, 2013).

Data Collection

As characterised by qualitative research, this investigation involved the use of multiple methods of gathering data to facilitate comparison between both these methods and the participants who provided this evidence (Creswell, 2013).This strategy is commonly known as using a 'bricolage' of data collection tools (Denzin & Lincoln, 2005, 2011). However, in maintaining the previously mentioned metaphor, I have labelled this as my 'detective's toolkit' (Merriam, 1998). This also involved conducting multiple levels of triangulation across both methods and respondents (Luttrell, 2010; Punch, 2009) in order to 'analyse relationships between individuals and their contexts' (Denzin & Lincoln, 2005, p. 320).

The observations used in this investigation involved utilising the senses to take descriptive notes relating to engagement through examining and reflecting on the physical setting, participants, activities, interactions, conversations, and my own behaviours during the observed mathematics lessons (Creswell, 2013; Kumar, 2011; McMillan & Schumacher, 2010). These observations not only provided a depth of understanding in this investigation, but served the purpose of informing the in-depth interviews, which were the main source of evidence gathered in this investigation (Denzin & Lincoln, 2005).

In-depth interviews occurred with the purpose of describing, interpreting and capturing the essence of participants' perspectives and experiences (Lichtman, 2013; McMillan & Schumacher, 2010; Minichiello & Kottler, 2010) regarding engagement. These involved a process of open-response questions which were adapted according to individual participants (McMillan & Schumacher, 2010; Rubin & Rubin, 2012). As mentioned earlier, this primarily occurred with the teacher participant but also involved interviewing two of the student participants. Interviews in this investigation were based on a responsive interviewing model which involved the adaptation of questions and design in response to data gathered in prior interviews and observations (Rubin & Rubin, 2012), hence maintaining the emergent design of this investigation (Creswell, 2013).

The final source of evidence in this research involved the use of a reflective journal in which I, as the detective (Merriam, 1998), contributed to this investigation. This involved writing reflective entries during the process of gathering evidence (Yun, 2011) to capture my perceptions and describe the way in which my discoveries had changed my understanding (Corbin & Strauss, 2008), making this another source of evidence for analysis in this investigation. Furthermore, this journal proved to be valuable for reflecting on the decisions which needed to be made to adapt this investigation according to its emergent design (Creswell, 2013). Finally, this reflective journal provided an effective means for promoting my transparency in this investigation, as it involved keeping a record of my 'thoughts, actions and feelings' (Yun, 2011, p. 19).

Data Analysis

The data collected during this investigation was inductively analysed (Jackson, 2012) both during and after data collection through a process of coding, categorising, interpreting and validating (McMillan & Schumacher, 2010). These processes also occurred in the context of my 'detective like role' (Merriam, 1998) through the use of the CoL as a theoretical lens. However, the emergent design (Creswell, 2013) of this investigation was upheld through maintaining flexibility and adaptability in these planned analysis procedures.

Assumptions and Limitations

It was assumed in this research that the participants would provide honest and accurate perceptions of engagement in mathematics, and also that these would be able to be somewhat generalised to a typical learning environment beyond what was investigated here. The effect of this assumption was somewhat alleviated through constantly comparing the evidence gathered between methods, participants and the literature

(Luttrell, 2010; Punch, 2009) in order to gain an accurate picture of what influences and impacts engagement in mathematics.

The fact that this investigation occurred in the context of an honours thesis, indicated the somewhat unavoidable restrictions relating to both time and experience of myself, the researcher. The primary way in which this impacted my investigation involved attempting to gain student and parent consent for my study, which was somewhat unsuccessful at first due to the student participants only seeing this particular teacher briefly each day and hence lacking reminders to hand the notes to their parents. This initially caused major blockages to my investigation in that it further limited my already fleeting time. However, the responsive and emergent nature of this investigation (Creswell, 2013) allowed me to somewhat counteract this by focussing more on the teacher of this classroom, rather than the students.

The other main assumption present in this research involved the use of the CoL as a theoretical lens throughout this investigation. This primarily related to my role of playing the detective in this investigation (Merriam, 1998), as I explored the perceptions of engagement using this model of engagement as a point of reference. The use of the CoL as a theoretical lens also contributed to my transparency (Yun, 2011) in this investigation through allowing me to focus my attention on different aspects of the evidence as it was gathered and analysed (Reeves, Albert, Kuper, & Hodges, 2008).

Thesis structure

The presentation of this investigation is based on the traditional five-chapter model. However, I have somewhat elaborated on this regular structure within each chapter and have also added a dedicated chapter at the end of this thesis with the purpose of providing recommendations, effectively separating this facet from Chapter Five. A brief overview of what each of these chapters will involve is presented below.

Chapter One, which you are currently reading, serves the purpose of introducing this investigation and providing the structure for how it will be presented. This has occurred through briefly exploring the concepts required to understand the concepts within this investigation, which will be further unpacked in the following chapters.

Chapter Two will involve an in-depth exploration of the literature related to the focus of this investigation, namely engagement in a middle school context. This will intend to provide a background to this investigation and tentatively answer the focus question through using the literature to define engagement in this context.

The purpose of Chapter Three will be to detail the process used to collect and analyse the evidence gathered in this investigation. This will also involve descriptions of the paradigm and methods used in this investigation, as well as how they facilitate the need to answer the question driving this research.

Following this I will report the findings of this investigation in Chapter Four. This will initially involve presenting a case study of the teacher investigated in this research, and then also presenting a case study of the student respondents to facilitate comparison between these two sources of data. Throughout this process of reporting I will also add to the story by providing snippets of the other evidence gathered in this investigation, being observations and reflective journal entries. Furthermore, in reporting these findings I will also provide mini-analyses at the end of each section to preview the discussion that will occur in the following chapter.

Chapter Five will then involve a collaboration of the evidence reported in the previous chapter and the literature explored in Chapter Two to answer the question driving this research.

Leading on from this, Chapter Six will involve suggesting practices to promote engagement as well as offering recommendations for further investigation to expand on these findings.

Chapter Two – Investigating the Literature

Introduction

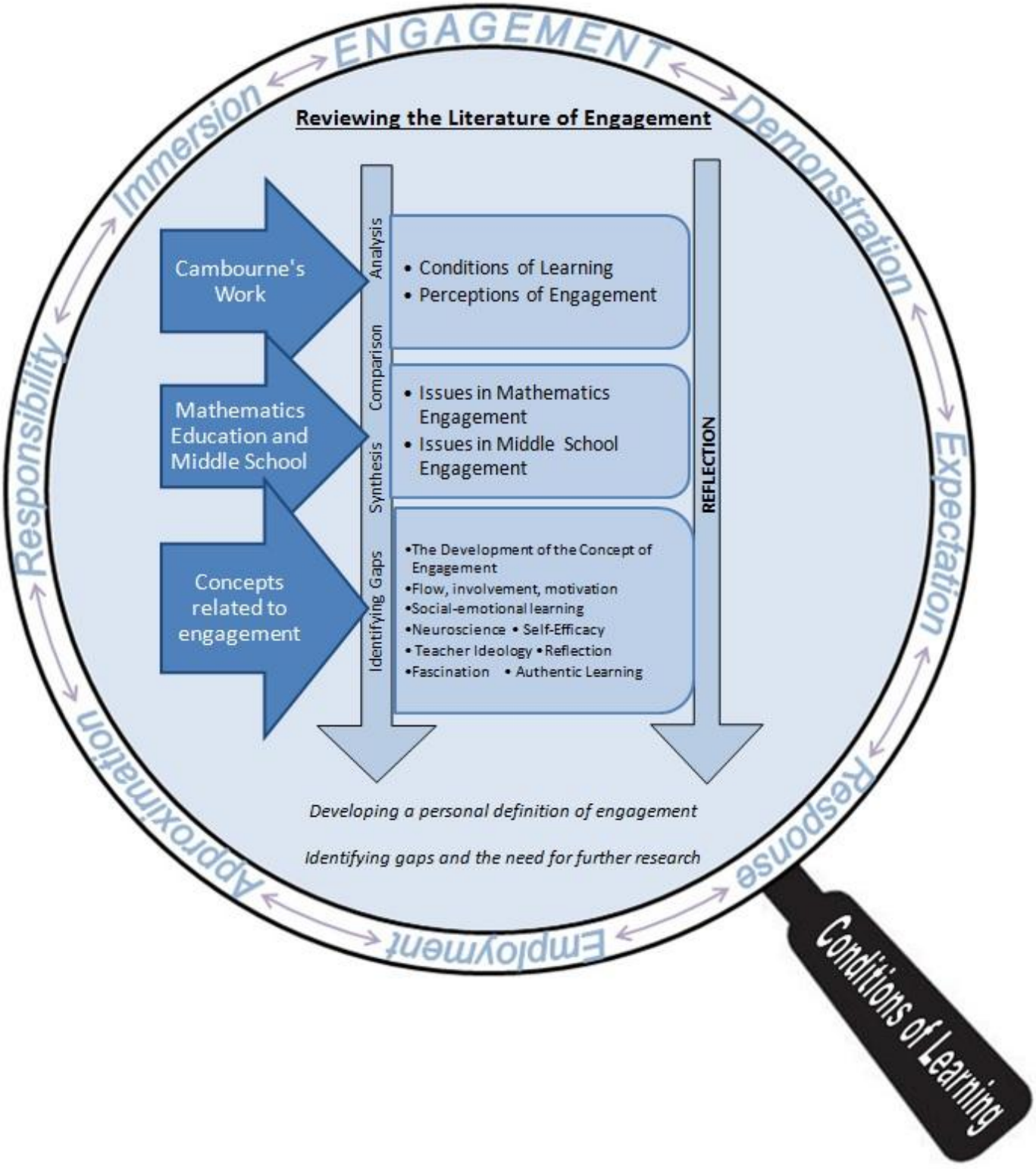
The purpose of this chapter is to explore and critique the literature regarding the concept of engagement as it relates to Cambourne's (1995) CoL and the question driving this investigation, which is:

> ***"What is the relationship between one teacher's understanding of engagement and his students' experience of this understanding in a middle school mathematics class?"***

Even briefly glancing at this question reveals that this review of the literature requires exploration of concepts such: engagement, theories related to engagement and previous research on the factors impacting engagement. In particular, it seems highly important to actually explore what the CoL are and how they were formed, as this model will be referred to both throughout this chapter and this entire thesis. Furthermore, the context and site of this research indicates the need to highlight what the literature has to say about mathematics education, particularly in that of the middle school age bracket. It also seems necessary in this process to develop a succinct and meaningful definition of engagement connected to the CoL and optimal mathematics education. For this reason, this review will simultaneously explore the relevant aspects of engagement while building up to a description of engagement that I perceive as appropriate in regards to the literature and the purpose of this investigation.

Below is a graphic display of how I have structured this investigation of the literature which indicates the topics that will be unpacked in exploring and defining engagement. As has been used already in this thesis, the lens of the CoL frames this graphical structure to indicate the importance of this model of optimal learning in guiding this literature review.

Diagram 2.1: The Structure of Chapter Two



I will begin this review by unpacking the CoL and exploring Cambourne's understandings of engagement as they appear in the literature. Following this, I will focus my lens on exploring what the literature reveals about the domain of mathematics as well as the

factors of being in middle school and how these relate to engagement. Next I will explore how engagement has been defined and redefined, as well as its perceived benefits and apparent prerequisite factors. In this section I will also explore concepts which are interconnected with engagement and indicate how these fit in with this investigation focussing on mathematics including: the theory of 'Flow', motivation and student involvement. This will lead to a further unpacking of the major factors impacting engagement in which I will discuss social-emotional factors, relevant neuroscience, self-efficacy, teacher ideology and practices of reflection as they apply to engagement. All of this will be tied together as I explore the notion of authentic learning and then offer a definition of engagement resulting from the synthesis of everything that will have been explored. Finally, and as a segue to the following chapter, I will briefly explore what is perceived as missing from the current research on engagement in education.

Cambourne's Conditions of Learning and Engagement

Conditions of Learning

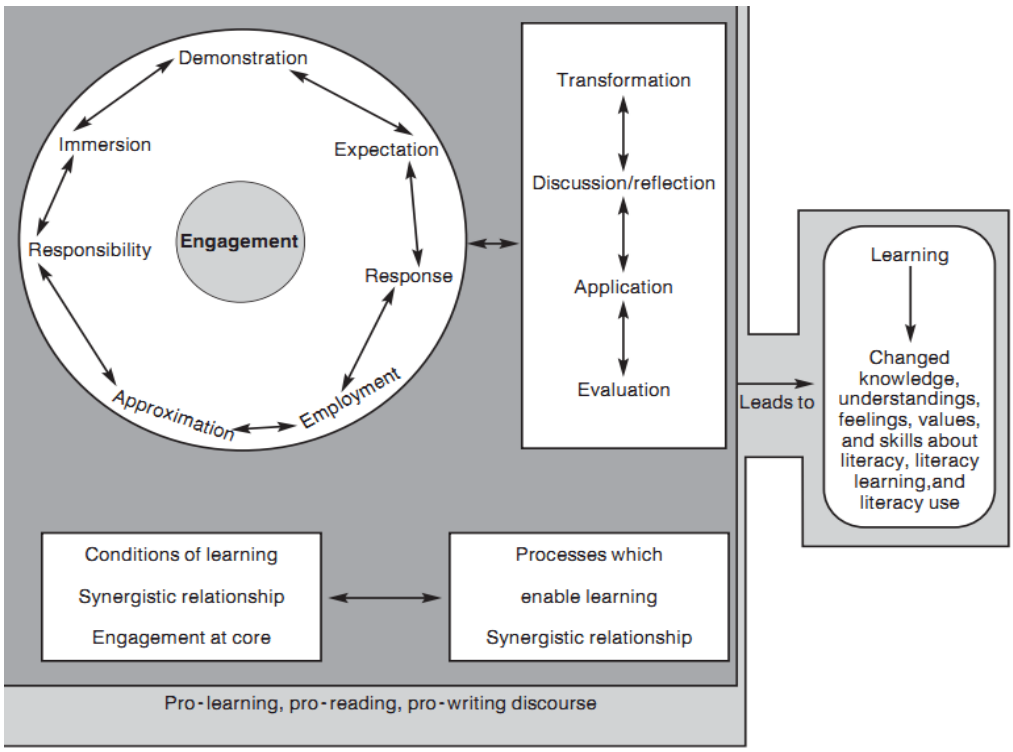
For over 20 years Brian Cambourne explored how children learn by collecting data from natural settings with the goal of finding an "educationally relevant theory of learning" (Cambourne, 1995, p. 182). The result of Cambourne's research in this area was the development of his CoL with which he discovered engagement's role at the centre of all other prerequisite conditions in the context of literacy learning, as well as its link to 'student-centred learning, perceptions on the relevancy of content and classroom learning environments where students feel safe' (Cambourne, 1995, p. 186).

This model of optimal learning conditions has also been shown to align with more recent ideas in which engagement is said to occur across multiple domains including academic, behavioural, cognitive and psychological (Appleton, et al., 2006; Toukonen, 2011), indicating that these conditions have remained relevant across time. Furthermore, it has

been noted by Cambourne himself (Cambourne, 1995) as well as other authors (Stoessiger & Edmunds, 1989; Toukonen, 2011) that the CoL have application in areas well beyond literacy learning, which relates to the use of this model in my research of engagement in mathematics. However, it seems that in applying this model to my own investigation, I should provide some adaptations and additions in order for it to be both meaningful in this different learning context and in relation to the modern perceptions of engagement which will be explored throughout this literature review.

The conditions that Cambourne developed were identified to be both "particular states of being" (Cambourne, 1995, p. 184) as well as interconnected crucial circumstances which affect and are affected by one another. Through this model he determined that engagement is the ultimate factor in learning above all else and is based on the conditions of immersion, demonstration, expectation, response, employment, approximation and responsibility (Cambourne, 1995). These aspects of the CoL are all present in the diagram below displaying this model as it applied to literacy learning (Cambourne, 1995, p. 189).

Diagram 2.2: Cambourne's (1995) Conditions of Learning



Analysing the Conditions of Learning

I will now summarise and explore the conditions listed and displayed above to provide a better understanding of this model as well as suggest possible gaps that exist within it. These definitions have been collated from a variety of Cambourne's books and papers (Cambourne, 1988, pp. 45-80; 1995, pp. 185, 186; 2002b; Cambourne & Turbill, 1987, p. 7), as well as other sources (Rushton, Juola-Rushton, & Larkin, 2010, pp. 355-358), and adapted into describing how they lead to engagement in a general context rather than describing learning in a literacy environment as these conditions were originally defined.

Table 2.1: Summarising the Conditions of Learning

CONDITION	DESCRIPTION
Engagement	Engagement precedes the conditions of immersion and demonstration and involves several factors including: attention, perceived relevancy and active participation (risk taking).
Immersion	Immersion involves a state of constant exposure to that which is to be learned.
Demonstration	Demonstration involves learning from observations of what is seen, heard, witnessed, experienced, felt, studied or explored.
Expectation	Expectations are messages that are communicated, either subtly or directly, to learners regarding what they are expected to learn as well as their capability of learning.
Response	Response relates to the feedback that is received as a reaction to the use of what has been learnt.
Employment	Employment indicates the opportunities the learner is given to use and practice what they have learnt.
Approximation	Approximation refers to the concept of 'having a go' which is supported by allowing students to feel safe in taking risks as a key part of learning.
Responsibility	Responsibility refers to the decisions the learner makes regarding what they will choose to engage with.

In many ways, these conditions appear to provide a cohesive and comprehensive overview of the factors that promote meaningful learning. However, some areas of this also do seem underdeveloped or missing in regards to what current research indicates about engagement and authentic learning. One aspect that seems to particularly require attention is the apparently underdeveloped idea of the impact that positive classroom environments and student-teacher relationships have on learning, which has been shown by recent research to promote student attentiveness, involvement, as well as a broadening of viewpoints and capabilities (Fitzsimmons & Lanphar, 2011; Lewis, Huebner, Malone, & Valois, 2011; Skinner, Furrer, Marchand, & Kindermann, 2008). While this is alluded to in facets of several of the conditions including responsibility and expectations, both the place and application that emotion holds in learning does not seem explicitly indicated enough in this model of learning. This perceived area requiring consideration in this model, as well as several others, will be explored at a later stage in this literature review, when current ideas and concepts related to engagement will be analysed in comparison to the factors highlighted in this framework.

Processes Which Enable Learning

In applying these conditions of learning into classroom practice, Cambourne also noted the necessary processes which accompanied them (Cambourne, 1995). These processes are said to enable learning and, as indicated in the previously displayed diagram, occur simultaneously and are directly related to the CoL. On the next page is a summary of each of these processes, which Cambourne states achieve the “intellectual unrest” essential for engagement and learning to occur (Cambourne, 1995, pp. 188,189; 2002b, pp. 36, 37).

Table 2.2: Summarising the Processes Which Enable Learning

PROCESS	DESCRIPTION
Transformation	Transformation involves taking responsibility for learning by developing a personal paraphrase of a concept.
Discussion/ Reflection	Discussion/reflection allows learners to explore, transact and clarify meaning. Usually discussion involves oral interactions with others whereas reflection involves a discussion with oneself.
Application	Application involves teachers creating situations which gently persuade and allow learners to apply what they have learnt. This process has an interdependent relationship with that of transformation.
Evaluation	Evaluation is a constant process by which learners are given feedback on their learning from self-reflection.

These processes seem to indicate the need to refine current approaches to mathematics, as will be explored later in this chapter. Generally speaking, the perceived abstract nature (Muijs & Reynolds, 2011) and the bland learning experiences (Klein, 2010; Rowan-Kenyon, et al., 2012; Sousa, 2008) that seem to be coupled with mathematics appear to be causing a deficit of engagement in this subject area. In particular, the processes above seem to address the need to make mathematics education more relevant and authentically engaging for students by igniting their curiosity to investigate solutions (Bragg & Nicol, 2011).

Cambourne's Perceptions of Engagement

Cambourne notes that engagement is the 'key to optimal learning in regards to its prerequisite nature to all other conditions of learning' (1995, p. 185). However, a clear definition or description of what engagement actually is seems somewhat absent in the model of the CoL, beyond it being designated as the "key condition of learning". Perhaps a notion of what engagement involves is implied based on the "Principles of Engagement" formed by Cambourne and his teacher colleagues (Cambourne, 1995, p. 186), which

indicate that the likelihood of engagement is increased through students': 'belief of capability (self-efficacy), perceived relevancy of content, freedom from feelings of anxiety and their individual perceptions of the person who is attempting to engage them' (Cambourne, 1995, p. 188; 2002b, p. 28). Besides this information and the notion that engagement 'incorporates a range of different behaviours including attentiveness and active participation' (Cambourne, 1995, p. 185); the actual nature of engagement as it applies to this theory appears underdeveloped in presenting the CoL.

If engagement is to be used as the basis of a model of learning, it seems that it requires a clearer definition than presuming and implying its nature or simply describing it as 'time spent on task' (Borich, 2011). I certainly do not pretend to have a better understanding of engagement than someone who has literally "spent thousands of hours observing teachers" in structuring the CoL (Cambourne, 2002a, p. 758). However, while engagement appears difficult to define in a universally agreeable way due to its complex nature (Whitson & Consoli, 2009), it is also apparent that 'current definitions of engagement are too abstract and the relationship between engagement and learning too poorly understood to fully guide us' (Axelson & Flick, 2010, p. 43). This is also partly due to the seemingly confused and inconsistent relationship between engagement and other related concepts such as motivation and 'Flow', which will be explored later in this literature review, and indicates the need to meaningfully define and describe the nature of engagement as it applies to learning.

Cambourne's theory and perceptions will be further examined and compared as I now explore the literature of engagement relevant to this investigation on understandings of engagement in a middle school mathematics class.

Engagement and Mathematics Education in Middle School

Issues in Mathematics Education

The area of mathematics has been chosen for my study because of both personal interest in this domain as well as the perceived need to improve the quality and outcomes of this subject in an educational context. Despite the proven significance that mathematics holds in both education and employment, it is commonly seen as 'the most difficult and abstract subject in the curriculum' (Muijs & Reynolds, 2011, p. 256). This is in part related to the perceived threatening nature of mathematics (Metallidou & Vlachou, 2007), students suffering from poor self-efficacy (Fast, et al., 2010), as well as poorly designed lessons and ineffective classroom management (Rowan-Kenyon, et al., 2012). In this respect it appears that mathematics education may be suffering from a lack of engagement through failure to understand and apply the CoL and, in particular, learning environments and teachers who fail to encourage students to take responsibility and approximate by feeling safe to take risks in their learning. This lack of engagement also seems to be caused by educators who lack a sense of awareness and expertise in the subject of mathematics.

These factors reduce opportunities for students to fully engage in mathematics and have caused recurring problems relating to negative attitudes, the focus on rote learning as well as bland and seemingly irrelevant learning experiences overall (Klein, 2010; Rowan-Kenyon, et al., 2012; Sousa, 2008). This poor quality of teaching in this area has in turn led to 'the mathematical knowledge and abilities of Australian students to deteriorate to a dangerous level' (Klein, 2010, p. 1, citing Brown, 2009), which indicates the need for action to improve educational practices in this area.

Furthermore, while the area of mathematics has been explored in relation to student engagement (Fast, et al., 2010; Hughes & Riccomini, 2011; Rowan-Kenyon, et al., 2012), clearly this is an area requiring further scrutiny as it seems of great importance to

determine specific contributing factors and improve educational practices. The perceived need for research to improve engagement in mathematics *has* resulted in the identification of many helpful teaching strategies such as: developing relevant contexts (Borich, 2011; Muijs & Reynolds, 2011), the use of cooperative learning (Strebe, 2010) and constructivist approaches (Jameson, 2009) to learning. However, despite this the state of mathematics education still remains in a state of distress in modern times (McAteer, 2012), which is apparent by the lack of competency in teachers of mathematics (Hamlett, 2009) as well as the evident decline of student engagement and participation in high school mathematics (Martin, Anderson, Bobis, Way, & Vellar, 2012).

It appears that recent studies may have fallen short due to a lack of qualitative inquiry with a more refined approach at investigating engagement, which will be further highlighted in the next chapter. It is for this reason that I have chosen to approach this investigation through the theoretical lens of Cambourne's (1995) CoL, which have been said to have transferability to educational contexts beyond the field of literacy which Cambourne studied (Cambourne, 1995; Toukonen, 2011). This not only refines this investigation but provides an invaluable reference point in the process of developing a model of optimal learning conditions that promote engagement, as is the purpose of this research. Furthermore the adaptability of the CoL to learning contexts beyond literacy learning (Cambourne, 1995; Toukonen, 2011) suggests that it may be effective in improving engagement in mathematics by countering the discussed issues of irrelevancy, anxiety and low self-efficacy through the conditions of employment, approximation and expectation respectively.

Issues in Middle School Engagement

A middle school classroom has been chosen as the focus for this study, again because of my personal interest and experience, but also because of the decline in motivation that students often seem to face at this stage of their schooling (Hughes & Riccomini, 2011). It

has also been noted that negative attitudes toward mathematics supposedly become particularly prominent during middle school, where students wrestle with increasingly abstract concepts, rote learning and lack of variety in educational experiences (Attard, 2012; Klein, 2010; Rowan-Kenyon, et al., 2012). Furthermore, the middle school years are also seen as the most challenging for students due to the barrage of developmental changes and the consequential emotional confusion and anxiety that occurs (Lanphar & Fitzsimmons, 2010). These issues indicate the need for a focussed investigation of perceptions relating to factors impacting these negative attitudes and emotional facets of mathematics, as this will facilitate the improvement of educational practices and identify measures for preventing these attitudes early in students' school life.

Exploration of the Research on Engagement

Engagement has been defined in educational contexts as the level of interest and involvement students have in learning (Axelson & Flick, 2010; Rotgans & Schmidt, 2011). The perceived academic, behavioural and emotional improvements associated with promoting active engagement in learning has designated it as the key factor of learning (Cambourne, 1995), which has caused it to become the basis for numerous investigations in modern times (Doll, et al., 2010; Elias, et al., 2011; Green, et al., 2006). The outcome of these studies has indicated that engagement is highly influenced by self-efficacy [defined as students' self-belief of their capabilities] (Elias, et al., 2011; Hughes & Riccomini, 2011; Jameson, 2009), relevancy of learning content (Arends & Kilcher, 2010; Borich, 2011; Rotgans & Schmidt, 2011), as well as positive relationships between students and their teacher (Doll, et al., 2010). In the content area of mathematics particularly, engagement has shown ties to the use of technology [such as interactive whiteboards and specialised software] (Hughes & Riccomini, 2011) as well as challenging and caring classroom environments which encourage mastery in learning (Fast, et al., 2010) and allow students to direct their own learning through interaction in social contexts (Jameson,

2009). These factors will be further unpacked and related to the CoL at a later stage of this review.

The Development of the Concept of Engagement

The term engagement has historically indicated the offering of oneself as a guarantor of something promised such as marriage (Axelson & Flick, 2010). Over time this term has developed to more broadly designate total absorption and active involvement in an activity through a heightened level of concentration, enjoyment and involvement (Appleton, et al., 2006; Elias, et al., 2011).

One of the pioneers for investigating factors relating to engagement was Maslow, who described human needs in terms of five ascending levels listed as: physiological, safety, love and belonging, esteem and self-actualisation (Brady & Scully, 2005; Maslow, 1954), as demonstrated in the diagram below.

Diagram 2.3: Maslow's Heirarchy of Needs



This hierarchy of needs has also been translated directly into the modern educational domain through relation to student incentives to learn and academic achievement (Freitas & Leonard, 2011; Wu, 2012). In reflecting on the typical classroom of today, it would seem that the needs of love, esteem and self-actualisation are somewhat neglected through the lack of emphasis on positive student-teacher relationships, feelings of anxiety and undeveloped opportunities for students to express their creativity respectively. This failure to meet basic emotional needs seems particularly prevalent in mathematics, and is evidence for the perceived anxiety, lack of engagement and negative perceptions in this content area today (Jameson, 2010). However, recent research has shown that caring environments positively influence students' engagement in mathematics (Fast, et al., 2010), indicating the importance of meeting the needs shown above.

I will now briefly illuminate current related concepts and facets that could be added to the definition of engagement. These include the theory of 'Flow', motivation, student involvement and social-emotional learning. A definition that seems to come close to illuminating these is that of educational engagement being "the quality of a student's connection or involvement with the endeavour of schooling and hence with the people, activities, goals, values, and place that compose it" (Roorda, Koomen, Spilt, & Oort, 2011, p. 494).

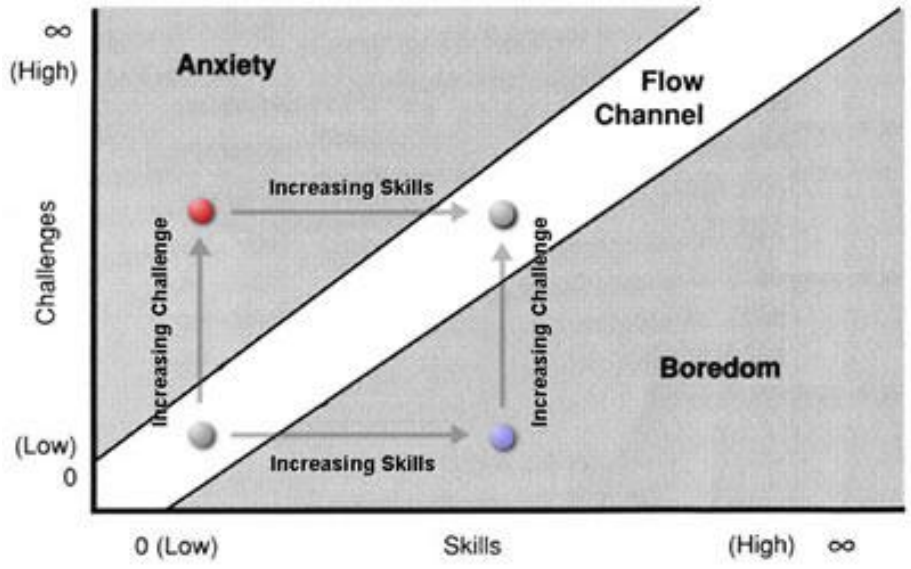
Related Concepts – Confusion of Terms

As discussed above, the concept of engagement lacks a clear definition despite its apparent importance in education and the amount of research recently undertaken in this area. Furthermore, while engagement is a construct that is frequently discussed, studied and utilised in the world of education, there seems to be some confusion that often occurs due to contradictory literature and overlapping of distinct terms such as engagement, attentiveness and motivation (Astin, 1999).

The Theory of Flow

'Flow' is a concept which has been developed by Mihaly Csíkszentmihályi since the 1960s when he was struck by the 'single-mindedness of artists who continued painting despite hunger, fatigue and discomfort' (Nakamura & Csíkszentmihályi, 2002, p. 89). In essence, the idea of 'Flow' involves "an optimal state of immersed concentration in which attention is centred, distractions are minimized, and the subject enjoys an autonomous interaction with the activity" (Whitson & Consoli, 2009, p. 41). Being "in flow" is categorised by intense concentration, loss of reflective self-consciousness, time seeming to pass faster than normal, being intrinsically motivated by the experience and working at full capacity with clear goals (Csíkszentmihályi, 1990; Nakamura & Csíkszentmihályi, 2002; Shernoff & Csíkszentmihályi, 2009). Achieving the experience of 'Flow' primarily involves an intrinsically fragile balance between the skill of an individual and the challenge of the activity (Jameson, 2009; Nakamura & Csíkszentmihályi, 2002; Shernoff & Csíkszentmihályi, 2009), as indicated in the diagram below (Whitson & Consoli, 2009, p. 42). This shows that inducing 'Flow' involves finding the "sweet spot" between anxiety and boredom, in which students become deeply engaged in learning.

Diagram 2.4: 'Flow' as the Balance between Skill and Challenge



It is quite clear that applying the theory of 'Flow' in classrooms promotes an increase in student engagement (Jameson, 2009; Whitson & Consoli, 2009) as well as learning, skill development and satisfaction in students (Elias, et al., 2010). Elias et al. (2010, pp. 2042, 2046) propose that 'Flow' is in fact simply a 'heightened level of engagement involving complete absorption in an activity', rather than simply being a contributing facet of engagement. Also, this theory is more concerned with the quality rather than quantity of time spent on task, as it is this which induces a state of 'Flow' (Whitson & Consoli, 2009).

The condition of immersion seems to be the primary factor relating this concept of 'Flow' to the CoL, as this condition has connotations of being heavily saturated in the learning. 'Flow's attribute of involving a balance between skill and challenge also indicates that this is related to the need to feel safe to approximate in learning and also indicates the importance of the condition of responsibility in that learners must choose to engage with something in order to experience 'Flow'.

It seems that 'Flow' is an essential but not all encompassing aspect of engagement as it does closely relate to engagement's facets of effortful attentiveness, but misses the collaborative aspect of engagement. Also, the idea that 'Flow' involves focussing on a single activity does not appear to involve the somewhat collaboratively driven conditions of demonstration and response, as this is generally considered to be an autonomous experience (Whitson & Consoli, 2009). Furthermore, it would seem that engagement is possible as both an individual and collaborative construct, in that engagement is often made possible through relatedness with others, whereas 'Flow' seems to largely be a self-centred state of being. In this regard, it seems that this construct is somewhat alluded to yet not sufficiently developed in both Cambourne's CoL as well as common descriptions of engagement.

Student Involvement

The modern idea of educational engagement has been credited to Astin's (1984) theory of student 'Involvement' (Axelson & Flick, 2010), which is said to simply refer to the quantity and quality of energy that is devoted to the academic experience (Astin, 1999). This original description was later confirmed to essentially correspond to the contemporary definition of engagement (Axelson & Flick, 2010) and also aligns with the definitions for educational engagement that I have highlighted.

The word involvement certainly seems to be used extensively in relation to attempts to describe engagement, and seems to be an essential aspect. This appears to also relate to the CoL, particularly through the conditions of employment, where it is required that students are given opportunities to be involved by applying and practising their learning; and approximation, which involves students feeling safe to be involved and 'have a go'. Also in regards to the CoL, student involvement seems to entail students taking responsibility in choosing to be involved, an immersive learning environment supporting this involvement and meaningful responses from teachers to promote further involvement.

Motivation

Motivation is said to be fundamental for authentic learning and includes the primary components of excitement, interest and enthusiasm (Nilsen, 2009). Intrinsic motivation involves a decision making process made by a student in which they consider the importance of a task, their personal interest in its content, its relevance and the perceived toll that undertaking this task will take (Metallidou & Vlachou, 2007). Extrinsic motivation on the other hand involves attempts to promote learning through external incentives, which has been said to weaken the enjoyment and natural interest produced in well constructed learning situations (Rowan-Kenyon, et al., 2012). As identified, motivation is declining in schools in that students often lack aspirations of achievement beyond that of a passing grade (Lent, 2006), which indicates the influence motivation has on learning. Intrinsic motivation is said to be promoted by: allowing students to have

personal choice in their learning (Elias, et al., 2011; Roorda, et al., 2011), using relevant contexts for learning (Jameson, 2009), and also through positive self-efficacy (Hughes & Riccomini, 2011; Metallidou & Vlachou, 2007), a concept which will be explored below. The factors of personal choice and relevant contexts also seem to relate to the perceived benefits of basing learning around what students are actually interested in rather than forcing them to follow directions (Kohn, 2011).

One of the current critical debates seems to revolve around the distinction between engagement and motivation. Appleton et al. (2006) argue that motivation involves the direction, intensity and quality of one's energies, whereas engagement is a reflection of active involvement in an activity which relates to energy in action, and therefore 'motivation is necessary, but not sufficient for engagement'. In this manner it would seem that although motivation and engagement are certainly related (Elias, et al., 2010), they are also somewhat distinctly separate, which indicates the need for referring to motivation in descriptions and applications of the construct of engagement.

Intrinsic motivation also seems to be related to the condition of expectation (Lent, 2006), as students will be driven to complete an activity based on what expectations their teacher has voiced in regards to their learning and capabilities. The CoL also seems to be tied to intrinsic motivation through it involving a student making a decision based on the perceived relevance and risk involved in the task, which is based on the conditions of responsibility, employment and approximation. This decision to learn also appears to be promoted by an immersive learning environment, influenced by demonstrations of learning and further encouraged by teacher response during learning.

Developing intrinsic motivation, promoting 'Flow' and encouraging involvement in mathematics is also said to occur based on how well a teacher knows their students and the characteristics which affect their learning (Lewis & Forsythe, 2012). This allows teachers to increase engagement in their classroom by facilitating mathematical learning

experiences that students perceive as relevant, interesting, meaningful and valuable for daily-life (Bobis, Anderson, Martin, & Way, 2011; Fielding-Wells & Makar, 2008; Keng & Kian, 2010). This perceived benefit of knowing students and developing connections in an engaging classroom also indicates the role of positive emotion in this environment, which I will now explore.

Social-Emotional Learning

A developing area relating to quality teaching practices and the CoL is that of social-emotional considerations in learning. The importance of emotion in the classroom has certainly been identified, be it the positive influence that challenging and caring environments have on self-efficacy (Fast, et al., 2010), the fact that engagement has been revealed to relate to peer relations (Doll, et al., 2010) and parental impact in learning (Fan & Williams, 2010; Rowan-Kenyon, et al., 2012), the manner in which positive emotions promote student attentiveness (Lewis, et al., 2011), or research findings showing the importance of social-emotional support in creating authentic learning environments (Fitzsimmons & Lanphar, 2011). Alfie Kohn (2011) also indicates the lack of emotional development in schooling and advocates the idea that students are more likely to engage and be successful in learning when they feel involved and cared for in a collaborative classroom community. Nevertheless, it has been noted that "emotion in learning in general, and in the classroom setting appears to be still in a state of flux" (Fitzsimmons & Lanphar, 2011, p. 52) with an apparent lack of research in associating positive emotions and engaging schooling experiences (Lewis, et al., 2011).

One of the key aspects of creating a positive learning environment is allowing students to feel safe to express themselves (Lanphar & Fitzsimmons, 2010). Cambourne refers to this notion in his idea of approximation, whereby it is said to be important that learners feel safe to 'have a go' (Cambourne, 1995). The importance of the social-emotional aspect of learning is also hinted at by Cambourne saying that learners are more likely to engage

with demonstrations given by someone they 'like, respect, admire, trust, and would like to emulate' (Cambourne, 1995, p. 188). It also appears that that CoL are related to emotion in learning through the role of collaboration in an immersive learning environment. This is also evident through the possibility of responses occurring not just from teacher to student but between students and even from student to teacher. However, on the whole, the social-emotional side of Cambourne's CoL and ideas of engagement also seems underdeveloped and lacks explicit description, which may be a sign of this model being somewhat out of date and needing revisitation.

Collaboration has been said to promote engagement in mathematics through adopting an inquiry based approach in which students are exposed to social interaction as they learn about the world around them (Fielding-Wells & Makar, 2008) by interacting with more competent others, which could be the teacher or their peers (Tan & Lim, 2010). Effective learning in this subject area has also been said to be promoted by establishing a classroom community where multiple voices are heard and everyone's input is valued (Perry, McConney, Flevares, Mingle, & Hamm, 2011). Also in regards to mathematics, one study showed students' perceptions of their favourite teachers as being caring, supportive, approachable and having a sense of humour to make mathematics fun and relevant (Lewis & Forsythe, 2012). This also seems to indicate the importance of relationships in the mathematics classroom for providing students with engaging and authentic learning, which also ties in to the way the brain becomes engaged by these positive emotions.

Neuroscience Regarding Engagement

When exploring engagement it also seems appropriate to review what modern neuroscience reveals in relation to this topic, as it has been highlighted as necessary to understand the mechanisms of the brain in order to facilitate engagement in education (Rushton, et al., 2010). When it comes to neuroscience and learning, the fundamental concept is that the brain filters all incoming stimuli and chooses what to attend to and

what to ignore (Arends & Kilcher, 2010). This indicates the need for educators to make learning meaningful and perceived as necessary for engagement to occur. Rushton et al. (2010) indicate that while learning can seem a rather simple process on the surface and is often indicated by facial expressions, this process is in fact extraordinarily complex with the firing of millions of neurons as well as the brain's continual development by growing new connections and pruning away old ones during learning.

Understanding how the brain works certainly has direct application in teaching, which I will highlight examples of relating to the domain of my investigation. Knowledge of the workings of the brain is highly useful in the goal of optimising learning in general as it allows educators to create 'brain friendly learning environments to promote engagement' (Rushton, et al., 2010, p. 360). From the perspective of teaching mathematics to adolescents, the decrease in grey matter volume during puberty (due to pruning unneeded and unhealthy neurons) implies that 'creative problem solving becomes easier with more options and greater sophistication of thought' (Sousa, 2008, p. 99). Furthermore, through the developmental stage of puberty comes an increased search for novelty from the brain, which indicates the need to be aware of appropriately challenging students to promote interest in learning (Sousa, 2008).

An understanding of this neuroscience is somewhat evident in Cambourne's CoL, particularly through that of immersion, where it becomes necessary to create a learning environment which stimulates and persuades the brain that it is worth paying attention in order for engagement to occur (Rushton, et al., 2010). This aspect of persuasion also has ties to the condition of responsibility, as it involves making a decision to engage in learning. The use of demonstrations also heavily ties in to neuroscience, as this involves the use of students' mirror neurons (Iacoboni, 2009) as they observe these demonstrations and later have a chance to imitate and apply what they have observed, hence involving the conditions of employment and approximation as well.

This is particularly true in mathematics, where students often learn by observing the procedures used by the teacher to solve mathematics problems and then mimicking these steps as they experience the concept themselves (Tan & Lim, 2010). Also, the increased capacity for problem solving that the adolescent brain experiences, as was mentioned above, indicates the benefits of 'Project Based Learning' (Arnold, 2012) for promoting engagement in mathematics by combining student interests with a variety of challenging and meaningful problem-solving tasks. However, the seemingly common anxiety amongst students of mathematics today hinders the brain's working memory capacity and hence impacts performance in this area (Jameson, 2010). This also seems to relate to the impact that self-belief in one's competence and the capacity to persevere through challenges has on engagement in mathematics, as will now be explored.

Self-Efficacy

The importance of self-efficacy is clearly demonstrated in the literature of engagement, and is clearly referred to in Cambourne's work. This is as expected, as self-efficacy seems to be one of the vital ingredients for engagement to occur and is acknowledged as a key motivational component (Metallidou & Vlachou, 2007), hence why I give it special focus.

At its core, self-efficacy involves a student's belief in their capability of learning and performance (Cambourne, 1995; Nilsen, 2009), which directly relates to the expectations facet of the CoL (Lent, 2006) where teachers communicate messages to students regarding what they are capable of. This belief is said to determine the level of effort students will exhibit in learning as well as how long they will persist in the face of hindrances (Elias, et al., 2010, 2011), which directly translates into educational performance and success (Hughes & Riccomini, 2011). This also appears to tie to the condition of approximation, as belief of one's capabilities seems to relate to the need of feeling safe and supported in learning. As expected, self-efficacy is positively influenced by challenging and caring environments (Fast, et al., 2010) and hence directly relates to perceptions of support and

respect in the classroom (Patrick, Ryan, & Kaplan, 2007), indicating a link to social-emotional aspects of learning. Furthermore, it seems that the conditions of employment and response are also at play in developing self-efficacy as having opportunities to apply and practise learning as well as the feedback received from this process appears to affect students' perceptions of learning and hence their own capabilities.

However, it seems that many students have negative perceptions of themselves in mathematics, which greatly hinders the confidence they have in their own abilities (Jameson, 2010) and hence the likelihood that they will persist in the face of challenges. Part of overcoming this anxiety in mathematics involves encouraging students to break seemingly difficult tasks into smaller, more achievable chunks to allow them to control and manage their learning more successfully (Bobis, et al., 2011). Developing this perseverance in mathematics seems to not only promote self-efficacy, but increase student engagement as they experience success and feel a sense of ownership in learning (Perry, et al., 2011).

Self-efficacy also appears to be an important consideration amongst successful teachers, as this seems to result in greater professional accomplishments, improved relationships with colleagues, and higher enthusiasm regarding their role as educators (Archambault, Janosz, & Chouinard, 2012). This also seems to relate to the way in which a teacher's ideology informs how they go about putting their knowledge of teaching into practice.

Teacher Ideology

In describing engagement and its related concepts, it also seems necessary to briefly look into the effect that a teacher's ideology has on their understandings of education. Ideologies of teaching are said to involve theories and beliefs that drive teachers' understanding about learners and the processes that underlie learning (Cambourne, 1988). For quite some time, teachers have been perceived to view theory as having an 'airy fairy lack of practical relevance' and seem to be 'imprisoned to a dated model of teaching'

focussed on habit formation through repetition instead of developing learning in true learning contexts (Cambourne, 1988, p. 18). Unfortunately, this also seems to be true of today's teachers, who often appear to subconsciously base their teaching practices on tacit knowledge from their own schooling experiences which may or may not have been "sensibly derived or consciously tested" (Churchill, et al., 2011, p. 465). This is particularly true of mathematics teachers, who are apparently at risk of holding onto these reinforced rituals from their own schooling experiences in which they were not exposed to constructivist approaches or active involvement in learning (Ribeiro & DeMagistris, 2009).

Sahlberg (2011) outlines that the country of Finland's approach to teacher education has been shown to be successful due to its focus on integrating theory, research and practice throughout a teacher's development and practical training. Singapore's education system has also been praised through its focus on engaging not only students but also teachers in continual professional development, action research, collaboration and discussion (Choo & Darling-Hammond, 2011). This focus on collaboration relates to the notion that learning for both children and adults occurs most effectively in cooperative and supportive communities which avoid competitiveness (Kohn, 2011). These countries' successful approaches to education also indicate the idea that an effective teacher should aim to continually grow in expertise through research and critical reflection on theory and their own practices by 'developing and retaining the mindset and disposition of a learner' (Churchill, et al., 2011, p. 481).

In regards to the teaching of mathematics, it seems vital for teachers to engage in reflective practices in developing their ideology and linking theory to practice as this will promote their awareness of students' individuality and strategies for involving them in meaningful learning (Bobis, et al., 2011). In particular, it appears that teachers need to be mindful of how well they know their students (Lewis & Forsythe, 2012) as well as their perceptions of the role that students' have in learning (Archambault, et al., 2012).

Reflection

It seems important that in order for a teacher to engage their students effectively they should have a clear understanding of what engagement is and how to best promote it in learning, which appears to require the teacher to undergo continual reflection and personal growth. One form of reflection in this manner is based on suggestions of Dewey (1933) who lists the essential facets of authentic reflection as being: open-mindedness, which involves actively seeking new themes and ideas; whole-heartedness, which involves complete immersion in problem solving and a willingness to risk discovering answers; and responsibility, which follows on from whole-heartedness by further exploring new ideas and thoughts and considering the consequences of following these up (Churchill, et al., 2011).

These facets of reflection also seem to tie to the CoL, particularly through the aspect of whole-heartedness relating to the conditions of approximation and immersion, and the aspect of responsibility relating to the conditions of employment and, quite obviously, responsibility. This in turn indicates that reflection is an important practice for not only teachers to undertake, but also for students to allow them to consolidate and develop a greater understanding in learning (Fielding-Wells & Makar, 2008).

Such reflection appears beneficial in mathematics for the purposes of creating meaning through reflecting on learning experiences (Fielding-Wells & Makar, 2008) as well as acknowledging the role that errors and misconceptions have in the learning process (Bobis, et al., 2011). This also appears to be promoted through the concept of fascination, as reflection in learning seems to involve asking questions in seeking to satisfy one's curiosity (Jirout & Klahr, 2012).

Fascination

I would also like to briefly unpack the concept of fascination, as this seems to be another important and relevant aspect of engagement in education. Fascination is related to the basic human instinct of being driven to learn about and master new skills as a means for solving problems (Arnone, Small, Chauncey, & McKenna, 2011; Reio, Petrosko, Wiswell, & Juthamas, 2006). This has also been defined as 'curiosity', which involves question asking behaviour (Jirout & Klahr, 2012) as one seeks to solve a problem (Litman, 2008). In this way, fascination has the potential to both trigger and be triggered by engagement leading to deep learning through participation and collaboration (Arnone, et al., 2011).

This concept is related to intrinsic motivation as it involves a 'drive to know' (Litman, 2008) as well as a desire to fill in gaps of knowledge (Jirout & Klahr, 2012), which has clear connotations of engagement in learning. In one instance, curiosity, or fascination as I am labelling it here, was defined as 'the threshold of desired uncertainty leading to exploratory behaviour' (Jirout & Klahr, 2012, p. 150). This indicates that the concept of fascination also relates to 'Flow' theory in that it seems to involve the fragile balance between the challenge level of an activity and one's skill level as a means for promoting engagement (Shernoff & Csíkszentmihályi, 2009).

Fascination seems to particularly be a key component of effective mathematics learning, in which students are said to be motivated by topics that they are interested in, enjoy and see as meaningful (Fielding-Wells & Makar, 2008). In this way, an inquiry approach to learning again seems to promote engagement through spurring students' curiosity as they learn about mathematics in a way that is relevant and enjoyable to them personally (Bobis, et al., 2011). This approach also lends itself to differentiating learning experiences for individuals in the classroom and allows students to have 'voice and choice' in their learning (Arnold, 2012).

The elements of fascination as a factor promoting engagement also seem to have distinct ties to authentic learning (Herrington, Reeves, & Oliver, 2009), which will now be explored as somewhat of a collaboration of all of the concepts explored in this section.

Authentic Learning

Authentic learning involves promoting engagement through creative, relevant and collaborative activities which the teacher must support through providing appropriate guidance and resources (Herrington, et al., 2009). This approach arose from the earlier perception of situated learning, which is said to occur in "contexts that reflect the way the knowledge will be useful in real life" (Herrington, et al., 2009, p. 14, citing Collins, 1988). Authentic learning is also believed to effectively occur through the use of computer-based tools (Herrington, et al., 2009) and, for mathematics in particular, is said to be promoted through the use of technologies such as interactive whiteboards and specialised software (Hughes & Riccomini, 2011). The focus on active learning (Kohn, 2011) using relevant situations in this approach also has ties to 'Project Based Learning' (Arnold, 2012; Herrington, et al., 2009), which is said to promote engagement through student-centred inquiry in meaningful contexts (Rotgans & Schmidt, 2011).

The model of authentic learning is often described by nine key aspects, which are listed below (Herrington & Oliver, 2000):

1. Provide authentic contexts that reflect the way knowledge will be used in real life
2. Provide authentic tasks and activities
3. Provide access to expert performances and the modelling of processes
4. Provide multiple roles and perspectives
5. Support collaborative construction of knowledge
6. Promote reflection to enable abstractions to be formed
7. Promote articulation to enable tacit knowledge to be made explicit
8. Provide coaching and scaffolding by the teacher at critical times
9. Provide for authentic assessment of learning within the tasks

The CoL appears to be related to several of the aspects listed above. The very use of authentic learning activities and contexts seemingly lends itself to rich, immersive learning environments, as well as giving students opportunities to employ their learning in meaningful ways. The aspect of modelling expert performances also indicates the condition of demonstration and how this shifts into students taking responsibility to apply what they have observed through reflection. The 'coaching' and 'assessment' aspects seem to relate to the responses a teacher gives their students in learning and also link to the condition of expectation. However, collaboration does not appear to be explicitly described in the CoL, despite it being a key aspect of authentic learning and having numerous benefits for engagement, as discussed above. Furthermore, although reflection was mentioned earlier as a related process to the set of conditions promoting engagement (Cambourne, 1995), its role lacks clear definition within the CoL, which may be an indication of another area needing consideration with this model for optimal learning.

For the content area of mathematics specifically, authentic learning is said to engage students and promote educational success through 'explicitly connecting mathematical concepts, skills and strategies to purposeful, relevant and meaningful contexts' (Keng & Kian, 2010, p. 305). As indicated in the key aspects above, this also involves learning mathematical concepts through interacting with others who are seen as more competent as well as observing and imitating their demonstrations (Tan & Lim, 2010). Furthermore, as was indicated throughout this chapter, authentic learning of mathematics seems to require that the content and processes are relevant to students' current interests and concerns to make learning more meaningful, enjoyable and relevant (Bobis, et al., 2011).

As stated earlier, this approach of authentic learning appears to have ties to several of the other concepts discussed in this chapter regarding what is involved in student engagement. These will now be used to establish a clear and concise definition of engagement as it applies to learning.

A Working Personal Definition of Engagement

It is at this point that I would like to collate all that has been discussed into a self-developed definition of engagement which I perceive to appropriately encompass all relevant areas discussed in this chapter and directly apply to my investigation. Before this though, I will reflect on some of the definitions for engagement taken from the Merriam-Webster Online Dictionary (2013). You will notice that I have highlighted key words in bold.

Dictionary Definitions of Engagement

At its fundamental level in an educational context, engagement clearly relates to **holding attention** or **engrossing** (definition 5a). This indicates the need to make learning meaningful and also has connotations of motivation and 'Flow'.

Engagement is also said to relate to **attracting** and **holding attention** through **influence** or power (definition 2b). This hints at the need to not only initially engage students but to hold their attention throughout the learning process. As indicated, this is facilitated by influence, which can be translated as social-emotional facets of learning, but also comes to fruition through allowing autonomy in learning. While I as a teacher personally avoid over-exerting my power as a means for gaining attention (as this definition alludes to), it is true that the authority a teacher holds has an impact on them being able to gain and maintain attention.

Engagement also has connotations of dealing with something for a **length of time** (definition 7). This indicates that one does not simply become engaged for a split second and that true engagement involves sustained attention. Although I have argued the case for quality over quantity of time regarding engagement, attentiveness for an extended period of time is still an important facet of engagement.

As discussed, engagement has historically referred to a contract in which one **binds** themself to do something, such as marriage (definition 3). In an educational context, this can be translated to the need for one to commit to learning to truly be engaged in it.

Engagement also has connotations of **conflict** and entering into battle (definition 6a). While we certainly do not want to view the classroom as a place of warfare, I believe in an educational context this definition relates to the close and intimate encounter that engagement denotes. The idea of conflict does also seem to relate to the "intellectual unrest" Cambourne refers to as being essential for engagement and learning to occur (Patrick, et al., 2007) in which ideas are challenged and thoughts provoked.

In summarising, it appears that engagement not only indicates prolonged attentiveness, but attentiveness arising from the perception of something being meaningful or attractive. Furthermore, the definitions above seem to have connotations of engagement being a close and intimate encounter which can occur in collaboration with others.

Concluding Thoughts and Definition of Engagement

In considering the concepts explored earlier in this literature review and how they relate to my study as well as the points discussed above, I would like to offer this personal description of engagement as a tentative attempt at defining this concept.

> *"Engagement is a state of intimate involvement and extended attentiveness which a group or individual experiences in being entirely devoted to and secure in that which they are focussing on."*

As is seemingly clear, in developing this definition I have aimed to not only incorporate the above dictionary definitions, but allude to the concepts of: 'Flow', motivation, student involvement, the CoL, social-emotional learning and self-efficacy. However, at the same time I have attempted to denote engagement as being distinct to these concepts while providing a single and relatively simple overall designation. As discussed, this

definition was developed because of the perceived gap in the literature of a clear and valid description of what engagement is. Furthermore, Cambourne's CoL noticeably lacks defining the nature of engagement, which I perceive as necessary for the purposes of categorising conditions that precede learning. This definition will therefore be used as I gather and analyse the data in this investigation, and then revisited at the conclusion of this process to provide a more refined description of engagement in education.

This literature review has also highlighted the timeliness of my study in the area of engagement in middle school mathematics lessons. Engagement is quite clearly the key for authentic learning which indicates the critical need for a refining of this concept to occur. This is especially important in the field of middle school mathematics due to the noticeable deterioration of interest, skills and attentiveness in this area; despite the necessity of numeracy skills for success in both school and future employment prospects (Muijs & Reynolds, 2011; Rowan-Kenyon, et al., 2012). However, research has not effectively determined the factors impacting mathematical engagement due to a lack of specificity, qualitative methodology and constraints within the investigations.

Gaps in the Research

In finalising this exploration of the literature related to this investigation, I would like to further discuss the gaps that I have identified regarding understandings of engagement and point out what these indicate in terms of appropriate methodological approaches as a segue into the following chapter.

Methodological Deficiencies

It was noted earlier that there has already been quite a significant amount of research into the area of engagement with the outcome of identifying related factors and considerations for teaching. However, despite this recent focus on students' enjoyment of and motivation in learning, they typically remain unmotivated at school as modern

classrooms frequently fail to utilise engagement's potential for developing effective learning (Shernoff & Csíkszentmihályi, 2009). This has been found to relate to classroom issues causing distraction from the goal of engagement such as curriculum constraints and behaviour management (Rowan-Kenyon, et al., 2012) as well as a lack of reflective and intentional teaching practices (Churchill, et al., 2011), but also indicates that something is amiss in the way that engagement has been examined, applied or both.

When it comes to the research on educational engagement, there seems to be two main areas requiring attention. One of these is the need to broaden methodology to include qualitative inquiry rather than just quantitative studies (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012). A qualitative approach will facilitate refinement of the phenomenon of engagement through exploring perceptions of both students and teachers. Furthermore, it has been indicated that the complexity of engagement requires it to be understood by asking students questions about their learning experiences rather than simply expecting observations of time spent on task to provide a meaningful perception of engagement (Whitson & Consoli, 2009).

The other need is that of constraining the research of engagement through investigating specific learning goals, contexts and students in order to understand it better. Axelson & Flick (2010, p. 5) suggest going about this by basing research on more specific questions relating to engagement such as "what are the factors affecting student engagement in a particular type of learning process?", as I have somewhat done in this investigation. However, this is not to say that theories developed relating to engagement in specific contexts cannot have applicability in other learning areas. As stated, Cambourne's (1995) CoL were originally developed for the purposes for literacy education, but have since been adapted and applied in further areas; which is what I have endeavoured to explore in my research. However, it does seem that focussed inquiry is necessary to explore the factors of engagement, rather than simply having a broad and potentially unfocussed view of the concept.

In summarising, while there have evidently been several quantitative studies attempting to measure engagement in both mathematical (Fast, et al., 2010; Hughes & Riccomini, 2011) and more general constraints (Doll, et al., 2010; Elias, et al., 2011; Green, et al., 2006; Rotgans & Schmidt, 2011), it appears necessary to step back and broaden the methodology of investigation in this area in order to gain a clearer perception of the factors impacting engagement. This has been noted to most appropriately occur through a qualitative inquiry (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012). On the other hand, although engagement in general has been the subject of several research projects, the immense domain of this phenomenon indicates the need for a more refined approach to exploring the factors impacting engagement which may then be applied to the classroom environment (Axelson & Flick, 2010).

While some constrained qualitative inquiry relating to mathematical engagement has recently occurred (Attard, 2012; Rowan-Kenyon, et al., 2012), this area requires further exploration and should precede the rigid, confirmatory nature of quantitative studies. Although one longitudinal study resulted in the development of a framework for engagement with mathematics (Attard, 2012), data for this investigation was collected completely through observation. This indicates the need for further exploration of actual perceptions on engagement in mathematics and triangulating (Luttrell, 2010; Punch, 2009) across both methods and participants in order to gain an improved undertanding of engagement and its related factors.

The Unclear Definition and Description of Engagement

Another issue that arises in the research is the somewhat unclear and unrefined definition of engagement, which I have attempted to address in this chapter by tentatively defining this concept. While engagement's direct association with educational achievement has led to the occurrence of an extensive amount of investigating, categorising and theorising attempting to refine this construct (Appleton, et al., 2006; Fan & Williams, 2010), it has

also been noted both historically and currently that overall research exploits have failed to precisely define and evaluate engagement effectively (Appleton, et al., 2006; Astin, 1999; Elias, et al., 2010). Whitson & Consoli (2009, p. 47) note the need for educators to think about engagement as a 'complex construct that relates to cognition, motivation and emotion, rather than simply a measurement of behaviours relating to time spent on task'. They also mention the misguided approach of measuring engagement as "the amount of time students devote to learning" (Borich, 2011, p. 12) rather than quality of time spent on task (Whitson & Consoli, 2009). Although Cambourne appears to not clearly define engagement, his model of the CoL has connotations of the quality of time rather than quantity of time spent on task through his focus on deep engagement and reflective learning related to constructivism (Cambourne, 2002b).

Although engagement has multiple facets, it has been deemed appropriate to deal with it as a single concept for the purposes of research due to the overlap that exists between and the diversity that is present within each of its related components (Roorda, et al., 2011). However, this is not to say that engagement's definition should be limited to its relation to students' active involvement in learning (Axelson & Flick, 2010; Park, Holloway, Arendtsz, Bempechat, & Li, 2012) and the fact that it translates directly into high achievement (Green, et al., 2006; Roorda, et al., 2011). Instead, it seems that engagement is better defined in the context of what factors or conditions actually need to be present for it to occur.

A qualitative study exploring the factors impacting mathematical engagement in a middle school classroom using Cambourne's CoL as a theoretical lens would be extensively valuable to this domain. This approach seems unexploited so far and will form a clearer picture of perceptions in this area which will translate directly into applications for classroom practice (Jirout & Klahr, 2012) and provide the basis for altering constraints in future investigations. During the next chapter I will describe how I have actually planned and structured this approach by exploring the methodology of this investigation.

Chapter Three – Methodology of the Investigation

Introduction

The purpose of this chapter is to outline and describe the process and choices I have made regarding the methodology of this investigation. These were primarily driven by my question, as this is said to be the driving force of any research project (Graziano & Raulin, 2013). To recall, the question underpinning this research is:

> ***"What is the relationship between one teacher's understanding of engagement and his students' experience of this understanding in a middle school mathematics class?"***

This question aimed to explore some key factors which arose from the literature review in the previous chapter. It was here that I highlighted the needed improvement in the quality of mathematics education (McAteer, 2012), particularly in middle school contexts (Attard, 2012; Klein, 2010; Rowan-Kenyon, et al., 2012), as well as the way engagement is defined, evaluated and applied (Appleton, et al., 2006; Astin, 1999; Elias, et al., 2010). I also illuminated how Cambourne's (1995) CoL helped to guide and direct this process through its use as a theoretical lens to investigate engagement in this setting. In maintaining the emergent design (Creswell, 2013) of this investigation, which will be further explained below, this literature review was responsively developed according to what was found during the process of data collection and analysis (Wolcott, 2009).

The diagram on the following page displays the structure and planning process of this investigation while also overviewing the format of this chapter.

Diagram 3.1: The Research Process

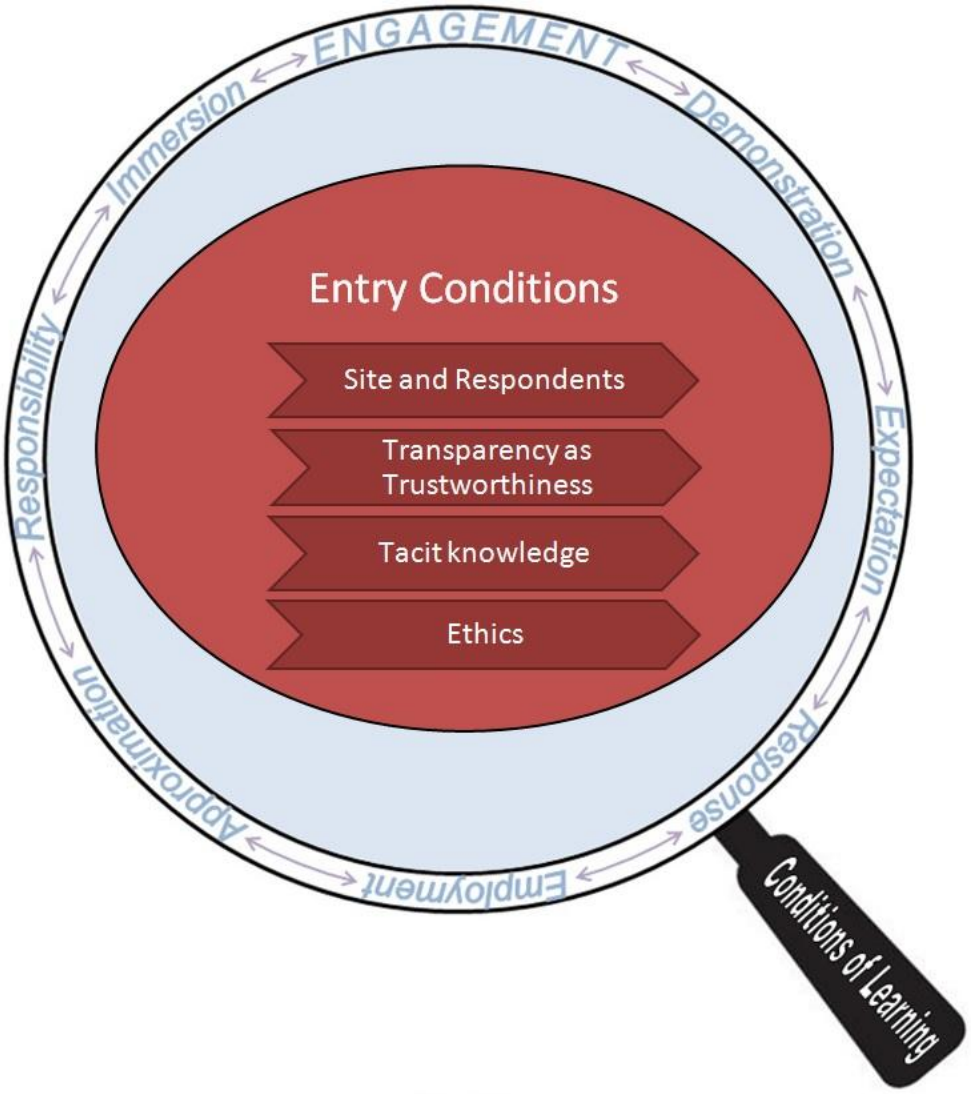


This diagram illustrates the process of this investigation as I play the role of 'researcher as detective' (Merriam, 1998) by exploring engagement in mathematics through the lens of the CoL. The overlapping aspects in this diagram represent the stages of 'focussing in' during the design of this qualitative investigation, which I will explain in this chapter through describing the aspects of entry conditions, research design, data collection and analysis. Following this, I will focus in on the need to report and display the findings of this study, as will be done in Chapter Four. The diagram above also indicates the continual

iterative process of emergent design (Creswell, 2013) that my investigation was grounded in where all decisions and processes were flexible and adaptive to any developments that needed to occur, examples of which will be revealed throughout this chapter. Finally, the definition of engagement that was a result of analysis, synthesis and reflection in my literature review has also been displayed in this diagram as a secondary lens. This indicates the use of this definition in the processes of data collection and analysis that occurred during this investigation (secondary to the CoL lens), as well as the perceived need to refine this definition as a result of this study.

Entry Conditions

Diagram 3.2: Structure for the 'Entry Conditions' Section



The Site and Respondents

In explaining the entry conditions that I encountered in conducting this research (as displayed in the diagram on the previous page), I would like to begin by describing both the site and participants of this investigation. This research occurred in a Christian primary school in Australia by investigating the students and teacher of a grade five and six mathematics class. As I outlined in the Prologue to this thesis, this class group was primarily chosen due to a combination of my own curiosity in what actually promotes or influences engagement and my perception of this particular teacher constructing engaging learning experiences as well as his reputation of being a highly competent teacher of mathematics. This particular group of students were considered to be in the 'Mathematics Support Class' and therefore only met together with their mathematics teacher for 45 minutes each day.

Each student of this class became a respondent in this investigation through my observation of their mathematics lessons. From this group, two male students of ages 11 and 12 were requested to participate in focussed interviews. When dealing with children, particularly in the interview context, I remained aware of the need to keep the time frame short, ask relatively concrete (yet still open-ended) questions and children's tendency to often respond to suggestions compliantly (Rubin & Rubin, 2012).

The teacher respondent of this investigation was an experienced educator who had been teaching upper primary classes for several years at this school. However, this year he had taken on a new role of being the computer teacher for all students in the primary school as well as teaching the mathematics support class which was the subject of this investigation. This teacher participated in this investigation by allowing me to explore his understandings of engagement in mathematics by both observing and interviewing him. Although initially I intended to focus more on the students of this class, the emergent design (Creswell, 2013) of this investigation led to the focus shifting more onto the

teacher and his understandings of engagement, making him somewhat of the key participant in this research.

The final respondent in this study was myself, the researcher of this investigation. As stated I had previously met the classroom teacher, so a prior affiliation did occur, however this was not perceived to greatly affect the investigation. The primary role that I played as a participant in this research occurred with the reflective journal that I regularly updated throughout the process of data collection and analysis (Lichtman, 2013), which became a valuable tool of this investigation. However, I also impacted this investigation through my role as detective by developing a classroom presence during observations and collaboratively constructing meaning from the data by negotiating with participants during interviews (Creswell, 2013), as will be explored later on.

Transparency as an Entry Condition

The Conditions of Learning as a Theoretical Lens

The magnifying glass graphic, which is displayed in the diagrams above and has been a feature throughout this thesis, serves the purpose of not only indicating my 'detective like' (Merriam, 1998) role in this investigation of engagement, but also showing the influence that the CoL have had on all aspects of this research through its role as a theoretical lens. The use of this image also indicates the continual focussing that has occurred using this lens during this investigation as I have explored understandings of engagement in mathematics. Furthermore, the see-through nature of this lens is an indication of my transparency (Scott & Garner, 2013; Yun, 2011) in this research, in which I have attempted to acknowledge my bias and clarify my opinions throughout this investigation. The use of the CoL as a theoretical lens has also contributed to this transparency through allowing me to focus my attention on different aspects of the data and hence providing a basis for the various aspects involved in carrying out this investigation (Reeves, et al., 2008).

Transparency as Trustworthiness

This idea of transparency as a means for trustworthiness (Denzin & Lincoln, 2005; Kumar, 2011) in this research involved clearly expressing the presence and impact of the motives, assumptions, interests and values that were apparent in this investigation (Flick, 2009; McMillan & Schumacher, 2010; Scott & Garner, 2013). In particular, this required an acknowledgement of how my specific worldview shaped the procedures for design and interpretation in this research (Auriacombe & Schurink, 2012), which occurred during the Prologue to this thesis and has also been made explicit throughout this chapter. Furthermore, Yun (2011, p. 19) states that transparency involves not only describing the procedures used for qualitative research, as is evident througout this chapter, but also 'making the data openly available for inspection to support what was concluded', which will primarily occur during the next chapter. This was also a means for preventing bias in my study, as it involved reporting findings honestly and making sure that nothing was omitted in order to provide an honest and transparent picture of what was discovered (Kumar, 2011). This was also apparent in my means of gathering data, in which I made every effort to meticulously record all that I saw and heard, rather than being selective, and avoided leading my respondents to answer questions in a particular way (Rubin & Rubin, 2012).

The table presented on the following page, as adapted from McMillan & Schumacher (2010, p. 330), describes and gives examples of the specific strategies used to enhance the transparency of this investigation.

Table 3.1: Strategies to Enhance Trustworthiness

Strategy	*Description*	*How this occurred in my investigation*
Prolonged and persistent fieldwork	Allows interim data analysis and corroboration to ensure a match between findings and participants' reality.	By spending an extended period of time investigating in the field to gain a better understanding.
Multi-method strategies	Allows triangulation in data collection and data analysis.	By comparing data collected across observations, interviews and reflective journal entries.
Participant language	Obtain literal statements of participants and quotations from documents.	By transcribing interview data word for word for the purpose of analysis.
Low-inference descriptors	Record precise, almost literal, and detailed descriptions of people and situations.	By describing exactly what I saw, heard and perceived during observations.
Digitally recorded data	Use of digital media to record audio or video.	By using a digital recording device to record the audio of all interviews to allow them to be transcribed afterwards.
Participant researcher	Use of participant-recorded perceptions in diaries or anecdotal records for corroboration.	By recording my perceptions and understandings in a reflective journal as data was collected and analysed.
Member checking	Check informally with participants for accuracy during data collection.	By verifying my understandings of participants' interview responses in further interviews.
Negative or discrepant data	Actively search for, record, analyse, and report negative or discrepant data that are exceptions to patterns or that modify patterns found in data.	By being open to data which would not only confirm the CoL, but also elaborate on it.

Many of the strategies outlined above to promote transparency will be further described later in this chapter where they will be more relevant. However, the most distinct way in which this occurred involved overcoming subjectivity through being aware of my thoughts and decisions regarding this investigation and recording them within a reflective journal (Lichtman, 2013; McMillan & Schumacher, 2010). This reflective journal also contributed to the audit trail of this investigation (Flick, 2009) through allowing me to track my decisions in designing this study and analysing the data. An example of this is evident in the snippets below which highlight the major stages in the process of refining my research question through reflective conversations with myself (Cambourne, 1995).

Table 3.2: Reflective Journal Excerpt #1 – Development of the Research Question

Reflective Journal Entry – 25th April 2012:

"At this stage I am keen on investigating the factors relating to engagement during mathematics lessons in a year 6 classroom... I perceive that I will need to constrain engagement either by focussing solely on educational factors or by looking through the lens of an already established theory (such as Cambourne's 'Conditions for Learning')."

Reflective Journal Entry – 13th March 2013:

"At this stage the question which I have written to direct this research is: 'What factors promote student engagement during mathematics lessons in a grade 6 classroom?' I plan on exploring this through the theoretical lens of the CoL..."

Reflective Journal Entry – 7th June 2013:

"I need to reflect on if my question has changed, given that what I am seeing is perhaps more so evidence against how to promote engagement rather than the positives of this. Perhaps I could frame it by looking at how engagement is influenced in this one classroom, and then compare that with what is found in the literature?"

Reflective Journal Entry – 14th August 2013:

"I also need to think about revising my question now to tighten and refocus it by considering the CoL as well as the relationship between student and teacher perceptions of engagement. How about: 'What influences perceptions of engagement in one grade six classroom?'"

Reflective Journal Entry – 10th September 2013:

"We also discussed rephrasing my question to the following: 'What is the relationship between one teacher's understanding of engagement and his students' experience of this understanding?' This seems like an appropriate question, as it indicates the concept of engagement being a 'meeting of minds' between teacher and students and lends itself to the exploration of this case in which engagement was not fully present."

As will be explored later, the transparency of this research was also improved through 'prolonged engagement in the field' (Flick, 2009, p. 392) as well as confirming and negotiating findings through the process of member checking and triangulation (Christensen, et al., 2011; Creswell, 2013; Kumar, 2011; Rubin & Rubin, 2012). Furthermore, as indicated above, the key aspect of transparency as a means for developing trustworthiness in this research involved sensitivity to the presence and origin of assumptions relevant to this investigation (Merriam, 1998; Scott & Garner, 2013), which I will now highlight in discussing tacit knowledge.

Tacit Knowledge as an Entry Condition

Tacit knowledge essentially refers to that which one knows but has "no valid introspective access" (Rugg & Petre, 2007, p. 97); that is, knowledge which one struggles to depict or even be conscious of. This is somewhat opposite to explicit knowledge, which refers to that which 'one is aware of and able to express' (Rugg & Petre, 2007, p. 96). As the aim of this thesis is to engage and be transparent with you, the reader, I perceive it as necessary to shift my tacit knowledge driving this study into explicit knowledge (Rugg & Petre, 2007). This has primarily occurred through considering subjectivity, as discussed in the previous section, to allow me to refine the research question driving this study. The tacit knowledge impacting this research primarily relates to my experiences in teaching and, in particular, a general sense of the importance that engagement has in learning.

Although I aimed to approach the development of this investigation with no expectation of the outcomes in order to facilitate a clear understanding of perceptions relating to engagement, I also acknowledge the presence of some assumptions here. It is seemingly impossible to fully ignore such assumptions, which suggests the more reasonable idea of authentic reflection whereby the researcher simply ensures they acknowledge and are aware of their subjectivity during the design and implementation of the research process (Creswell, 2013; Lichtman, 2013). This attentiveness to my tacit knowledge and

subjectivity particularly occurred through reflective journal entries, which involved a careful consideration of the influences that my prior experiences and observations of the focus teacher had on this investigation. Triangulating the data (Creswell, 2013) also aided this, as comparing between methods and respondents allowed me to confirm the authenticity of my findings.

Guiding Assumptions

One of the guiding assumptions in this study was that engagement would be impacted by particular contributing factors related to the learning environment and experiences in the classroom. However, this idea was confirmed in an extensive amount of related material found in the literature highlighting this relationship (Doll, et al., 2010; Elias, et al., 2011; Green, et al., 2006). The other main assumption present in this investigation related to the use of Cambourne's (1995) CoL as the theoretical lens driving this investigation. It was believed that this would be a valuable tool for comparison in the data analysis process due to the acknowledgement of its application in areas of learning beyond literacy, which it was originally developed for. Furthermore, it seems that the current state of mathematics education (McAteer, 2012) calls for a refocussing on how engagement can be improved in this subject area.

Tacit knowledge also played a role in the design of this research and, in particular, the development of my research question in that the wording of this initially intuitively developed query was continually refined through reflection and a shift into explicit knowledge (Smith, 2001). This was somewhat evident in the reflective journal snippets presented earlier, but will be further explored later on in this chapter.

Ethical Considerations

In my study, the issue of ethics was one of the first hurdles to cross as I endeavoured to design and propose a study which was deemed by both the ethics committee of my college and the research site as ethically satisfactory. However, I soon came to realise that ethical concerns were not simply overcome during the initial part of my investigation, but were in some way confronted at every stage during the research process (Flick, 2009). This is illustrated in "The Research Process" diagram displayed at the start of this chapter and is particularly evident by the need to be aware of bias throughout the research process (Kumar, 2011), which I described and explored earlier as my 'transparency' in this research (Scott & Garner, 2013; Yun, 2011).

The other major ethical concerns of this qualitative investigation involved the issues of confidentiality, researchers' access to sensitive information, participants' informed consent and the freedom of participants to withdraw at any time (Creswell, 2013; Graziano & Raulin, 2013; Kumar, 2011; McMillan & Schumacher, 2010). These ethical requirements were met in my investigation through gaining the participants' informed and voluntary consent before the research commenced, which involved justifying the importance and relevance of my research (Kumar, 2011) in requesting that they agree to share information during interviews and be observed during their mathematics lessons (Flick, 2009). The forms used to provide information to the participants of this investigation can be found in Appendix A and B, and the forms used to gain their consent can be found in Appendix C, D and E. As children were involved in this research, part of the consent process also involved gaining parental permission (as can be found in Appendix F). The participants' confidentiality was maintained in this study through the security in storage of information, as well as the use of pseudonyms to encrypt their personal details (Creswell, 2013; Flick, 2009; Graziano & Raulin, 2013).

Design of the Investigation

I will now unpack and explore the design of this investigation through discussing the aspects displayed in the diagram below.

Diagram 3.3: Structure for the 'Design of the Investigation' Section



Research Question

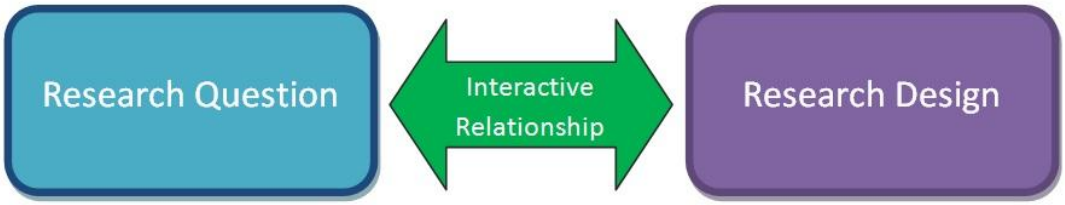
As hinted at earlier, the design of this investigation occurred through an interactive relationship with the development of the research question in that, although this question was the driving force in this investigation (Graziano & Raulin, 2013), it was also responsively refined during the process of data collection and analysis to maintain the

emergent design (Creswell, 2013) of this investigation. This was highlighted earlier through the reflective journal snippets I presented which demonstrated my transparency in this investigation and indicated that this question was initially formed as a response to my observations, world view and reaction to the literature regarding engagement in the classroom, which will be further explored below. The development of this question was also a reaction to the perceived need to refine how engagement is understood, defined and utilised in the classroom, as evident in the literature (Appleton, et al., 2006; Astin, 1999; Elias, et al., 2010). Furthermore, the literature also revealed a lack of qualitative research in this field and, in particular, indicated the need to ask specific questions when investigating engagement, such as:"what are the factors affecting student engagement in a particular type of learning process?" (Axelson & Flick, 2010, p. 5). The initial development of this research question was also influenced by my own personal interests and background (Flick, 2009; Kumar, 2011), which translates as my passion, experiences and desire to see improvement in teaching through increased engagement.

In order to provide clear direction and maintain the nature of emergent design in my research (Creswell, 2013), the wording of the question driving this investigation was continually transformed and refined, as indicated in the reflective journal snippets presented earlier. This primarily occurred as a response to the factors that arose from analysis and reflection during the processes of reviewing the literature and collecting data. While the initial question driving this research was very similar to the previously mentioned wording of "what are the factors affecting student engagement in [mathematics]" (Axelson & Flick, 2010, p. 5), this changed to have more of a focus on the 'processes of engagement', due to the nature of the CoL, which has guided all aspects of this investigation. However, this question then became further refined to indicate an investigation of the 'understanding of engagement', as initial data collection and analysis suggested that the focus teacher's perceptions and understanding of engagement were primary factors influencing the level of engagement apparent in his classroom.

I found that the development of the question driving this research began an interactive relationship with the design of this research, in which each aspect affected and was affected by one another, as visually represented below. This explicitly occurred through the qualitative nature of this research influencing the creation of the question, while the question itself shaped the design of the research. For example, the nature of engagement being difficult to quantitatively measure (Borich, 2011), indicates the suitability of a qualitative approach for investigating what influences it (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012). Furthermore, the method of using in-depth interviews to investigate an 'understanding' of engagement seemed appropriate, given that the goal of this strategy is to obtain data on how individuals conceive, explain and make sense of their world (McMillan & Schumacher, 2010).

Diagram 3.4: The Interactive Relationship between the Research Question and Design



Research questions have also been said to emerge from findings in an interactive relationship between the problem and what the researcher has learnt (McMillan & Schumacher, 2010). Although I have already outlined examples of this relationship, this interaction primarily occurred through reflective conversations with myself that I recorded in a journal (Lichtman, 2013; McMillan & Schumacher, 2010). The iterative relationship that the research question has with the design of the rest of the study is also indicated in the diagram on the following page, as adapted from Graziano & Raulin (2013, p. 45). This symbolises how the idea driving this investigation was continually refined (as outlined above) throughout the processes of designing, implementing and analysing the research. This diagram also indicates the role that the literature and personal experience has in the

initial formation of this question and hence the design of the entire investigation, as was discussed earlier.

Diagram 3.5: The Iterative Process of Qualitative Research



Qualitative Investigation

This research has been designed as a qualitative investigation (Creswell, 2013) which sought to explore understandings of the seemingly unrefined domain of engagement in mathematics through the lens of the CoL. The decision to design the investigation in this way was primarily driven by the apparent need to explore the perceptions and actions of individuals (Graziano & Raulin, 2013) in regards to engagement through my role of 'researcher as detective' (Merriam, 1998). This choice was also influenced by the intangible nature of engagement (Borich, 2011, p. 13) as well as the related factor of the research question itself, as discussed above, which is what drives appropriate procedures for conducting a study (Graziano & Raulin, 2013). As outlined earlier, it has also been

suggested to investigate factors impacting engagement through asking questions which aim to qualitatively explore specific learning processes (Axelson & Flick, 2010). Furthermore, the apparent need of gaining a clearer perception of the factors impacting engagement was noted in the literature to most appropriately occur through a qualitative inquiry (Appleton, et al., 2006; Rowan-Kenyon, et al., 2012).

The qualitative nature of this investigation indicated the need for it be grounded in emergent design (Creswell, 2013), and therefore characterised it as being 'inductive, emerging and shaped by my experience of collecting and analysing data' (Creswell, 2013, p. 22). As has been reflected throughout this chapter, this occurred by responsively adapting the aspects of research design, data collection and analysis (Christensen, et al., 2011; Drew, Hardman, & Hosp, 2008; Graziano & Raulin, 2013; Rubin & Rubin, 2012). This investigation also reflected appropriate qualitative processes through utilising a 'bricolage of data collection tools' (Denzin & Lincoln, 2005, p. 384; 2011, p. 168) and conducting multiple levels of triangulation (Luttrell, 2010; Punch, 2009), both of which will be identified and explored in the following section. In particular, this involved the inductive and adaptive process of gathering data, in the form of both the emic language of the participants and the etic language of myself, the researcher (McMillan & Schumacher, 2010), directly from its natural source with a focus on the understandings of engagement and the affect they have. In general, the characteristics of qualitative research outlined by McMillan & Schumacher (2010, p. 321) were used as the basis for conducting research procedures in this investigation. Descriptions of these characteristics as well as the way in which they occurred in my investigation particularly are provided in the table on the following page.

Table 3.3: Key Characteristics of Qualitative Research

Characteristic	*Description*	*How this occurred in my investigation*
Natural settings	Study of behaviour as it occurs or occurred naturally	By exploring the understandings of educational engagement through investigating students and their teacher in the context of their actual classroom.
Context sensitivity	Consideration of situational factors	By being aware of the story and situation of this class group and how it may have differed from the norm.
Direct data collection	Researcher collects data directly from the source	By directly interviewing respondents and observing them in their natural setting.
Rich narrative description	Detailed narratives that provide in-depth understanding of behaviour	By collaborating gathered evidence and reporting it in Chapter Four.
Process orientation	Focus on why and how behaviour occurs	By seeking to understand what engagement is and how it is promoted.
Inductive data analysis	Generalisations are induced from synthesising gathered information	By using initially gathered evidence to inform further data collection and analysis.
Participant perspectives	Focus on participants' understanding, descriptions, labels, and meanings	By investigating respondents' perceptions of engagement using their own words as observed or recorded from interviews.
Emergent design	The design evolves and changes as the study takes place	By adapting both the question and structure of this investigation as data was collected and analysed.
Complexity of understanding and explanation	Understandings and explanations are complex, with multiple perspectives	By comparing in depth understandings of engagement across multiple participants.

Detective Role in Research

Elements of Case Study

The metaphor of myself playing a detective like role (Merriam, 1998) in this investigation will be extended in the following chapter as I report my findings in the format of a case study. Because of this, the methodology of this qualitative investigation does contain some aspects of case study research, in that I am exploring the case of engagement in a particular classroom. In this way, this case study will be both a method and a product of inquiry (Creswell, 2013), in which I will use multiple sources of in-depth information to investigate understandings of engagement. The form of this will be an "instrumental case study" (Creswell, 2013, p. 99; Fraenkel, Wallen, & Hyun, 2012, p. 435), in that it will involve the investigation of a specific case as a means for exploring the larger goal of understanding engagement in mathematics education. Furthermore, the analysis of this investigation will involve comparisons of the gathered evidence both within different sections of each case, as well as between the individual cases (Creswell, 2013). The cases explored in this investigation were primarily that of the teacher and students of the focus classroom. However, as highlighted earlier and elaborated on below, I also had a perspective to contribute to this investigation as my role of detective required.

Researcher as Detective

The qualitative nature of this study implied its involvement with describing, interpreting and capturing the essence of experiences as perceived by participants (Lichtman, 2013; McMillan & Schumacher, 2010; Minichiello & Kottler, 2010). As will be explored at a later stage in this chapter, an aspect of this was the notion of myself, the researcher, as an instrument for data collection and analysis (Denzin & Lincoln, 2005, p. 210; Merriam, 1998, p. 7).

In particular, this investigation involved the metaphor of my detective role (Merriam, 1998), in which I sought to uncover clues related to understandings of engagement and the

CoL in this mathematics class. In this way, I was somewhat of a participant in this investigation, through the reflective journal that I kept, the impact that I had on the data by being present in the classroom as I conducted observations (Flick, 2009; Graziano & Raulin, 2013), as well as negotiating meaning during interviews (Creswell, 2013). I remained aware of this role I had in the investigation in order to promote my transparency in this research and prevent distortion of the data collection process (Graziano & Raulin, 2013; Lichtman, 2013).This detective like role also focussed and improved my strategies for collecting evidence by making me become 'aware of and familiar with the key issues, environment, language and respondents in this investigation' (Rubin & Rubin, 2012, p. 26). This particularly occurred in the context of my reflective journal, an example of which is displayed below to indicate how I used this medium to record my reflective thoughts on the evidence as I gathered it. This in turn heightened my awareness of areas that needed further investigation, whether this required scrutinising the data I had already gathered, or seeking to find out more in the context of interviews.

Table 3.4: Reflective Journal Excerpt #2 – Reflective Thoughts on Student Interview

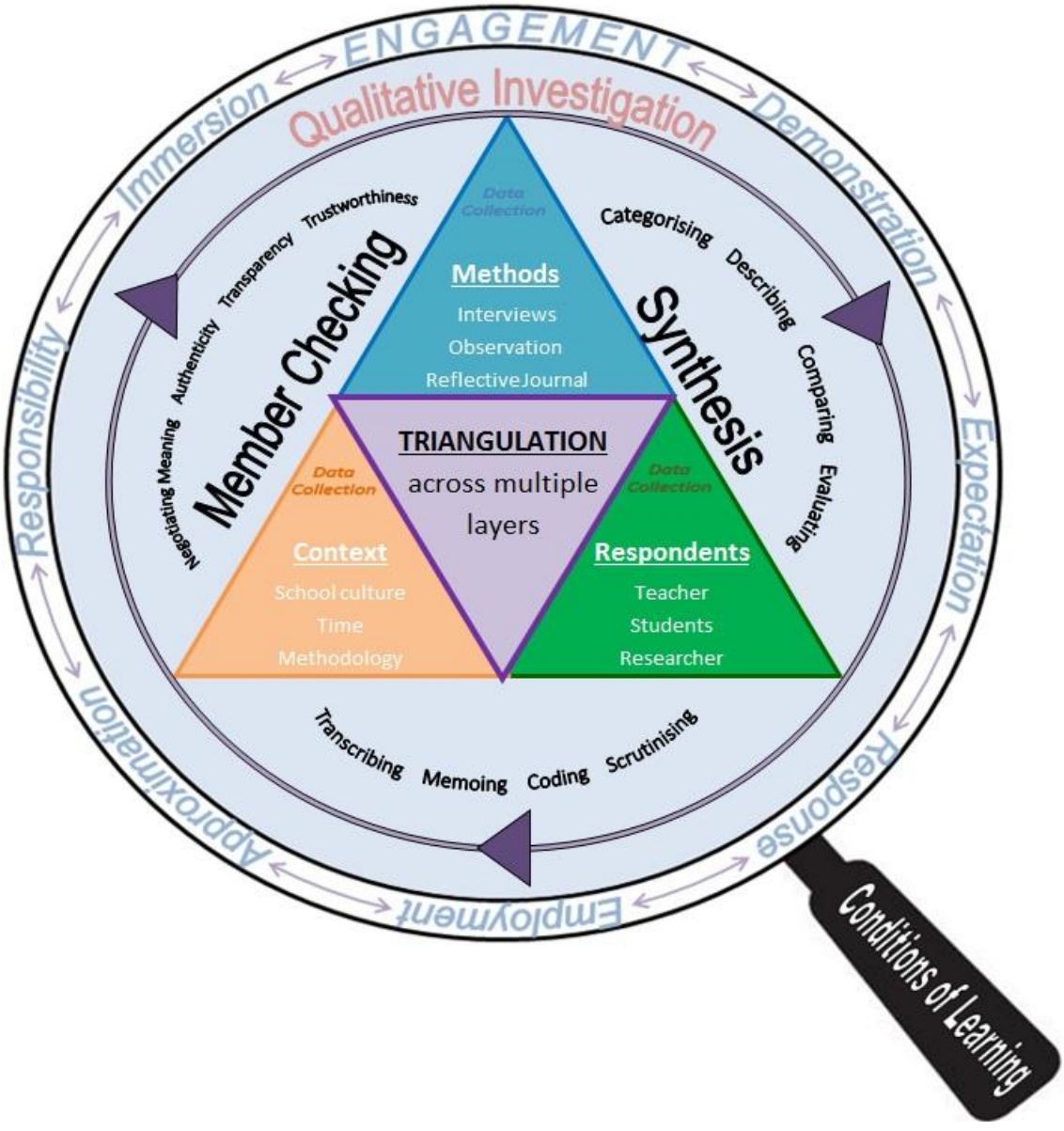
Reflective Journal Entry – 19th June 2013:

"Today I had my interview with Jay... Many interesting points came out. One of the most striking was the relation between enjoying maths and students' personal interests. Jay talked about many opportunities where engagement could have occurred but was hindered by the teacher, and particularly evident was the theme of him wanting to learn about maths in the context of things that he enjoys. Catering for individual students is not something Mr Jackson seems to do well and he acknowledges that he does not really put much effort in this either. Another interesting factor was that this student felt he genuinely likes to work with and help other students, but feels anxious about doing this due to negative experiences in the past. These findings are definitely related to my other findings in this investigation, and may be things I need to explore further."

Methods of Gathering Evidence

As it is now time to describe the specific methods used in this investigation, I would like to offer another diagram which visually represents how the processes of data collection and analysis were structured in this research. Although the diagram presented at start of this chapter provided an overview of the entire process of this investigation (and at the same time indicated the structure of this chapter), the purpose of the diagram presented below is to provide a closer look at how these processes of data collection analysis specifically occurred, as will be explored in the following two sections of this chapter.

Diagram 3.6: Processes of Data Collection and Analysis

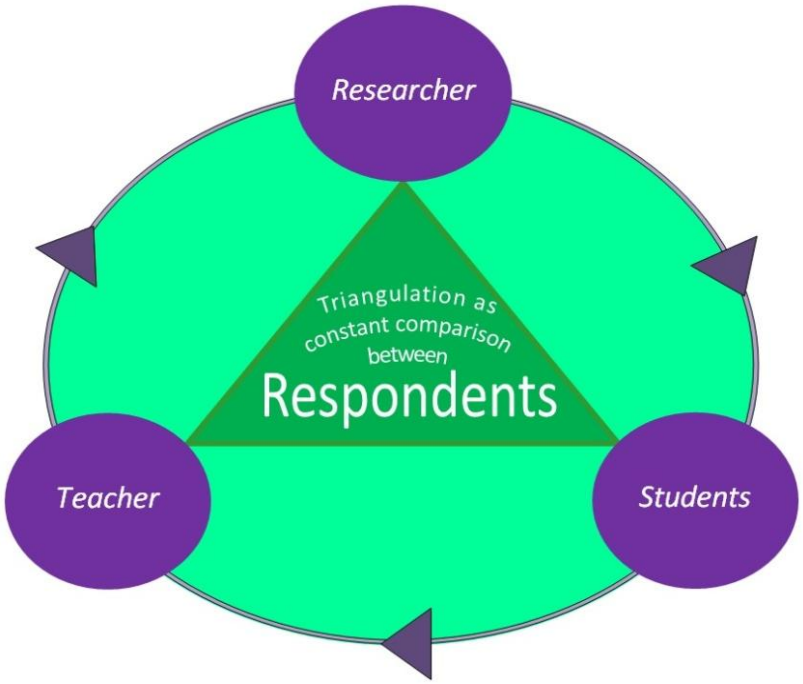


The circular feature of this diagram indicates the iterative and responsive nature of emergent design (Creswell, 2013) in this investigative process of exploring engagement and the CoL in a mathematics class. The spaces outside each of the triangles indicate the processes involved with data analysis, which will primarily be explored in a later section of this chapter. The triangles at the centre of this diagram indicate the multiple layers of triangulation in this investigation, which is a method of obtaining convergent evidence among data sources, data collection strategies, time periods and theoretical schemes (McMillan & Schumacher, 2010) in order to develop confirmed and authentic evidence (Christensen, et al., 2011; Creswell, 2013). This gathering of authentic evidence involved constantly examining and comparing multiple perspectives (Rubin & Rubin, 2012) of engagement, which also added to my transparency (Scott & Garner, 2013) as the detective in this investigation .

More specifically, the diagram above indicates the use of triangulation not only between methods, respondents and contexts, but within each of these aspects as well. As may be obvious, the ‘Context’ triangle in this diagram represents future prospects for extending this research, as will be explored in Chapter Six. The ‘Respondents’ triangle in this image indicates the constant comparison that occurred between the respondents of this investigation, as evident in the diagram on the following page.

Intentionally left blank

Diagram 3.7: Triangulation as Constant Comparison between Respondents



This indicates that triangulation occurred by constantly comparing the perceptions of engagement in this investigation between the respondents of the teacher, students and myself, the researcher, as was highlighted earlier in this chapter. However, comparison of the evidence gathered in this investigation also occurred between the variety of methods that were used, which will now be explored in this section.

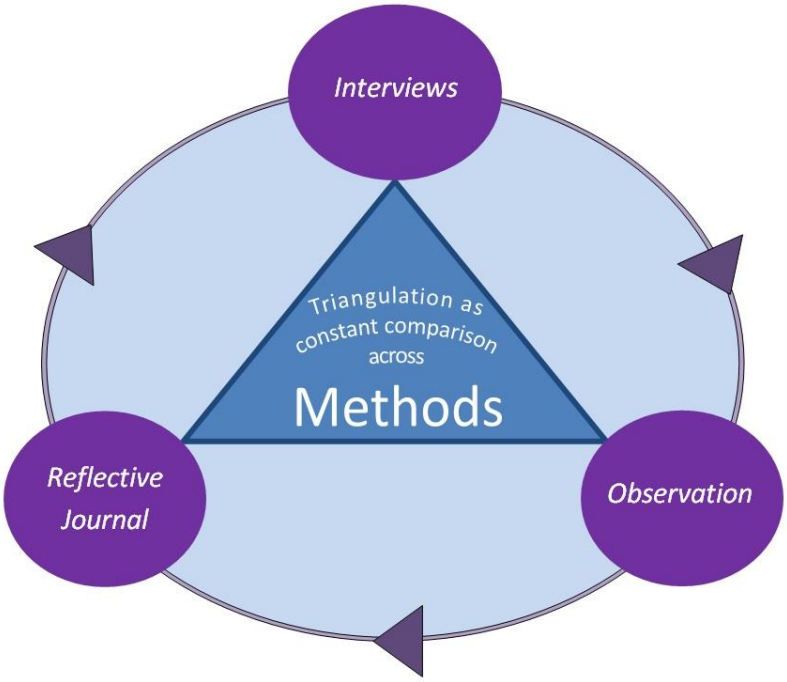
Intentionally left blank

Diagram 3.8: Structure for the 'Methods of Gathering Evidence' Section



The diagram above displays the structure of the following section in the same format as has been done to introduce every other section throughout this chapter. While this was inserted for consistency, I would also like to offer a further illustration, taken from the 'Processes of Data Collection and Analysis' diagram displayed earlier, to indicate the role of triangulation (McMillan & Schumacher, 2010) as constant comparison between these methods for gathering data.

Diagram 3.9: Triangulation as Constant Comparison across Methods



As commonly recognised in qualitative research, this investigation involved the use of multiple methods of gathering data to allow categorisation across each of these sources of evidence (Creswell, 2013). This was facilitated by my 'detective like' role (Merriam, 1998) in this investigation, which suggested the need for me to piece together a range of 'methodological processes as they were needed in the unfolding context of the research situation' (Denzin & Lincoln, 2011, p. 168). This is commonly called taking on the role of bricoleur (Denzin & Lincoln, 2005, 2011) in qualitative research. However, in maintaining the metaphor of myself as the detective in this research, I will refer to this use of multiple methods as the 'detective's toolkit'. This strategy is acknowledged as the 'key of social research in which multiple methods are used to analyse relationships between individuals and their contexts' (Denzin & Lincoln, 2005, p. 320). The approach of using my detective's toolkit was emergent and elastic as the methods and techniques used in this were open for adaptation and modification as the investigation and its interpretation required (Denzin & Lincoln, 2005). As displayed in the two diagrams above, triangulation in this sense involved

comparison between the data collection tools of observations, interviews and reflective journal entries, each of which will now be explored.

Observations

The observations that occurred in this investigation involved utilising my senses to take notes relating to engagement through examining and reflecting on the physical setting, participants, activities, interactions, conversations, and my own behaviours during the observation (Creswell, 2013; Kumar, 2011; McMillan & Schumacher, 2010). The schedule of where and when these observations took place is demonstrated in the table below.

Table 3.5: Observation Schedule

#	Date	Time	Location
1	13/05/2013	9:45am – 10:30am	Library Computer Room
2	15/05/2013	9:45am – 10:30am	Deputy Principal's Classroom
3	22/05/2013	9:45am – 10:30am	Learning Support Classroom
4	23/05/2013	9:45am – 10:30am	Deputy Principal's Classroom
5	27/05/2013	9:45am – 10:30am	Deputy Principal's Classroom
6	29/05/2013	9:45am – 10:30am	Learning Support Classroom
7	04/06/2013	9:45am – 10:30am	Deputy Principal's Classroom
8	05/06/2013	9:45am – 10:30am	Learning Support Classroom
9	17/06/2013	9:45am – 10:30am	Deputy Principal's Classroom
10	20/06/2013	9:45am – 10:30am	Deputy Principal's Classroom

Taking on the role of detective as participant in these observations also allowed me to gain a deep and accurate understanding of the data to be gathered through close interaction and developing rapport with participants (Drew, et al., 2008; Kumar, 2011; Punch, 2009), while allowing them to behave as they normally would in their natural setting (Bernard & Ryan, 2010; Christensen, et al., 2011; Jackson, 2012).

The observations in this investigation were initially quite unstructured and involved taking descriptive notes on as much as I could manage to record of what had occurred in each of the lessons (Creswell, 2013). A sample of this can be found in Appendix G, which displays an excerpt of one of these observations and indicates how they were structured. However, it was noted that being able to grasp every simultaneous aspect of each situation in an observation is impossible (Flick, 2009). This possibility of missing key evidence and hence not gaining a completely accurate picture of the understandings of engagement in this class was somewhat overcome by observing across several sessions, as evident in the schedule above, and noticing repeated themes through comparison. Furthermore, following each of these sessions I would reflect on what I had both seen and heard (Kumar, 2011; McMillan & Schumacher, 2010) and use the theoretical lens of the CoL to write analytic memos (Rubin & Rubin, 2012; Scott & Garner, 2013) as the beginnings of analysing this data and linking it to my question, a sample of which can be seen in Appendix H. The relatively small size of this group of students also made it reasonably easy to observe the class as a whole, instead of having to focus on smaller groups of students within the class.

Apart from promoting a depth of understanding, the participant observations that were conducted in this research also served the purpose of informing the in-depth interviews (Denzin & Lincoln, 2005), as highlighted by the reflective journal entry below.

Table 3.6: Reflective Journal Excerpt #3 – Observations' Role of Informing Interviews

Reflective Journal Entry – 20th May 2013:

"...discovered some interesting avenues which I will need to explore: how or even if immersion is present in this classroom, how valued students feel being in this class."

Interviews

The key goal of this qualitative investigation was to describe, interpret and capture the essence of participants' perspectives and experiences (Lichtman, 2013; McMillan & Schumacher, 2010; Minichiello & Kottler, 2010) of engagement. This occurred in a social constructivism framework where meaning was negotiated and constructed through broad questioning (Creswell, 2013) and the use of personal, in-depth, unstructured interviews as the main data collection technique (McMillan & Schumacher, 2010).

In-depth interviews occurred with two male students and their teacher, with the aim of obtaining evidence on these individuals' understandings and experiences of engagement through an initial process of open-response questions which were adapted according to the individual participants (McMillan & Schumacher, 2010; Rubin & Rubin, 2012). This progressed into semi-structured interviews towards the end of the investigation to consolidate and confirm the evidence gathered (Rubin & Rubin, 2012). Although I initially intended to interview four students across two sessions, the constraints of this research (as outlined in Chapter One) caused me to only be able to conduct one session each with two male participants. However, the flexible and emergent nature of this investigation (Creswell, 2013) led me to focussing more on the teacher's understanding of engagement in this case. When, with whom and for how long these interviews occurred is shown below.

Table 3.7: Interview Schedule

#	Date	Time	Respondent
1	29/05/2013	44 minutes	Mr Jackson
2	10/06/2013	45 minutes	Mr Jackson
3	14/06/2013	32 minutes	Peter
4	18/06/2013	36 minutes	Mr Jackson
5	19/06/2013	37 minutes	Jay
6	26/06/2013	24 minutes	Mr Jackson

Interviews in this investigation were based on a responsive model which involved an adaptation of the questions and design in reply to participants' responses in previous interviews (Rubin & Rubin, 2012). An example of this is evident in the reflective journal entry below, which highlights an instance in which reflecting on what was discovered in one interview informed what I could investigate in a following interview.

Table 3.8: Reflective Journal Excerpt #4 – Following up Themes Arising in Interviews

Reflective Journal Entry – 2nd June 2013:

"Besides the CoL directly, some other themes that have come up are: self-efficacy, anxiety to allow group work, feelings of pressure (time constraints, lack of ownership in learning environment, over-populated classroom) and there's definitely a sense that the teacher likes to be in control (likes to direct learning, likes everyone to be on the same level, sees himself as the best chance students have of learning). I will need to pursue these themes in further interviews to discover more about them."

These interviews were structured around the use of main questions, follow up questions and probes, which were verbal and nonverbal signals that I used to manage, interpret and clarify evidence gathered during these interviews (McMillan & Schumacher, 2010; Rubin & Rubin, 2012). In following suggestions from the literature for formulating appropriate questions for interviews, I ensured that I: used everyday language, made questions clear and unambiguous, avoided double-barrelled questions, and avoided asking leading or presumptuous questions (Jackson, 2012; Kumar, 2011; Lichtman, 2013; McMillan & Schumacher, 2010). This also involved making the evidence transparent and trustworthy (Denzin & Lincoln, 2005; Kumar, 2011) through establishing trust, being genuine, maintaining eye contact and connecting with the participants during the interview process (DeVito, 2008; McMillan & Schumacher, 2010).

To display this more explicitly, I will now highlight how I actually incorporated these types of questions and suggestions that were discussed above by displaying a sample of the

schedule I developed in planning for the initial teacher interview. As is apparent, this primarily involved asking main questions (colour coded as red), which were then supported by one or two follow up questions (colour coded as purple). Although probes (colour coded as green) were somewhat planned and indicated in this schedule where they were likely to be useful, these primarily occurred incidentally based on what the teacher revealed in order to maintain the open-ended nature of these interviews (Rubin & Rubin, 2012). Furthermore, it is quite clear that the language of these questions fulfils the guidelines of being clear, using everyday language and not leading the respondent, as discussed above. This annotated schedule sample can also be found in Appendix I.

Table 3.9: Highlighted Sample of Questions for Initial Teacher Interview

1. How do you think children learn most effectively?
2. How do you think students learn maths and how does this fit with your view of learning?
3. How do you go about planning lessons for mathematics?
4. What does engagement mean to you?
5. What do you think makes students engaged, excited or interested during Maths?
6. What is it about Mathematics that makes it important to learn?
    a. Listen and pick up on elements of his response, ask for more information
    b. Language used in mathematics?
    c. Further application of mathematical skills? Essential for everyone?

Apart from taking notes during the interviews (see Appendix J), I also audio recorded each of these sessions to allow their contents to be transcribed and carefully analysed (Creswell, 2013; McMillan & Schumacher, 2010). A sample of this transcription can be found in Appendix L. Following the transcribing process, I then used the theoretical lens of the CoL to write analytic and reflective memos throughout each set of interview data (as previewed in Appendix L) to facilitate initial analysis, identify emergent themes and structure follow-up interviews (Creswell, 2013; Rubin & Rubin, 2012; Saldana, 2013).

Further reflection on what was discovered in each of these interviews occurred in my reflective journal, which became yet another data source in this investigation, as described below.

Reflective Journal

The final source of evidence in this qualitative investigation came from my reflective journal, which was also the primary method where I, as the detective in this investigation, contributed as a participant. The literature suggested that it was important to write frequent reflections on my research in a journal (Corbin & Strauss, 2008; Lichtman, 2013), and before long I too was able to see how useful this tool was for organising and expanding on my thoughts throughout this investigation. This involved writing reflective entries to capture my feelings and perceptions of the process of gathering evidence (Yun, 2011), as well as describe the way in which my discoveries had changed my understanding (Corbin & Strauss, 2008). Furthermore, this journal proved to be valuable for reflecting on the decisions which needed to be made to adapt this investigation according to its emergent design (Creswell, 2013), as discussed earlier. As well as the snippets that have been displayed throughout this chapter, a sample of this journal can also be found in Appendix M.

Apart from recording my thoughts and decisions in this research, my role as detective (Merriam, 1998) in this investigation allowed this journal to also serve the purpose of being another source of evidence for analysis. Furthermore, this reflective journal improved my transparency in this investigation as it involved keeping a record of my 'thoughts, actions and feelings during this investigation' (Yun, 2011, p. 19), and also allowed me to confront my subjectivity (McMillan & Schumacher, 2010). My transparency will be made more explicit in the next chapter, where I will share snippets of this reflective journal as well as provide other reflective thoughts while reporting my findings to show where I have drawn my conclusions from (Yun, 2011).

Having used the descriptions of the respondents, site and methods of this investigation to show how triangulation occurred, I will now outline the procedures used in the analysis of the findings both during and after they were obtained, as well as what came after this.

Analysing and Reporting the Findings

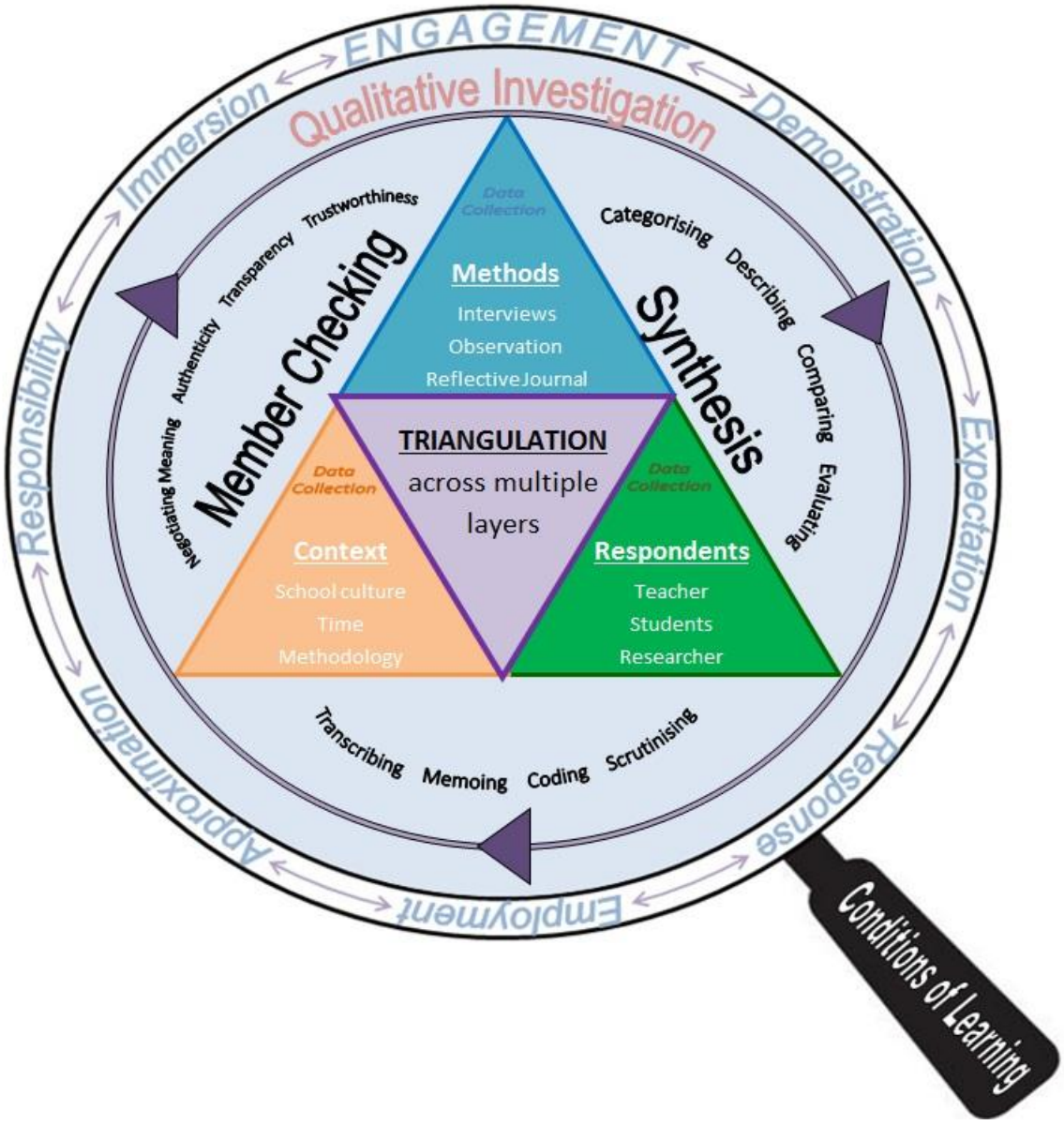
Diagram 3.10: Structure for the 'Analysing and Reporting Findings' Section



Investigation Analysis

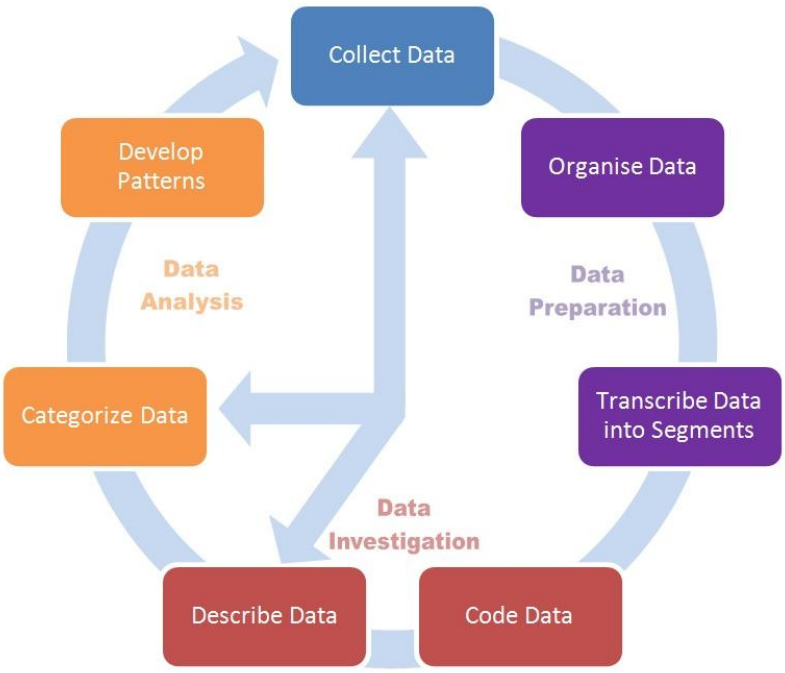
In describing what was involved in the analysis that occurred in this investigation, I would like to again display the diagram which overviews the processes involved in this research. In particular, I would like to recall this diagram's indication of my detective like role (Merriam, 1998) in this process of investigating engagement through the lens of the CoL.

Diagram 3.11: Revisiting the Process for Data Collection and Analysis Diagram



The analysis of the qualitative data of this investigation involved an ongoing inductive process of categorising to explore patterns and relationships (Jackson, 2012), as represented in the diagram on the following page which was adapted from McMillan & Schumacher's (2010, p. 369) "Steps in Analysing Qualitative Data". Although this process proved to be an effective structure for collecting and analysing evidence, the emergent design (Creswell, 2013) of this investigation was upheld through maintaining flexibility and adaptability in these and any other planned procedures.

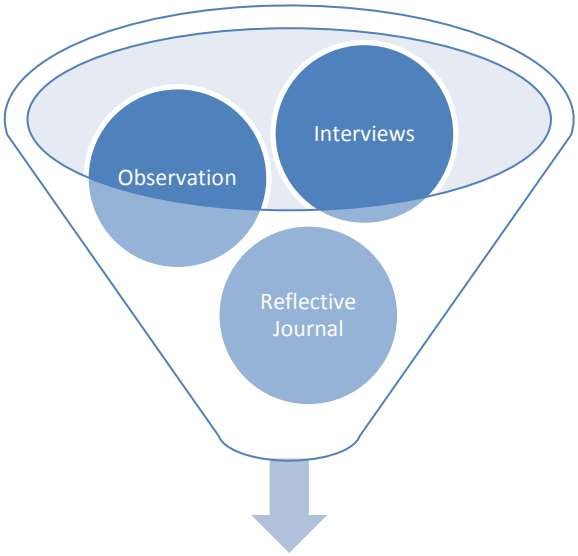
Diagram 3.12: The Iterative Process of Analysing Qualitative Data



The Process of Coding

Although tentative analysis of the evidence I gathered occurred through 'reflecting on and processing data as it was collected' (McMillan & Schumacher, 2010, p. 329), my attempts to analyse understandings of engagement was extended and formalised through a process of coding, categorising, interpreting and confirming data (Jackson, 2012; McMillan & Schumacher, 2010).This coding process involved labelling and categorising participant responses for further analysis and interpretation to occur (Graziano & Raulin, 2013; Rubin & Rubin, 2012), which stemmed from the initial analytic memos that I wrote throughout my data (Rubin & Rubin, 2012; Scott & Garner, 2013) through the lens of the CoL. This process will be further explained below, however, an example of this can be found in Appendix L, which shows a sample of a memoed interview transcription. More specifically, this process involved identifying themes and patterns, classifying all data under these codes and integrating themes throughout the responses (Kumar, 2011; McMillan & Schumacher, 2010) through collaboration between the primary sources of evidence in this investigation, which is demonstrated in the diagram on the following page.

Diagram 3.13: Collaborating between Methods to Develop Themes



The coding in this qualitative investigation 'extended beyond merely counting and labelling occurrences of themes to involve reflecting, comparing and collaborating the shades of meaning apparent in the evidence' (Rubin & Rubin, 2012, p. 192; Saldana, 2013, p. 8) showing understandings of engagement. In following the suggestion of Creswell (2013, p. 185), this process also involved a cycle of 'identifying, expanding and condensing codes in order to avoid being overwhelmed with too many distinct categories'. The theoretical lens of the CoL used in this investigation indicated the appropriateness of using these conditions as "a priori codes" during the analysis process (Creswell, 2013). However, in this process I not only sought to confirm these conditions, but also remained open to the emergence of evidence which elaborated on this model of optimal learning by supporting, strengthening, modifying or disconfirming aspects of it (Saldana, 2013).

Corbin & Strauss' (2008, p. 195) approach to coding qualitative data was also used in this analysis process. These three phases of exploring evidence were not completely discrete as they were somewhat combined and repeated throughout this process (Flick, 2009) instead of being strictly sequential. The way this approach occurred in this investigation is highlighted in the table on the next page and then further explained below.

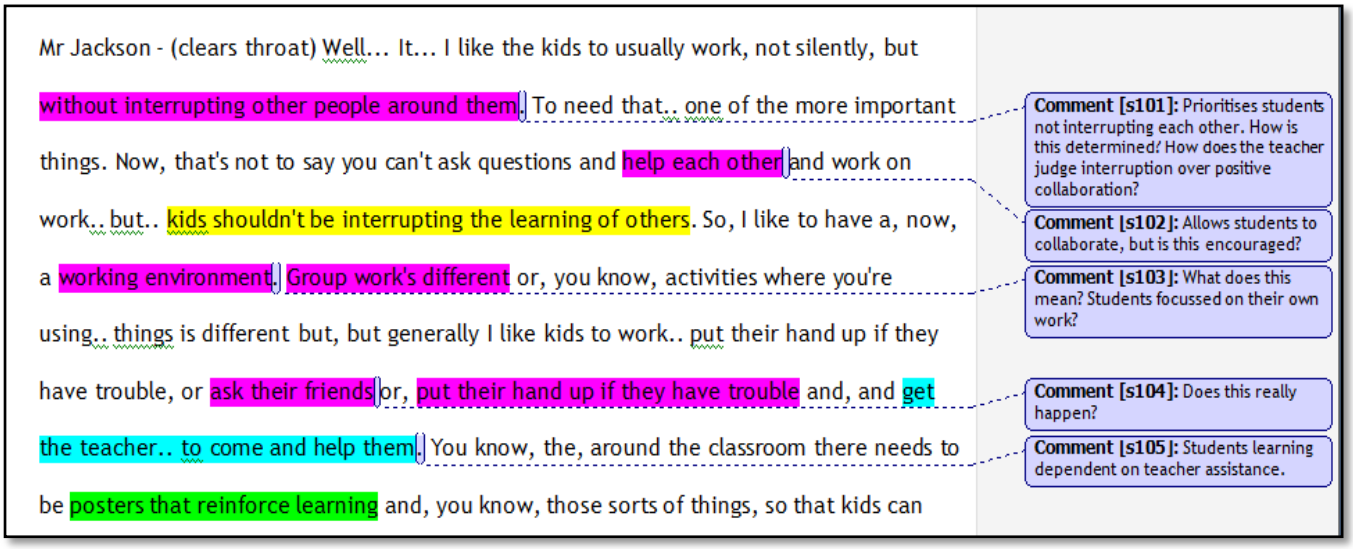
Table 3.10: Corbin & Strauss' (2008) approach to coding qualitative data

Level of Coding	What This Involves
Open Coding *Expressing phenomena as concepts*	• Segmenting data. • Attaching units of meaning to concepts (codes). • Categorising and redefining codes. • Borrowing codes from the literature if appropriate.
Axial Coding *Refining the categories resulting from open coding*	• Elaborating on relationships between categories. • Continually alternating between inductive analysis (developing concepts, categories and relations from the data) and deductive analysis (testing the results of inductive analysis.
Selective Coding *Continued axial coding at an increasingly abstract level*	• Focussing in on potential core concepts. • Progressing towards an elaboration or 'story of the case'. • Conclude interpretation of data when further analysis promises no additional knowledge.

Open Coding

As expressed earlier, the initial coding of this qualitative evidence involved labelling and memoing the data through the lens of the CoL (Rubin & Rubin, 2012; Scott & Garner, 2013). This involved a process of writing reflective and analytic memos as well as colour coding each set of data immediately after it was collected to initially categorise the evidence that showed understandings of engagement. More specifically, the data was colour coded according to my perceptions as a detective looking the CoL lens of what promoted engagement (green), what hindered engagement (yellow) as well as ideas which did not align with the CoL or the other literature on engagement (blue) and other interesting points (purple). These highlighted phrases also proved useful for structuring the focus of additional data collection through providing insights into areas which required further examination. An example of this process is displayed below (and is also found in Appendix L), which demonstrates the reflective and analytic memos I wrote on the data as well as the highlighting of key words or phrases.

Image 3.1: Excerpt of the Processing of Memoing and Highlighting Evidence



A different highlighting process was also used in this investigation to explore the teacher's ideology (colour coded blue), knowledge (colour coded green) and practice (colour coded yellow) in order to explore how this influenced engagement in his classroom. A sample of this can be found in Appendix N.

Axial Coding

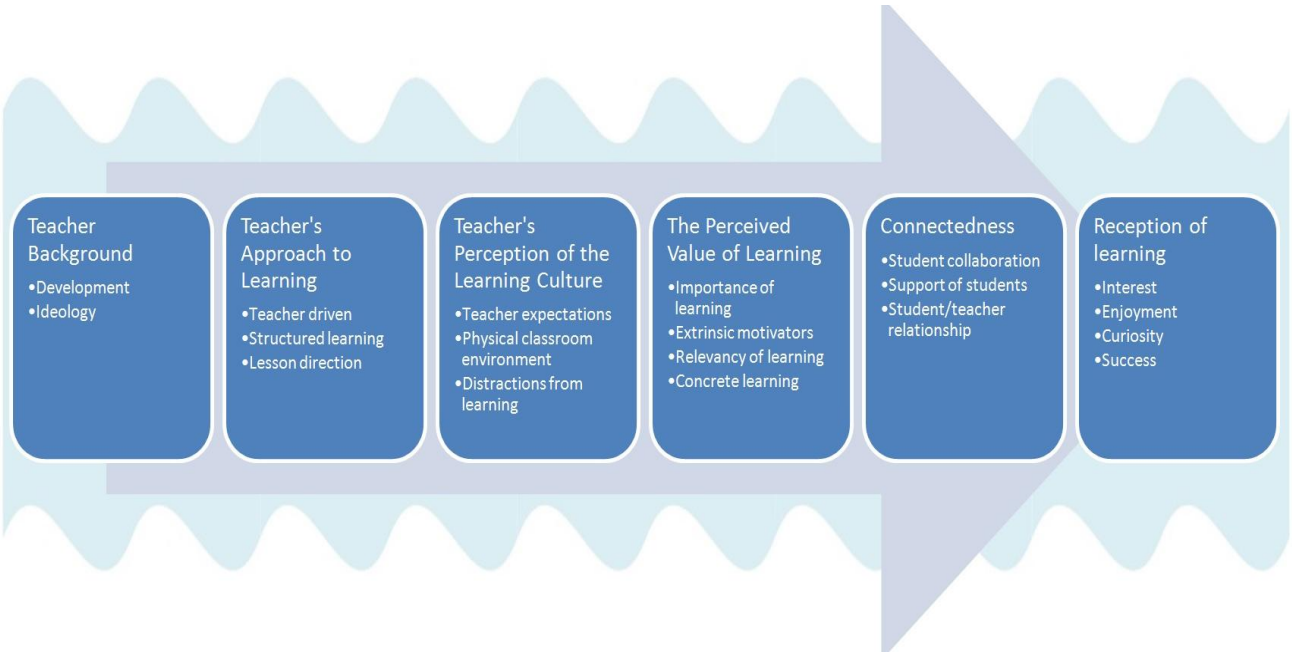
Following on from this process, I organised the initial themes from the data and recorded them in a table (as previewed in Appendix O). This was then used to develop initial codes, which I used to categorise and compare the evidence gathered from the different sources and methods used in this investigation, as demonstrated in Appendix P. These initial codes, which are displayed on the next page and appear in Appendix Q, became further refined as I revisited and reanalysed the evidence I had already collected.

Table 3.11: Initial Codes

Interesting learning	Teaching ideology
Student Enjoyment of learning	Concrete learning
Relevancy of learning	Distractions from learning
Student success	Extrinsic factors motivating learning
Teacher driven learning	Student curiosity
Teacher expectations	Teacher Development
Value of learning	Student Collaboration
Student/ Teacher relationship	Student support
Lesson direction	Physical classroom environment
Structured learning	

These initial codes were then combined and reframed (as evident in Appendix R) to further elaborate on the relationships between them. This then led to the creation of the "Flow of Learning" diagram displayed below and found in Appendix R, to represent the factors influencing engagement in this case.

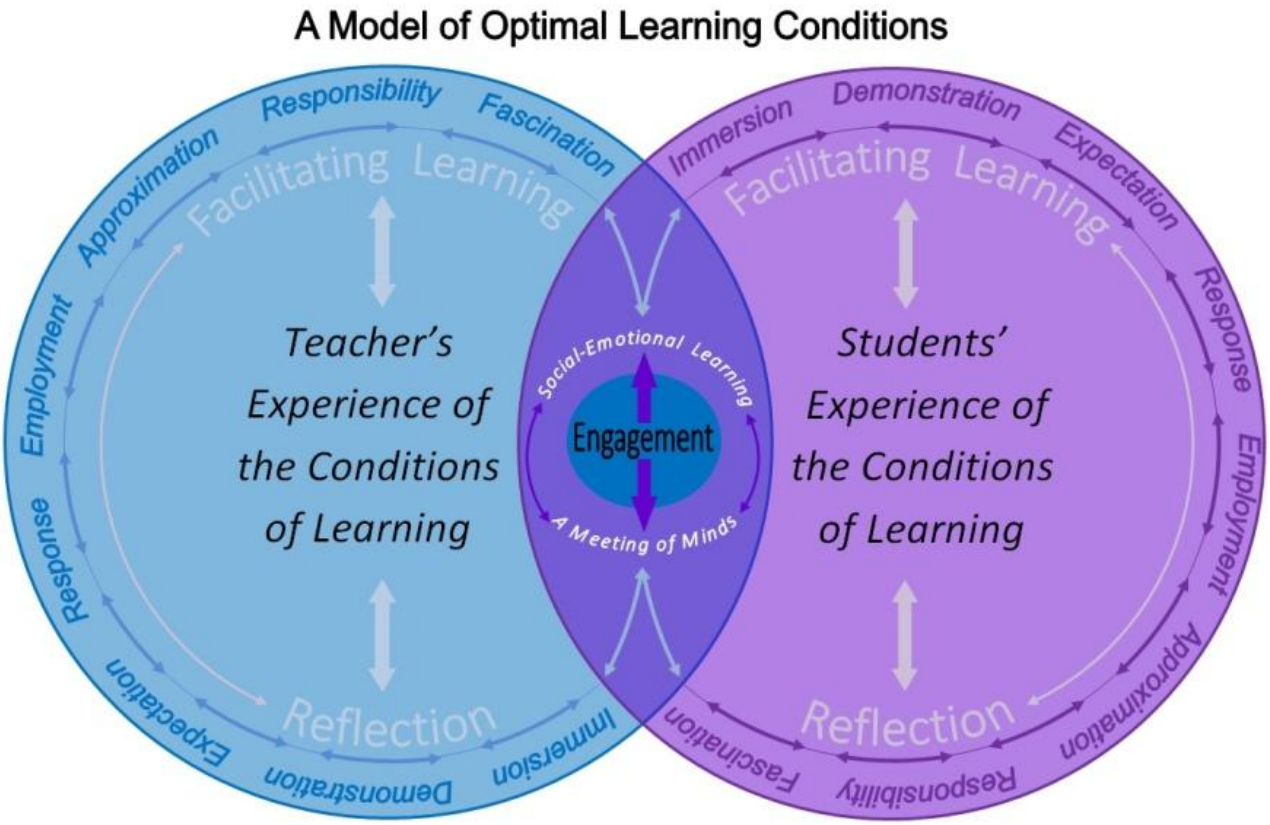
Diagram 3.14: The Flow of Learning



Selective Coding

After categorising and reframing the codes, as shown above, I then began to focus on what the understandings of engagement in this case revealed in comparison to the CoL. This involved further categorising and analysing the data to explore these conditions, which resulted in refining the CoL (as apparent in Appendix T) and establishing additional conditions in this model of optimal learning, as the data suggested. The final outcome of this process was to develop the "Model of Optimal Learning Conditions" diagram, as displayed below, which also indicates the final codes used in this investigation.

Diagram 3.15: The Result of Coding – A Model of Optimal Learning Conditions



Outcomes of the Investigation

Representing the Findings

The data of this investigation was organised through the construction of visual representations which both aided the categorisation and analysis process, as well as

served the purpose of displaying findings in an interesting and meaningful way (Creswell, 2013; McMillan & Schumacher, 2010). One of these diagrams (the CoL lens) has been displayed throughout this thesis to indicate the theoretic lens I used during this investigation. Another of these visual representations, which has been previewed above, involves an elaborated form of the CoL, which fulfils one of the purposes of this investigation. The process of developing this diagram will be further explored in the next chapter, in which I will report the findings of this study in narrative form as I present case studies which describe the understandings and experiences of both the participants and the researcher in this investigation of engagement (McMillan & Schumacher, 2010).

Towards a Theory of Optimal Learning Conditions

As indicated above and at various other stages throughout this thesis, the purpose of this research was to investigate the understandings of engagement with the intention of providing further insight into the best practices for engaging students in their learning, particularly for mathematics. This comes from Saldana's (2013, p. 250) thoughts of the role of social science being to not only explain how and why something happens, but to provide "insights and guidance for improving social life". For this reason, the intended outcome of the collection and analysis of evidence in this investigation is to elaborate on the CoL in determining a model of optimal learning conditions for engagement, contribute to a better understanding of engagement in the domain of education, and provide recommendations for not only improving classroom practices in this regard, but also for extending and further refining understandings of engagement through further investigation. This will begin to become apparent in the following chapter, as I report the findings of this investigation by presenting case studies of the understandings of engagement I explored in a mathematics classroom.

Chapter Four – Investigation Report

Introduction

Aim of this Chapter

As detailed throughout the previous chapters, this investigation involved the use of a variety of methods and respondents in exploring the question:

> ***"What is the relationship between one teacher's understanding of engagement and his students' experience of this understanding in a middle school mathematics class?"***

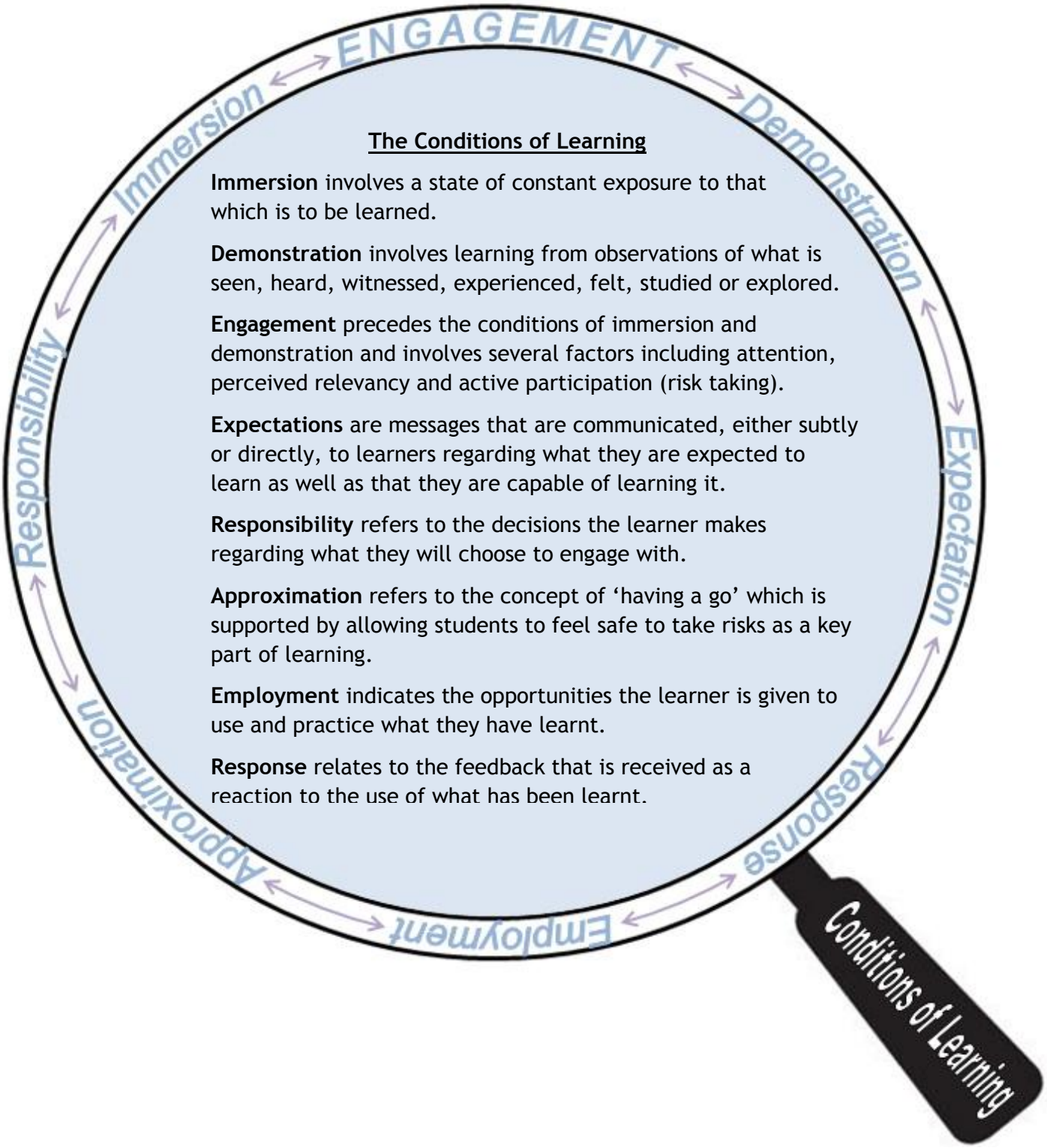
In maintaining my 'detective like role' (Merriam, 1998) throughout this research, the current aim is to now report and unpack the findings of my investigation, which will be the focus of this chapter. For this reason, the purpose of this chapter is to highlight the development of this teacher's understanding of engagement and how engagement actually occurred in his classroom. This will involve using the evidence and clues I have obtained to tell this story through the lens of the Conditions of Learning, which has been featured throughout this thesis.

Revisiting the Conditions of Learning

Cambourne's (1995) CoL have evidently been the driving factor behind all facets of this investigation and will therefore be the basis for reporting on this investigation into the understanding of engagement. This indicates the importance of being aware of these conditions in order to understand the findings presented here. Therefore, before beginning this report, I would like to briefly review what the CoL are so that you as the reader may fully understand this case as it is presented to you. This is framed in the lens of the CoL which has been a present feature throughout this thesis.

Below is a list and brief description of the CoL as they appeared within the literature review (Cambourne, 1988, pp. 45-80; 1995, pp. 185, 186; 2002b; Cambourne & Turbill, 1987, p. 7):

Diagram 4.1: Reviewing the Conditions of Learning



As expressed earlier, engagement is both a related condition and the key factor in this model (Cambourne, 1995), indicating the need to explore these conditions in this investigation of the understanding and consequent experiences of engagement in this case. The structure of how this will actually occur is outlined below.

Structure of this Chapter

I have previously outlined how the emergent nature (Creswell, 2013) of this investigation led to its focus shifting primarily to the specific teacher of the investigated classroom, with the students as a secondary source of data. For this reason, the structure of this chapter will be to present a case study (Creswell, 2013), which will primarily utilise interview data (presented in blue boxes) to detail the educational development of this classroom teacher – his personal school experiences, tertiary training, initial teaching, as well as his current teaching practices and ideology.

Following this I will also present the students' perspectives in this case using interview data gathered from them. Throughout both of these accounts, I will also briefly report from the other data sources of my investigation (reflective journal entries in orange boxes and observations in green boxes) as appropriate. This not only indicates the 'detective's toolkit' (Denzin & Lincoln, 2011) I have used in this investigation, but also facilitates comparison as I illuminate the presence (or absence) and effects of the CoL in this story.

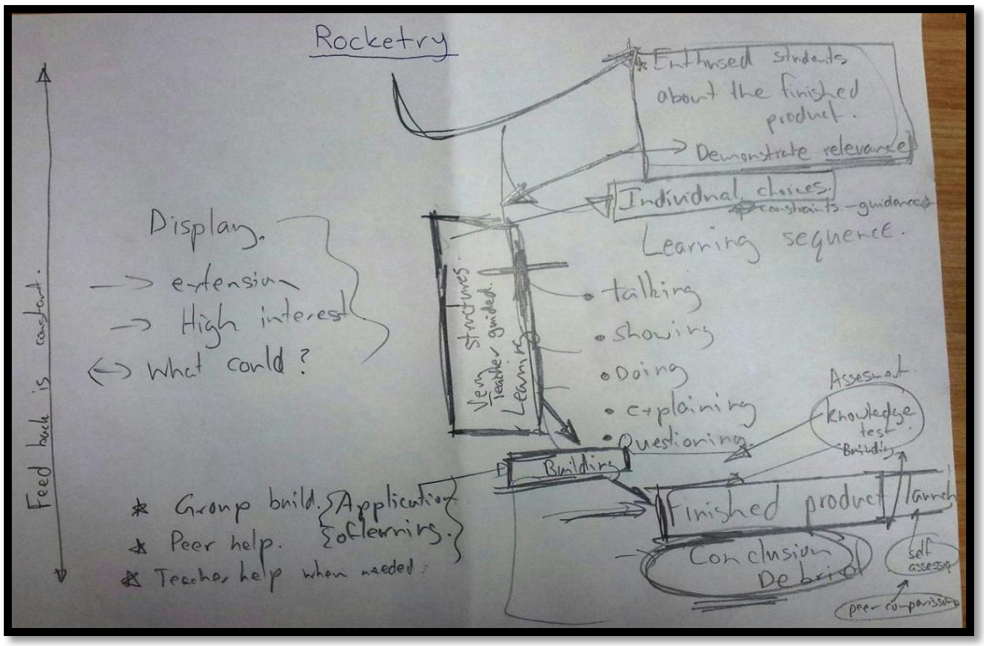
Although the typical model of this chapter is to purely describe the findings, I have decided to somewhat move beyond this and invite you, the reader, to see how and at what level the CoL were apparent in this story by allowing you to peer through the magnifying glass (representing the CoL) with me as I begin to illuminate the perceptions of engagement evident in this case. In particular, my detective like role in this investigation (Merriam, 1998), as well as the reality that what I investigated was a personally lived experience, suggests the appropriateness of offering evaluative (but not judgemental) statements throughout this process of reporting as I make links within this case. This will

take the form of mini-analyses interspersed throughout this report which aim to provide insight into the data through the lens of the CoL (evident by the magnifying glass image) as well as to summarise and compare findings. Revealing my personal thoughts in both these evaluative mini-analyses and the included reflective journal entries also increases my own transparency (Scott & Garner, 2013) as the detective of this investigation.

A Look into the Past – the Teaching of 'Rocketry'

As I outlined in the Prologue of this thesis, the motivation for this investigation into the CoL largely came from my experience in my final practicum as a primary school teacher in which I observed my supervisor (Mr Jackson) teaching a unit of 'rocketry' to his students. It was here in which I first perceived the CoL and wanted to learn more about how these conditions were actually present in his classroom and if he was indeed aware of them. For this reason, I would like to briefly unpack what I discovered about this learning sequence before launching into the presentation of my case study of this teacher. The below diagram, which was a result of discussion during our third interview, displays Mr Jackson's perception of what is involved in this learning sequence that he had previously structured.

Image 4.1: Processes Involved in the Teaching of 'Rocketry'



In this interview, Mr Jackson began by speaking about the importance of enthusing and exciting students in this learning by showing them completed rockets. This idea of developing curiosity in students is also seen as an exploration of "what could?" by engaging and experimenting in learning. Although this has ties to the approximation part of the CoL, the emphasis placed on it seems to suggest it has a more important and explicit role to play in engagement.

However, it also seems that the desire for developing enthusiasm in this learning experience is contradicted by the somewhat rigid nature of the learning experiences Mr Jackson set up. He was quite adamant that the learning in 'rocketry' is very sequential, structured and involves "levels of achievement" (as evident by the linear, top-down structure of his diagram). In explaining this, Mr Jackson actually referred to the teaching of mathematics by saying "I want them to have a certain skill set of information and it's the same for maths, it's very structured".

The responses below further explain Mr Jackson's perceptions of this learning sequence.

Third Interview with Mr Jackson - 18th June 2013

"...they haven't got what you think you've taught them. You've got to go back and re-teach."

" '...go and watch thingo, they've already finished it get them to help you.'"

"...feedback just comes into everything, it just becomes part of the conversation and the tone of the class... it's an ongoing thing."

Of particular interest in both the response above and as evident in the diagram is the notion of who drives the learning in this experience. Mr Jackson seems quite clear that the "learning phase" of this sequence is very much driven by him and his goals as a teacher. This, as well as his mention of having to re-teach students when they "haven't got what

you think you've taught them" could indicate this teacher's lack of trust in his students and that he does not expect them to be able to learn without his direct guidance.

However, in the 'building phase' of this 'rocketry' learning, Mr Jackson specifically talks about peer collaboration and also indicates that he encourages students to help each other in this stage. This is seemingly an effective idea in that it shifts the responsibility of learning from the teacher to the student, allowing them to immerse in learning together and demonstrate what they know to each other. Related to this is the idea of feedback being the "tone of the class", possibly indicating a supportive and collaborative learning environment in which response is an important feature of this classroom.

While there are aspects of this 'rocketry' teaching that reflect a somewhat restrictive and teacher-driven approach to teaching, there are also facets of this which clearly indicate the CoL and engaging learning experiences. In particular, factors such as collaboration, student choice, fascination and relevance seem to be successfully implemented in this learning sequence. However, we will now unfortunately see that these are not as clearly evident in the way Mr Jackson structures learning in his current situation. The case file presented below will outline this situation to highlight how and why practices for engaging teaching are not fully present in this teacher's classroom as well as why the engaging aspects of his 'rocketry' learning sequence failed to translate to his current teaching.

Case Study of a Teacher – Episodes of Education

The case study presented here will detail the episodes involved in this specific teacher's educational experiences and the development of his understanding of engagement. These findings are primarily based on interview data obtained from this teacher while exploring engagement and the CoL in the context of his current mathematics classroom. The construction of this case study will explore the development of this teacher's ideology and practices in exploring his perceptions of engagement and their formation. In particular,

this report will involve an account of the teacher's: schooling experiences, teacher training and practicum experiences as well as his experiences and beliefs as a qualified teacher.

Schooling Experiences

In general, Mr Jackson recalls being successful in school and finding it easy to achieve, particularly in mathematics. He does not attribute this success with mathematics to any particular teacher or mentor, but instead believes that it is simply part of his personality. On the other hand, it seems unlikely that not one individual would have influenced Mr Jackson's perception of mathematics, which may instead indicate he simply lacks awareness of this. Mr Jackson also feels that his ability to understand mathematics was internalised and improved by playing games as a family, which could indicate he was able to develop and practice the mathematical skills and thinking required to be successful at these games, such as problem solving, number computation and balancing risks. It is possible that this initial success and engagement spurred Mr Jackson's enjoyment of mathematics and led to his motivation to continue learning in this area.

However, Mr Jackson also recalls that, although he was able to succeed easily in school, his report cards often talk about him being an adequate, yet distracting child. He feels that this may be because he was not challenged enough in the classroom, which could indicate that he lacked a sense of responsibility in his learning and may have caused a perception that his teachers did not value his learning and did not expect him to value it either. This also suggests that Mr Jackson may have been exposed to a low quality learning environment in his schooling which hindered him from engaging in learning and feeling safe to risk full participation.

Mr Jackson's experience and perceived value of his schooling is summarised in the interview response below in which he answered the question of if and how his teaching practices had been modelled from a particular teacher or mentor.

First Interview with Mr Jackson – 29th May 2013

"I mean I can remember particular math teachers, good and bad... but I don't model my teaching on what they did... really. I mean I can't remember individual math lessons from primary school, you know, there's nothing outstanding that I can remember from primary school for maths. I can remember some things that happened in high school... like kids getting choked unconscious by other students in maths class, but (laughter) maths has nothing to do with detention."

This seems to reveal that Mr Jackson does not have many outstandingly memorable experiences of his own schooling and that he may lack an awareness of how his schooling experiences influence his current teaching. However, during our fourth and final interview, this teacher came to a realisation that his practices of being "a very traditional chalk and talk type teacher" most likely reflect the way in which he was taught at school. Mr Jackson also stated in this interview that his goal is "to get the knowledge into students" and that this transmission model of teaching reflects his own personality and how he personally learns best. While this may be the case, it seems that this approach does little to promote students' sense of inquiry in learning. In regards to the CoL, a transmission of knowledge style of teaching may also cause an environment where learning is viewed as the responsibility of the teacher alone and students are expected to just receive the learning, rather than take risks and experience the learning for themselves.

This "chalk and talk" style of teaching which Mr Jackson experienced appears to have, as he believes, evidently influenced his current teaching style. This is further suggested by the data snippets presented below.

Observation 2 – 15th May 2013:

"Questioning continues to be lower order, no discussion between teacher and students. Asks yes/no questions or number answers."

Reflective Journal Entry – 2nd June 2013:

"…there's definitely a sense that the teacher likes to be in control (likes to direct learning, likes everyone to be on the same level, sees himself as the best chance students have of learning)."

The data displayed above as well as Mr Jackson's perception of himself fitting with a "chalk and talk" approach to "get knowledge into students" suggests that his current style of teaching is focussed around the transmission of knowledge. This also seemed apparent from observations of him being 'firm with the students' (observation 2) and using a 'consistently loud and clear voice' (observation 1), which may indicate his authoritative approach to teaching in this situation. However, it is possible that he not only uses this approach because it attunes with his personal learning style, but as it is a replication of what he also experienced as a learner in school, where he feels he was reasonably successful. In regards to the CoL and his choice to employ this style of teaching, it seems that Mr Jackson may feel that the expectations and responsibility he has as a teacher are centred around rigidly directing students' learning rather than giving them responsibility to engage with and experience the learning themselves. Perhaps even Mr Jackson himself lacks the confidence or awareness to approximate in that he seems to be replicating teaching in the way he is used to instead of trying a different approach.

High School Specific Experiences

During high school, Mr Jackson recalls being able to finish his work quickly and efficiently. This was due to him being internally rewarded by completing problems and viewing mathematics as puzzle solving rather than actual work, which could suggest that his engagement was somewhat related to his responsibility of how he chose to perceive mathematics. Mr Jackson was also seemingly driven by success and a sense of responsibility to achieve as was evident during our second interview when he recalled how he was able to surprise teachers with his efficiency and viewed his ranking in the class as a

source of motivation. However, it would seem from this that Mr Jackson based his success in learning on the somewhat shallow responses of his marks as compared to his peers, rather than a deeper value of learning and appreciation of its meaning.

Mr Jackson actually attributes his support of separating students into ability groups (as is done for the mathematics classes at his school) to his positive experience in high school. In this situation, Mr Jackson felt that he was fortunate to be in the 'top' class, but also indicates that he believes students were better off working with students at a similar intellectual capacity to ensure those at a lower level did not feel worthless next to classmates who were perceived as being brighter. This was evident in Mr Jackson's response when asked how he felt about students being separated according to perceived mathematical ability:

First Interview with Mr Jackson - 29th May 2013

"I think it's a positive thing. I don't see any negative aspects of it when it's done that way. And I guess that comes from my experience of high school. I went to a very big state school. In year seven there was eight classes of kids, and they were streamed 'A' through to 'G'. Now my positive experience of that is, I was always in the 'A' classes, and so I always got to work with kids who were at my level. Now if I was in the 'G' classes I might have a different experience. But the other side of it is I don't think I'd wanna be a 'G' level kid working in an 'A' level class. Cause you'd constantly be feeling like you're an idiot. And you may be an idiot (laughter)... but there's no need to constantly feel like you're an idiot."

In this interview Mr Jackson also stated that he feels separating students into different mathematics classes is beneficial as it allows students to work at the same rate and allows the teacher to 'concentrate' their learning rather than trying to cater for mixed abilities. Mr Jackson also feels that this is particularly successful at his school because "it's not made into a big deal". However, although students in the lower classes in this situation might not always feel like "idiots" when compared to their classmates, it seems that this

may possibly communicate that they are not expected or able to succeed and hence should not bother taking responsibility or risks in engaging with learning.

Further data I gathered relating to the classroom I focussed on for this investigation tells more about the effect that segregating students in this manner can have:

Observation 2 – 15th May 2013:

Spent several minutes finding a classroom to go in because of complications, teacher informs them they need to get straight into work.

Observation 8 – 5th June 2013:

Teacher collects students from outside as usual. This is always a difficult process as teachers allow students to leave at different times; it is an awkward transitional period.

Reflective Journal Entry – 2nd June 2013:

"…feelings of pressure (time constraints, lack of ownership in learning environment, over-populated classroom)."

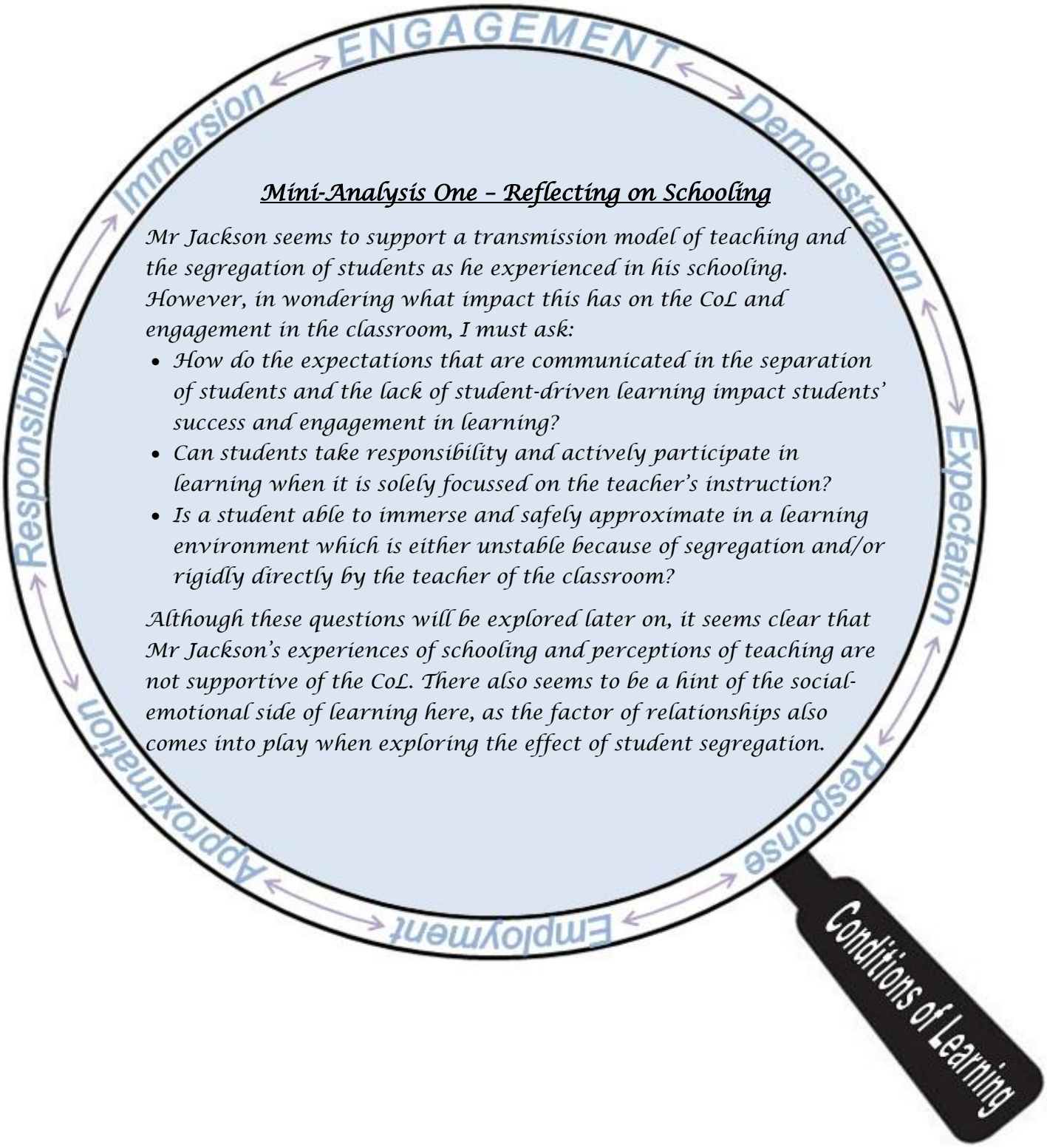
Reflective Journal Entry – 19th August 2013:

"He seems to not have really tried to develop deep relationships with the members of this group, as he is involved with so many other students in his IT teaching role as well. This seems to be preventing an optimal learning environment/culture, hence hindering the CoL from occurring, as is evident from his teaching paradigm and how this disconnects the classroom culture."

The complications that this particular group experiences in having to find a room each week and attempt to meet together from six separate classes seems to cause wasted time and beginning lessons in an unsettled way. This may also indicate to this group that they are not as important as other class groups and prevent immersion from occurring due to the lack of ownership in a classroom space. Furthermore, this situation seems to possibly

be a contributing factor to the apparent lack of unity between the members of the class and, in particular, the lack of relationships between the teacher and his students.

Diagram 4.2: Mini-Analysis One – Reflecting on Schooling



Teacher Training and Practicum Experiences

Tertiary Education

Mr Jackson's education as a teacher initially occurred through him obtaining a diploma from a Christian institution of tertiary education, which was later updated to a bachelor degree. However, teaching was not Mr Jackson's first choice of further education. After high school, Mr Jackson did not initially have any plans of becoming a primary teacher and instead aimed to apply his interest in mathematics to become an engineer. Below is an interview response from Mr Jackson which overviews his journey into teaching and how he feels being a teacher has transformed him as a person.

Third Interview with Mr Jackson – 18th June 2013

"I left high school with the intention of becoming an engineer, and I did 18 months at ***** University doing Civil Engineering... and then stopped... didn't really enjoy engineering once they got into the real engineering stuff. Then I had the intention of becoming a science/maths teacher. So that's what I went to college to do. And took some time off and did some work here or there. Ended up being a primary teacher kind of falling into it and then just enjoying it, with no intention really of ever to really sticking to it, but I have stuck to it... and to be honest, I don't think when I was 18 and left school, I could have been a teacher, or a primary school teacher. I don't think I had the personality for it. And I think I developed the personality for it through my teacher training, to be more open. A bit more of an actor, a bit more loud, a bit more forward, you know what I mean? Generally I'm a fairly shy person, believe it or not (laughter)... I don't like going and meeting new people and that, you know. I don't like being in situations where I'm required to talk and speak and be boisterous or the centre of attention. But I enjoy classroom teaching. So it's almost like a switch that turns on when you're in front of the classroom. It's a, it's a switch, and I can turn it on. But then it turns back off again when I'm away from the front of the classroom."

Mr Jackson's change in his course of study could indicate that he desired to find a career path that suited him personally and would not settle for something that he did not enjoy. It seems that Mr Jackson may have given up on his training in engineering when it became too difficult to understand and apply. In regards to the CoL, it seems as though Mr Jackson's lack of engagement in engineering may have been caused from the condition of employment not being met, as he perhaps struggled to see the meaning and relevance of what he was learning.

At a different stage in the interview referenced above, Mr Jackson revealed that in changing his course of study he was able to join his sister who was also studying primary teaching, which could indicate his desire to maintain a connection with her during this stage of learning. While Mr Jackson feels he just ended up "falling into" primary teaching, it is possible that this instead came from observing what his sister had demonstrated about teaching. Perhaps this is also a subtle indication that, although Mr Jackson acknowledges his shyness, he was able to engage with his teaching training because of a relationship, which may imply the importance of connecting with others for successful learning to occur. Furthermore, Mr Jackson's engagement in primary teaching may also be indicated by him becoming more "open" and "forward" in his personality when in front of the classroom. This may be a sign that he felt safe to approximate and take risks in his demeanour as a teacher, as he usually does not like to talk or be the centre of attention.

Although Mr Jackson does not explicitly say why it is that he likes teaching, he does claim that his decision to change his career path is one that he does not regret. However, Mr Jackson does speak of disliking the chore of having to compile essays and having to find quotes from others to justify his own thoughts during college. Mr Jackson revealed in our final interview that he feels this style of learning was "English based" rather than skill based and focussed too much on theory and regurgitating information. This may indicate that Mr Jackson lacked engagement in his teacher training, as he struggled with feeling like he was missing out on the opportunity to employ the skills he had learnt.

Instead Mr Jackson believes that his personality lends itself much more to a mathematical process of learning which, as he states, involves: learning, understanding and applying knowledge. Although the latter part of this case study will be specifically dedicated to further exploring Mr Jackson's teaching ideology and practices, it seems appropriate to hint at this by briefly unpacking these processes. For this reason I will outline below how each of these processes of learning are evident in Mr Jackson's current teaching practices by presenting brief snippets of data and descriptions for each.

Learning

First Interview with Mr Jackson – 29th May 2013:

"Teachers need to guide that learning."

"I try and teach in the way that I'd like to learn."

"...the not so bright kids, you have to teach them a way that works for them to get to the answer."

Observation 1 – 13th May 2013:

Demonstrates how to complete questions before sending students back to their computers.

Observation 2 – 15th May 2013:

Informs students that they will do some questions together on the board (demonstrate) before allowing them to do them on their own (responsibility).

The observation data above is indicative of the CoL through the perception that learning involves the teacher demonstrating and then shifting responsibility on to the learner. In our first interview, Mr Jackson suggested that although this is sequential and requires planning, he also stated that "you can't rely on a textbook to teach students" and that "what you teach may change as the lesson progresses", indicating that it is an adaptable

process. However, although there is a suggestion that students need to learn processes that "work for them", the evident perception of the teacher needing to guide learning rather than students seems to contradict this. Also, the indications that Mr Jackson teaches how he would "like to learn" begs the question of how students' individuality is catered for in this classroom and may indicate that students lack opportunities to take risks as part of their learning.

Understanding

Observation 4 – 23rd May 2013:

Relates names of shapes to things they know (quadrilateral as a quad bike).

Observation 5 – 27th May 2013:

"How many times can I fold this triangle exactly in half... that's what symmetry means."

Observation 8 – 5th June 2013:

Teacher tries to relate each part of the circle to things that they know, things that are in the real world (e.g. arc is like an arch, circumference is like circumnavigating the globe).

The teacher's focus in developing an understanding in students as a part of learning seems to be predominantly based on relating mathematical concepts to familiar objects or activities. However, there again seems to be a lack of developing student-driven understanding in this process. This is also evident by Mr Jackson's approach of 'running students sequentially through the order of learning', as he said in our first interview, which may further suggest the restrictive nature of this attempt at developing understanding. This indicates the possibility that only students who understand the teacher's demonstrations will benefit from learning, which may also indirectly communicate to students that they are not expected to value or take responsibility in their own learning.

Applying:

First Interview with Mr Jackson – 29th May 2013:

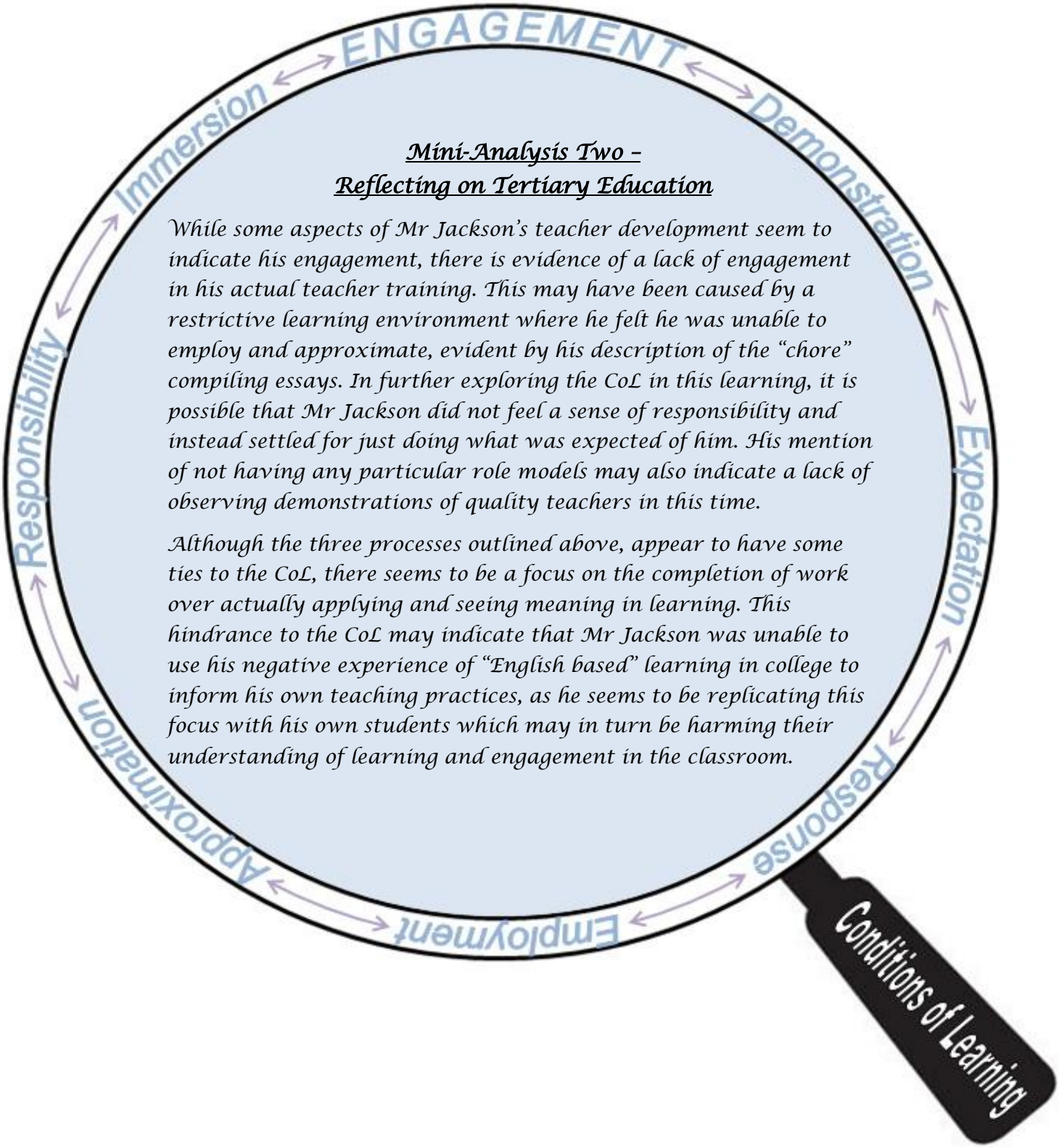
"...show me that they've understood what to do and then give them book work or worksheet work to trial it, to do it, to reinforce it."

Third Interview with Mr Jackson – 18th June 2013:

"…we have to get though our work regardless... there comes a time where even though I know some students still don't get it, we've got to move on... and we hope that the next teacher has another go at teaching them the same thing."

The evident perception of the process of "applying" seems to be mostly focussed on students' completion of paperwork rather than actually using and experiencing learning in a meaningful and engaging way. Although I observed occasional experiences of students using computers (observation 1), equipment (observation 4) and playing games (observation 7) as part of their learning, in general the focus seemed to be to "get through our work... regardless" in this case. This perception further indicates that students are expected to finish the required work, even if they "don't get it" and seems to be causing a hindrance to the CoL and engagement. This could also give students a negative perception that their learning is not valuable, and has no meaningful application in their lives. Furthermore, this stage of applying learning also seems to be quite restrictive due to this teacher's approach of needing to guide learning, as was discussed above and is indicated by his statement to students (in observation 9) that they 'need to put their hand up for help' because 'that's the only way they're going to get it'.

Diagram 4.3: Mini-Analysis Two – Reflecting on Tertiary Education



Mini-Analysis Two –
Reflecting on Tertiary Education

While some aspects of Mr Jackson's teacher development seem to indicate his engagement, there is evidence of a lack of engagement in his actual teacher training. This may have been caused by a restrictive learning environment where he felt he was unable to employ and approximate, evident by his description of the "chore" compiling essays. In further exploring the CoL in this learning, it is possible that Mr Jackson did not feel a sense of responsibility and instead settled for just doing what was expected of him. His mention of not having any particular role models may also indicate a lack of observing demonstrations of quality teachers in this time.

Although the three processes outlined above, appear to have some ties to the CoL, there seems to be a focus on the completion of work over actually applying and seeing meaning in learning. This hindrance to the CoL may indicate that Mr Jackson was unable to use his negative experience of "English based" learning in college to inform his own teaching practices, as he seems to be replicating this focus with his own students which may in turn be harming their understanding of learning and engagement in the classroom.

Practicum Experiences

In general, Mr Jackson speaks positively about the practical experiences involved with his teacher training, as one would expect given the importance that he places on being able to apply learning (as outlined above). Upon reflecting on his practical experiences, Mr Jackson feels that his place of tertiary education "had a really good process for lots of practice teaching" and recalled that when changing his course to primary school teaching he "just really enjoyed prac, and stuck to it". He also indicated that the fact that his first practicum occurred early in his course was valuable as it allowed him to develop his teaching skill by 'actually experiencing it, rather than just learning about it'. This shows Mr Jackson's engagement in the practical side of teacher training, which seems to stem from the presence of immersion, employment and responsibility in this aspect of his learning. However, this comment could also possibly indicate this teacher's tacit understanding of teaching formed through "experiencing" without reflecting and consciously applying specific learning theories and models.

Hearing the account of Mr Jackson's second practicum, as outlined in the response below, revealed a somewhat disturbing story of the impact a practicum can have.

Third Interview with Mr Jackson - 18th June 2013

"I had a bad experience in my first year of prac. Not my first prac, I enjoyed my first prac, but it was my second prac in a Kindy classroom with a teacher... I was only in there for three days, but the teacher knew my parents and didn't really treat me that well... and admittedly I didn't know what I was doing either, that I was a first year male primary teacher trying to teach in a Kindy class... so from that moment on I was very careful who I chose to go with and I tried as much as possible to choose male teachers and prac in male teacher's classrooms. Coz I think the guys have a different way of doing things than the ladies."

Later on in the interview previewed above Mr Jackson states the primary way in which he feels that the above experience caused him anxiety was in that the poor mark he received could have negatively reflected his proficiency as a teacher. However, he was fortunate enough to have a lecturer at college who "dealt with the situation" and was aware that this particular teacher was known to have treated other male prac teachers similarly in the past, even though Mr Jackson was not warned about this. The lecturer reassured Mr Jackson by making an agreement that the results of that particular prac would disappear as long as Mr Jackson did not receive another prac result like that again during his course. It would seem that Mr Jackson was able to use this particular practicum as a learning experience in that he seemingly understood the importance that mentor teachers have in the process of teacher development and the impact they can have on one's teaching ideology. However, although Mr Jackson seemed to display resiliency in this situation, this negative experience could have had some detrimental effects on his teaching through perhaps causing a negative perception of particular types of teachers, anxiety in the remainder of his teacher training, and a focus on pleasing others' expectations of him rather than taking responsibility to meaningfully develop his own teaching proficiency and beliefs.

Mr Jackson's negative experience in this practicum may also be a sign of the important role relationships have in meaningful and authentic learning. The experience he outlined seems to show that he lacked a connection with the teacher who was supposed to mentor him in one of his initial teaching experiences. Also, even though his lecturer somewhat gave him a second chance from this experience, one must ask what the impact was of Mr Jackson not being warned about this teacher who was renowned for her lack of affection towards male teachers. It seems that this experience involved a lack of positive approximation, response and employment in learning. This may have even degenerated Mr Jackson's trust and hence relationship with his lecturer, as well as caused a diminishing of Mr Jackson's engagement and perceived value of his learning in this teaching course.

Overall, Mr Jackson believes that he was quite successful in his periods of practical experience in that he exceeded the expectations of required time spent teaching, developed his teaching competency and was appreciated by the teachers that he worked with. This is evident in his response below, in which he also reveals his feelings on how the practical component of the teaching courses could be improved.

Third Interview with Mr Jackson - 18th June 2013

"When I did it I think it was pretty good, but then again I was the sort of person who asked to teach as much as the other teacher would allow me to do. I wanted to learn to be a quality teacher and so I would teach as much as I could. I would take whole days and whole weeks before the college required us to. And I think I was reasonably competent at doing it, but, you know, most of the teachers, I think, appreciated having me in their room. I saved them work. I think these days there's too much emphasis on the prac teachers coming to school and doing assignments and research projects, rather than watching teachers teach and then teaching themselves. I think there's too much collecting of data and, you know, doing other assignments and stuff. And I don't think the prac teachers for the first few years watch enough lessons and I don't think they teach enough lessons."

This above response shows that Mr Jackson held opportunities of practical experience in high regard for his development as a teacher and wanted to make the most of them. He also indicates here that practicums ought to focus on actually observing and practising teaching, rather than being overburdened with assignments, as is further evident in his response presented on the following page.

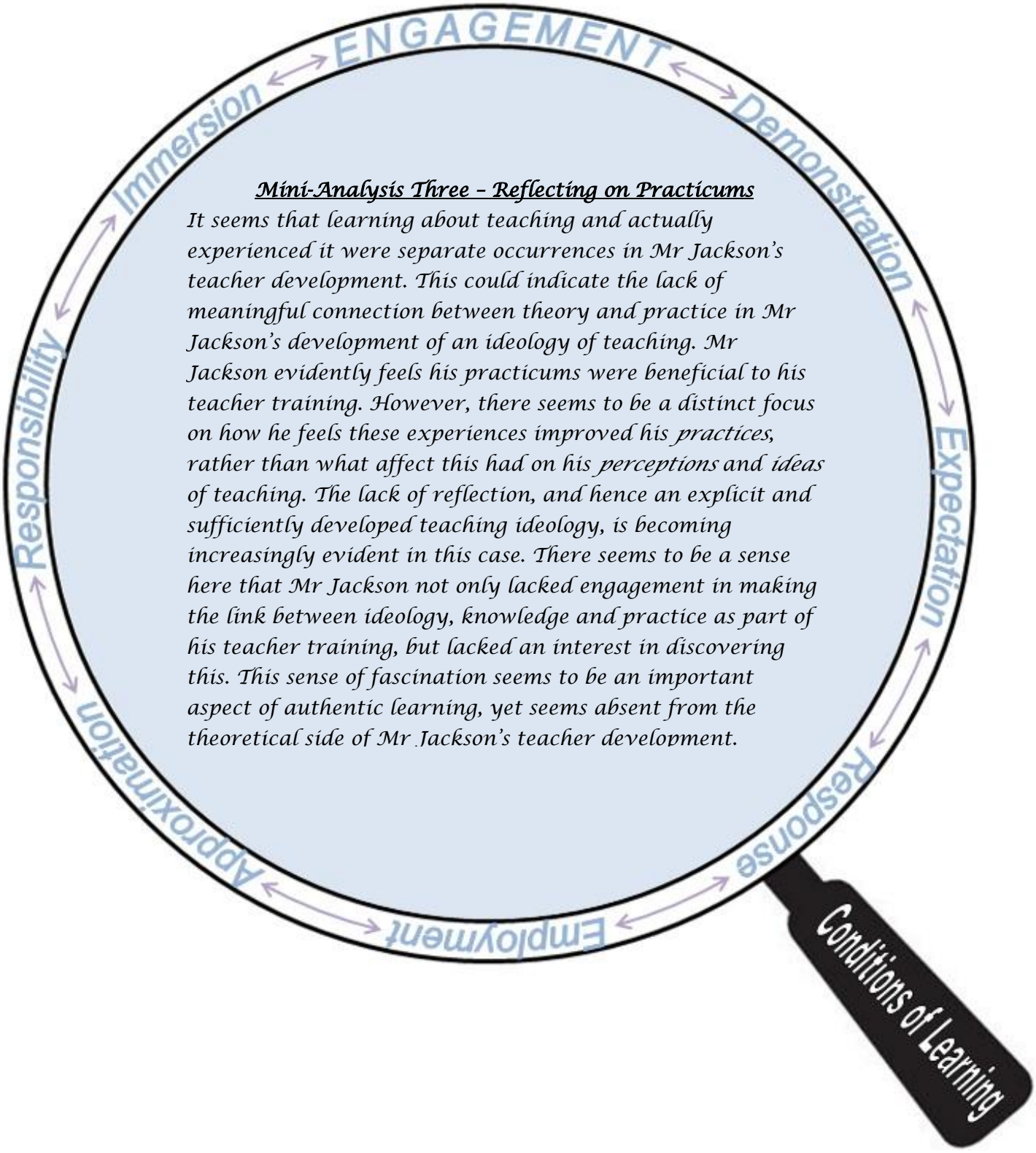
Third Interview with Mr Jackson - 18th June 2013

"So basically what I'm saying is I think in the, in the earlier class, college ought to focus more on getting the students to observe lessons. And then towards the later classes they need to get them more focused on teaching lessons rather than doing other projects or assignments and stuff when pracs are on. They should write programs and things during term time, not during prac time. Prac time is their only time to learn to become quality teachers. And to do that you've got to watch quality teachers and you have to model quality teaching."

It is quite evident that during his teacher training Mr Jackson valued and took responsibility for extending his own learning through seeking to make the most of his opportunities to teach. In this regard, it seems as though he engaged in this aspect of his learning through immersing in practicing teaching, observing demonstrations of quality teachers as well as exceeding expectations for what was required of him as a pre-service teacher and received positive responses as a result of this.

However, it would seem that Mr Jackson somewhat disliked what he was required to do as part of his degree in that he desired to separate the theoretical and practical aspects of teaching. Furthermore, it appears that he believes the processes of 'watching' and 'modelling' quality teaching need not be paired with reflection and consideration of theoretical knowledge of teaching. This is also evident by Mr Jackson's statement in our third interview that, although theory is 'in the back of his head somewhere', he feels "it has very little to do with real day to day teaching". Again, it is possible that this teacher's practices could be based in the realm of tacit knowledge and lacking strong foundational beliefs.

Diagram 4.4: Mini-Analysis three – Reflecting on Practicums



Experiences and Beliefs as a Qualified Teacher

Development as a teacher

In regards to development since finishing his educational training, Mr Jackson revealed that he feels the way in which he teaches has not changed over his many years of experience.

First Interview with Mr Jackson - 29th May 2013

"I don't know... I probably haven't changed a great deal. I guess I've always used the processes... you know, go back to real life examples if I can, concrete examples, demonstrate on the board, give kids some examples and some challenges to, you know.. here's three questions, see if you can get them right, if you can, come show me and I'll give you a lolly. You know, that encouragement to get them to try the ones, to show me they, they've understood what to do and then give them book work or worksheet work to trial it, to do it, to reinforce it. And I guess I haven't really changed much from that structure... and I think that's the structure that works for maths."

The fact that Mr Jackson feels he has not changed much in his approach to teaching could suggest that he has lacked growth and reflection in his development. It is also noteworthy that Mr Jackson feels like he has not changed the structure he uses for teaching as he sees it as "the structure that works for maths", which could indicate his inflexibility in further developing his teaching competency and catering for individual students. Furthermore, in our third interview Mr Jackson also indicated that he 'doesn't set up his classroom on a particular model or style' and instead just tries to 'teach as well he can teach'. Perhaps this indicates this teacher's lack of responsibility in providing students with optimal learning conditions and fear to approximate by trying out different teaching structures to pursue the development of an authentic learning environment.

However, when asked in a further interview if he feels he changed at all from when he first started teaching to the present, Mr Jackson gave a somewhat different response.

Third Interview with Mr Jackson - 18th June 2013

"I think I've become far more relaxed. In my first few years of teaching I thought that I had to teach kids everything and they had to leave my classroom fully understanding all the knowledge acquired of the classroom. And for some students I really highly stressed them because, you know, some kids are slower learners and then as a teacher I put pressure on them to do well and keep them in and make them finish work and that sort of thing. I think I've learnt over the years that I am one step in a long journey... and while I want my step to be interesting, relevant, important, and I want it to be worthwhile... I am only one step in the journey, and I've learnt to move on basically. To say: 'I think I've done a good enough job trying to teach this kid or this group. It's now up to the next teacher to, to give it a go.' Do you know what I mean? I've had to draw a line. And I think probably the thing is having family have mellowed me, as much as anything else... having my own kids. And that was probably about the same time that I started to, you know, think that it wasn't just all about the quality of my teaching or how fantastic my lessons were and all these kids had to finish their work and do great work, and that sort of stuff... education became a bit more relaxed and a bit more fun and less stressed. I mean, that's not to say that I still don't rouse on kids when they don't finish work. But that's become, you know, that's an act."

Although initially in the interview process Mr Jackson did not seem to think he had changed much over his teaching career, the above suggests otherwise. Perhaps this response was a product of reflection between these two interviews, but it does seem that Mr Jackson has indeed undergone changes in his approach to teaching. This could indicate the possibility that a number of other facets of this teacher's attitude and beliefs have formed and evolved without his conscious awareness due to a lack of reflection. Either way, Mr Jackson states that he feels he has "relaxed" in his approach to teaching by focussing less on the quality of his lessons and deciding to "draw the line". This, as well as

the perception of rousing on kids being an "act", could possibly be indicative of this teacher's lack of engagement and a feeling of disconnection in his craft of teaching. Mr Jackson's statement of leaving learning "up to the next teacher" could also indicate this lack of engagement and may possibly suggest that he does not expect his students to be successful learners and hence does not expect himself to be a successful teacher.

Although Mr Jackson's teaching ideology will be further explored later on in this section, the data presented below hints at this in the context of providing evidence for how Mr Jackson has "relaxed" in his teaching, as was just discussed.

Observation 3 - 22nd May 2013:

"For those who are done, you'll just have to wait for today..."

Observation 4 - 23rd May 2013:

Teacher has misplaced his folder, has to chase it down while the students just sit in the class.

Reflective Journal Entry - 19th August 2013:

"He seems to not even have tried to develop relationships with this group, as he is involved with so many other students in his IT teaching role as well. This is not creating an optimal learning environment/culture, hence hindering the CoL from occurring, as is evident from his paradigm and how this disconnects the classroom culture."

Reflective Journal Entry - 14th June 2013:

"Mr Jackson arrived really late to maths today and he appeared unshaven."

The above data is also an indication of the possibility that this teacher has become somewhat stagnant in his development as a teacher. There also appears to be a sense of learning not being valued by this teacher in some aspects, which could have effects on his

own demeanour and teaching proficiency, as well as the way in which children respond to the learning. This is also somewhat apparent by the inconsistencies between certain lessons that I observed. For example, while Mr Jackson would sometimes convey a sense of urgency to pay attention and finish work (observation 4 and 8 respectively), there were other times when students were observed to have extended periods of being unproductive and seemingly having nothing to do as he was unavailable able to help them (observation 7) or because he was not even aware of their disengagement (observation 10). Furthermore, the reflective journal entry revealing a time when this teacher was late to class may possibly indicate that his current situation is causing him stress. It seems that Mr Jackson is struggling to create an immersive classroom and feel responsibility in his current teaching role in which he and his students only meet for a short amount of time each day and lack ownership of a learning space.

While Mr Jackson states that he feels the main structure and focus and teaching has remained the same over his career, he also states that his attitude has changed in that he has somewhat surrendered and is willing to hand over responsibility to the next teacher. Although Mr Jackson feels that "education became a bit more relaxed and a bit more fun" over time, this could possibly be suggestive of a teacher who lacks a sense of true value in learning and lacks the motivation and know-how required to provide his students with quality learning experiences. Yet again, the tacit nature of this teacher's ideology in which he seems to perhaps not fully understand engagement is somewhat apparent as well. While it seems the origin of this attitude towards teaching is unknown, the story from the previous section suggests the possibility that a lack of reflective practice and application of theory during tertiary studies may have caused the formation of a tacit approach to teaching rather than something more grounded, intentional and meaningful.

On the other hand, during our final interview Mr Jackson acknowledged that during his career as a qualified teacher he has in fact enhanced his teaching proficiency. This development occurred through updating his qualification from a diploma to a bachelor

degree as well as both participating in and running a "quite a significant amount" of professional development and in-service sessions, particularly in the last five or six years.

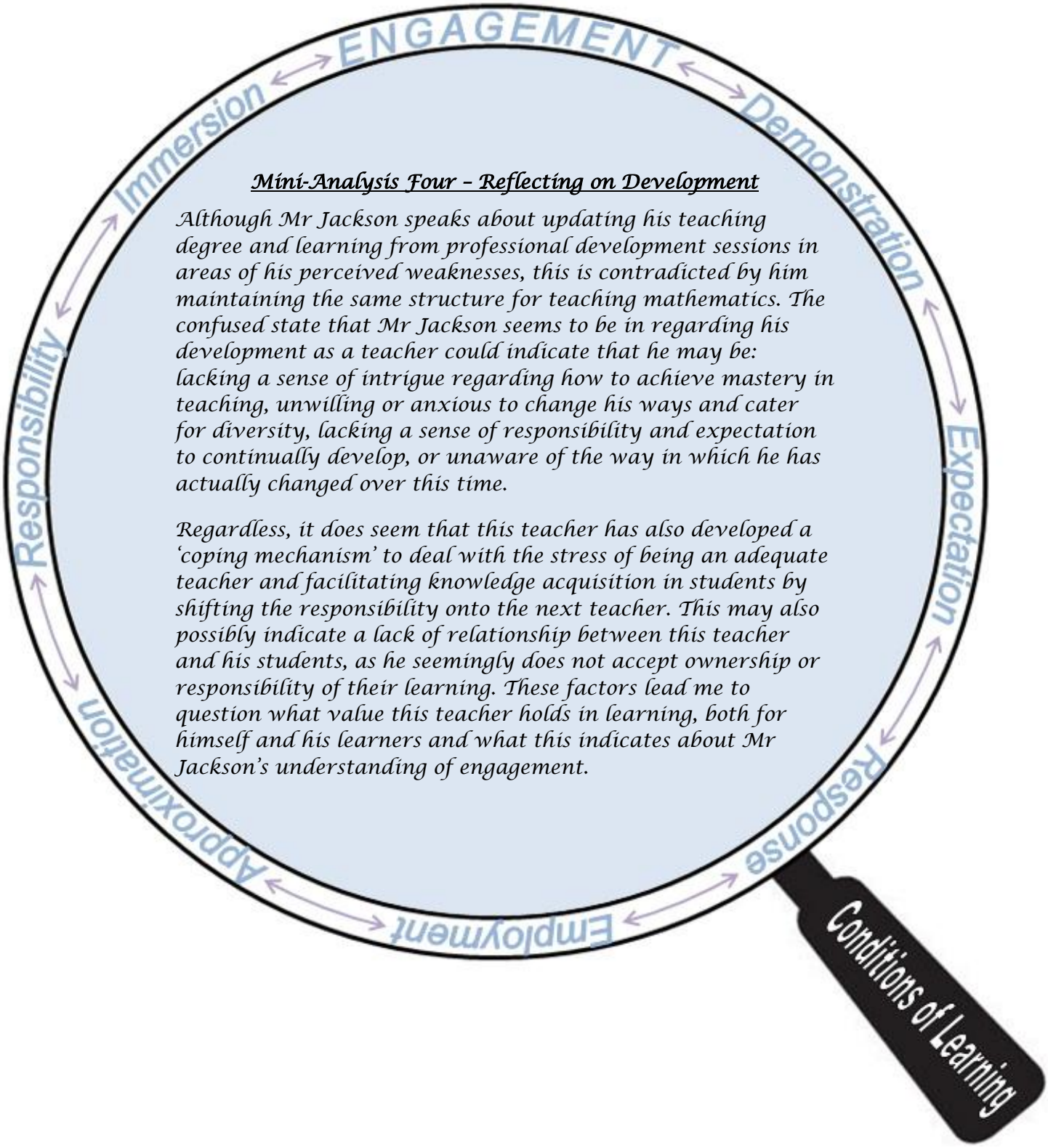
Third Interview with Mr Jackson - 18th June 2013

"Like I was saying earlier, I had go through a diploma... And then about 12 years ago I started a bachelor. That actually took me 6 years to do. It took a very long time to get finished. You know, working full time, doing it part time. My academic record has lots of withdrawals in it. S there was that... that was really good. That was very relevant I thought to my teaching. Plus now that I'm at bigger schools, the schools have budgets to send you on professional development and stuff and I generally make myself available to those and go to those and try and learn at those. And I usually try to pick ones where I think my teaching weaknesses are."

The update to Mr Jackson's qualification and his continual involvement in professional development shows that he has indeed undergone additional learning since beginning his career, regardless of whether or not this has actually affected his teaching practices and beliefs. Mr Jackson's acknowledgement of choosing specific professional development sessions in areas of his perceived weaknesses could also be a sign of him taking responsibility in improving his teaching and seeking opportunities to employ better practices. However, there is still a noticeable lack of details in the above response, which may suggest that what was learnt wasn't necessarily meaningful or taken on and applied by this teacher.

Intentionally left blank

Diagram 4.5: Mini-Analysis Four – Reflecting on Development



Mini-Analysis Four – Reflecting on Development

Although Mr Jackson speaks about updating his teaching degree and learning from professional development sessions in areas of his perceived weaknesses, this is contradicted by him maintaining the same structure for teaching mathematics. The confused state that Mr Jackson seems to be in regarding his development as a teacher could indicate that he may be: lacking a sense of intrigue regarding how to achieve mastery in teaching, unwilling or anxious to change his ways and cater for diversity, lacking a sense of responsibility and expectation to continually develop, or unaware of the way in which he has actually changed over this time.

Regardless, it does seem that this teacher has also developed a 'coping mechanism' to deal with the stress of being an adequate teacher and facilitating knowledge acquisition in students by shifting the responsibility onto the next teacher. This may also possibly indicate a lack of relationship between this teacher and his students, as he seemingly does not accept ownership or responsibility of their learning. These factors lead me to question what value this teacher holds in learning, both for himself and his learners and what this indicates about Mr Jackson's understanding of engagement.

Ideology, Knowledge and Practice as a Teacher

Attitude towards Teaching

In this section of the case study I will report on and explore the set of beliefs and principles driving Mr Jackson's teaching practices. This will begin through revealing what I have found regarding Mr Jackson's attitude towards the teaching and hence learning that occurs in his classroom, which is an indication of what drives his ideology.

In this chapter we have already seen indications of the way in which Mr Jackson structures his teaching, through hints at highly structured and sequential learning, as well as the preference of a transmission model of teaching. The interview responses below provide more details of the way in which Mr Jackson approaches the teaching of students.

First Interview with Mr Jackson - 29th May 2013

"... I try and teach in the way that I'd like to learn. That's really what it comes down to. And that comes down to my boredom fairly quickly with repetitive work. So I try and break up lessons into smaller pieces and I try and have concrete materials and examples and things to play with and then some harder challenges. So I guess I try and teach in a way that I would want to learn. So I would want my teacher to come in and teach me this way, and that's what I try and do in class."

Fourth Interview with Mr Jackson - 26th June 2013

"I'm a very traditional chalk and talk type teacher... I do the talking then we do the work"

"I try and run my classroom in a way that I would like to be a student in my own room, with the understanding that there's gotta be work and there's gotta be learning, but there's gotta be breaks and there's gotta be fun as well, there's gotta be, you know, something that holds attention."

As indicated earlier and now more clearly established, Mr Jackson's attitude towards learning relies on establishing a classroom environment which he personally feels he would like to learn in. While he describes this as involving concrete materials, things to play with and something that holds attention; the way in which these actually occur in his classroom seem to be in the context of the way he best experiences learning, not his students. Also, as explored previously, Mr Jackson's understanding of learning seems somewhat based on the transmission of knowledge. This "chalk and talk" style of teaching seems to be what Mr Jackson draws on in his teaching, as this is what he appears to have experienced in his own learning where he feels he was quite successful, as detailed earlier. This could possibly indicate that Mr Jackson lacks the willingness, ability, or awareness to cater for the diversity of learners in his classroom, which may significantly impact the authenticity of learning which occurs. This could also suggest a lack of engagement within this classroom as both the teacher and his students may be failing to immerse in learning.

The authenticity of learning in this classroom as well as the attitude Mr Jackson has towards teaching is further revealed in the interview responses below.

Third Interview with Mr Jackson - 18th June 2013

"...it's a switch, it's an act. You know, teaching is an act. And there are days where that act becomes a giant bluff. And you know, you just dread the day that the kids call your bluff... it's an acting game."

"I think that I teach reasonably well and the kids learn pretty well in my room, so it might simply be an attitude of, 'Well, I think I do enough, to teach enough'."

The above statements give further indication of the possible inauthentic nature of this learning environment. Mr Jackson's belief that teaching is "an acting game" and his attitude of "do enough, to teach enough" highlights the potential lack of engagement that he has in his own teaching practices and providing students with an authentic and optimal learning environment. It seems that this teacher may indeed be content with teaching

"reasonably well" and unwilling to risk revealing his true character to his students, which again may have an impact on the authenticity and consistency of the learning environment he establishes. This also seems to be influenced by the apparent struggles this teacher seems to be facing in his current teaching role, in which he and his students appear to face complications in finding a regular classroom to experience learning in (observation 2). All of this may possibly be further indication of this teacher's anxiety to approximate in his teaching, which could impact the engagement in his classroom with his students adopting the same demeanour.

Attitude towards Theory

Another theme of evidence in this case revealing Mr Jackson's perception of teaching relates to his understanding and application of theory. An overview of this is evident in the response displayed below.

Third Interview with Mr Jackson - 18th June 2013

"All of the theories and all of that stuff, I mean, they're all in the back of my head there somewhere. I think it has very little to do with real day to day teaching, to be honest. It's not like I set my classroom up on a particular model or style. I just try and teach as well as I can teach."

The response above indicates Mr Jackson's lack of value in theory as it applies to teaching and seems to possibly suggest the tacit nature of Mr Jackson's teaching ideology. Although Mr Jackson seems to feel theory holds no place in the way he runs his classroom, it is possible that he is simply unaware of how theory does influence his teaching practices due to a lack of reflection and his statement that theory is hidden 'in the back of his head somewhere'. This unintentional approach to teaching could suggest a lack of engagement through this teacher's struggle to employ what he has learnt about teaching. These ideas also seem to align with the already extensively explored notion of Mr Jackson teaching in a way in which he feels he would learn best, without particularly considering his students.

When talking about the particular theory of multiple intelligences in our third interview, Mr Jackson stated that this is something that he does not specifically cater for in his class. While he feels he provides students with a variety of different learning experiences and hence indirectly caters for diversity, Mr Jackson states that the "significant amount of effort" required to reorganise his program would probably result in a "minimal amount of benefit". Although the significant factor here seems to possibly be a lack of faith and value in this theory of teaching, Mr Jackson also acknowledges that he has "never really been taught to do it in a classroom situation". This could indicate anxiety and perhaps a lack of properly applying and reflecting on the use of such theories during Mr Jackson's teacher development and training. This theory does seem important though, as this teacher seems to get frustrated with students who talk too much during class (observation 3) or struggle to sit still and listen (observation 6), which may indicate that they simply need to experience learning in a different way than how it is usually presented.

However, when probed further in our fourth interview about the philosophies driving his teaching, Mr Jackson revealed that trained response and the experiment of Pavlov's Dog somewhat influences his practices. Although this is primarily a basis for the DARTS token reward system modelling real life that he invented, the responses below also indicate how this idea comes in to his regular teaching as well.

Fourth Interview with Mr Jackson - 26th June 2013

"...it is a bit of a philosophy... I tend to at the very beginning play lots of games and those sorts of things and get kids positive about maths, and then gradually the work gets harder and harder and more and more boring."

"Essentially it's a process of training the children to do what I want them to do through extrinsic rewards initially, and then gradually transferring that over to intrinsic motivators."

"They learn what's expected and then that becomes automatic."

The data above further supports the possible theme that Mr Jackson tries to control his students' attitudes and behaviours in order to develop what he perceives as being a productive classroom. It seems that this idea of learning may be somewhat deceptive, in that students are tricked into initially thinking learning will be fun, but are then expected to accept that it will become increasingly difficult and boring. The use of extrinsic motivators and training automatic responses was evident by Mr Jackson's occasional use of lollies to motivate students (as he indicated in our first interview and was observed to do in observation 7). This ideology may also be evidence of a devaluation of authentic learning and could indicate the existence of an unbalanced relationship between this teacher and his students, who could feel expected to act in particular ways rather than authentically experiencing learning for themselves. Mr Jackson does not recall if he experienced this idea of trained response in his own schooling, which may also indicate that this is not something that has been reflectively applied to his teaching practices and may instead simply be an attempt to make life easier for this teacher.

Role of a Teacher

The final area of Mr Jackson's teaching philosophy which I would like to highlight is that of his perception of the role that he as a teacher has in the classroom, which is summarised by the interview responses displayed below.

Fourth Interview with Mr Jackson - 26th June 2013

"I don't feel as though I'm earning my money if I'm not teaching or directly supervising the teaching."

"I don't see a point in doing work outside just for the sake of being outside I'd rather them be at their desk, inside, in comfort, supervised."

"...my goal as a teacher is to teach, to get the knowledge into students, to get students to have an understanding of the processes and the work we're expecting them to learn in an efficient fun way so that they remember the learning... my job is to facilitate that as best as I can."

These statements clearly show Mr Jackson's perception that his required role as teacher involves being directly involved in learning by facilitating the acquisition of knowledge in his students. The mention of earning money may indicate the extrinsic nature of Mr Jackson's motivation to teach well, which could possibly suggest a lack of value in learning. On the other hand, Mr Jackson also mentions in this interview that he feels he is actually paid too much, which may instead possibly indicate that he is not motivated by money but by the guilt of needing to do what is required to earn it. It seems that for this reason Mr Jackson's teaching may be primarily driven by the apparent requirement to directly teach or supervise learning, instead of allowing students to have much of a say in this. This may cause his students to struggle to engage, employ, approximate and feel a sense of responsibility in their learning. This seemingly restrictive attitude to students' learning is also apparent in Mr Jackson's preference of students working inside where he can supervise again. Again, this may possibly be a sign of this teacher structuring learning in the way that he prefers, without really considering his students.

This sense of needing to control learning, as well as the apparent priority of completing work, is evident in the additional data snippets below.

Observation 1 – 13th May 2013:

"I'm sorry, I'll treat you like babies".

Observation 2 – 15th May 2013:

"Put your hand up if you're stuck, that's what I get paid for".

Observation 9 – 17th June 2013:

Tells students they need to put their hand up for help – "that's the only way you're going to get it".

Students raise hands to wait for help, no strategy for gaining assistance any other way.

Reflective Journal Entry – 31st May 2013:

"Another theme is that of students relying on the teacher's individual assistance for their learning to occur. They don't seek the help of peers or even try and persevere through the problem, but simply wait for him to attend to them. Low self-efficacy seems evident."

This additional evidence also indicates the focus of this teacher being to directly monitor and guide the learning. The observed words which he says to the class seem to communicate that he is their best chance for learning, and reveal the motivation of earning his money as a teacher. While perhaps unintentional, this response and expectation that Mr Jackson seems to voice to his students may also indicate his distrust and lack of faith in their ability, which may hinder their opportunities to approximate and engage in their learning. It also seems that students take these messages to heart, as they were frequently observed simply waiting for Mr Jackson's assistance rather than trying to solve problems themselves or through peer collaboration, which may be an indication of poor self-efficacy. Perhaps this is also evidence of the idea of trained response in this class, as described above, as students seem to have developed the automatic reaction of seeking the teacher's assistance in difficult circumstances, rather than persevering through problems or attempting to collaborate with others.

Related to this perceived role of a teacher is Mr Jackson's attitude towards the use of group learning in the classroom, as displayed below.

First Interview with Mr Jackson - 29th May 2013

"I'm not real big on group work, I guess it takes a lot to organise really good quality lessons... And I don't see great benefit in them"

"...kids who know how to do the activity already take over and do it. The kids that don't know what to do get left behind and very little learning happens."

The above interview responses reveal that Mr Jackson is fairly resistant to the use of cooperative learning in his classroom. This may be an indication of his opinion of student collaboration in learning, which is seemingly also something he is resistant to given his view of being a "chalk and talk" style teacher, as detailed earlier. Again, this could possibly suggest this teacher's anxiety in teaching and a resistance to approximate beyond a transmission model of teaching. There are also hints in the above response that Mr Jackson lacks both a sense of trust in his students and faith that they can direct their own learning without him. This was also somewhat evident in the lessons I observed in that, although he told students they were allowed to talk 'sensibly' at times (observation 4, 10), in other instances he would separate students who seemed to be working well together (observation 6). This may also possibly be a sign of a poor relationship between this teacher and his students, and gives further indication of Mr Jackson's perceived need to control his students' learning experiences.

Further clues regarding the relationships present in this classroom are displayed below.

Observation 2 – 15th May 2013:

Quite firm with the students, stern facial expression. Vocal variations but not much attempt to converse with or interact with students.

Observation 8 – 5th June 2013:

Teacher gives responsibility to two boys who are finished to go around and check the work of others around the room.

*"**** is stuck, who's going to come out and help him?"*

Reflective Journal Entry – 17th August 2013:

"…it became clear from this observation that Mr Jackson somewhat lacked a relationship with these students, and had seemingly established an authoritative role over them with a somewhat cold and bland approach to teaching children... This cold demeanour is something which the kids clearly said they didn't like in teachers during my interviews with them."

While there certainly seems to be a lack of relationships and collaboration evident in this learning environment, there also appear to be times when peer collaboration and support amongst students is seen as beneficial. Despite seeming to express some distaste towards group work, in our first interview Mr Jackson stated that he sees value in peer supported learning "where individuals help each other". Furthermore, the data from "observation 8" outlines a scenario in which Mr Jackson encouraged collaboration in the classroom and seemed to give some responsibility of directing the learning to the students, which seems inconsistent with his attitude observed in other lessons. This inconsistency could indicate an unintentional and unreflective approach to student collaboration, as it does not align with the authoritative role this teacher was observed to have in his teaching elsewhere. The presence of inconsistencies, as well as the affect they have on engagement in this classroom context, became aware to me through reflection during this research, as outlined in the reflective journal entry displayed below:

Reflective Journal Entry – 18th August 2013:

I have also noticed some discrepancies. For example: Mr Jackson spoke about students being 'unorganised in their learning', yet in the 4th lesson I observed he had forgotten/misplaced his teaching folder... this made me think about the effect of this misalignment between what the teacher expects and what he actually does...Inconsistency seemingly appears in many forms within this class:

- *Attitudes to learning (structured and transmission or open and exploratory)*
- *Learning experiences (book work or games/concrete learning)*
- *Teacher demeanour (strict and structured or friendly and playful)*
- *Learning environment (lack of certainty of where they will be and a distinct lack of ownership of the room)*
- *Student collaboration (is it allowed or not? What are the rules?)*
- *Attitudes to mathematics (is it boring/tedious or fun/interesting?)*

...These inconsistencies seem to cause a definite hindrance to learning and engagement in this classroom, and could be a sign of a teacher who is confused or possibly inconsiderate of his teaching beliefs and philosophy. I also believe it is both a cause and effect of the evident lack of student/teacher relationships.

The above reflective journal entry seems to sum up what has been found as a result of investigating this teacher. The inconsistencies outlined here appear to be a possible sign of an unstable learning environment in which students do not really know what to expect and hence struggle to engage. This also could be another indication of the possible disengagement this teacher has in his own practices, as he seems to be struggling between somewhat opposite approaches. This may possibly be a sign of his attempts to engage his students, but a struggle to fully follow through with this due to what seems to be a sense of anxiety and a lack of reflection. This may in turn lead to him instead falling back on a restrictive approach to teaching which he perhaps feels comfortable with and expected to use in this particular situation.

Intentionally left blank

Diagram 4.6: Mini-Analysis Five – Reflecting on Ideology



Mini-Analysis Five – Reflecting on Ideology

The theme which continually appears throughout this story is the apparent deficiency of reflection and application of theory while learning to be a teacher. This may have caused the lack of a personally developed, refined and distinguished teaching ideology, which has apparently led to a range of inconsistencies in this learning environment. It also appears that Mr Jackson is not particularly driven by achieving excellence in teaching and is instead content to do 'enough', which indicates that he lacks engagement and a sense of responsibility in his teaching role. There also seems to be a lack of fascination here, as Mr Jackson doesn't appear interested enough to best cater for his students. Although Mr Jackson intends to engage students, it seems he falls back on a transmission approach, perhaps due to a lack of approximation and employment in his experience of teaching. The theme of relationships is also apparent, as it seems Mr Jackson lacks trust in, and hence a relationship with, his students. This is also evident by what he expects of his students (whether intentionally voiced or not), which may also hinder students engagement and self-efficacy.

In summing up, the data on Mr Jackson's teaching ideology as it applies to his practices essentially demonstrates the tacit and unreflective nature of his understanding of teaching in which he structures learning around his personal style. To further explore the actual effect this has, I will now investigate the perspectives of the students' in this classroom.

Student Case Study

Having reported on the findings from the investigation of the teacher, I would now like to provide an overview of the students' perspectives of engagement in this classroom. This will involve the use of interview data to compare what the students understand about engagement with the teacher's understanding and what actually happens in their classroom. Because of the complications outlined in Chapter One, I was only able to interview two students from this class, but their stories are still valuable for adding to this story and investigating engagement. These findings on what the students revealed about the CoL and engagement will be structured to talk about their perceptions of: interesting learning, achievement and collaboration.

Perception of Interesting Learning

I will first report on what these students told me about what it is that they see as interesting learning. As perhaps comes as no surprise, these students had an apparent desire for learning to be enjoyable, as is evident in the interview data presented below.

Interview with Jay - 19th of June 2013

"I enjoyed it first of all coz we got to go outside and have fun in a maths lesson... coz I know and knew how to use the compass, so and then at the end there was lollies for whoever found them and so, I found that fun."

"...she'd turn everything into like a game and made it very fun although we were still learning."

"I'd like to see maths teachers who are optimistic and enthusiastic."

Interview with Peter – 14th of June 2013

"When we were in the younger years we used to go outside and it was like a half PE half maths thing... learning about graphs and we went outside and we had to throw bean bags."

The responses above indicate that these students see optimal learning as being strongly related to a sense of fun and enjoyment. However, while they detail several examples of how this has occurred for them, these were all past learning experiences that occurred during their younger years of schooling, which may indicate that these types of activities are missing from their current schooling. These experiences of getting outside, playing games, using equipment and just having fun in general appear to indicate an environment that has the CoL richly present. In particular, these activities seem to successfully immerse students in learning, engage them in interesting demonstrations, help them to feel safe to approximate, allow them to employ their learning in an engaging way and give them the response that learning is actually fun.

As Jay stated, it seems that the teacher's attitude and enthusiasm is also an important part of this, which may be a reflection of the subconscious impact a teacher's demeanour can have regarding what they demonstrate and what expectations they communicate to students. Although there were times when these students' teacher would demonstrate enthusiasm and excitement in learning (observation 4 and 5), in other instances there seemed to be a much more firm and rigid approach to his lessons which lacked in friendly interactions with his students (observation 1, 2 and 6)

Related to this sense of fun in learning is a sense that engagement is impacted by the relevancy of learning for these students. The responses below further indicate students' desire for enjoyable learning, but particularly highlight the relationship between valuing learning and seeing meaning for it.

Interview with Jay – 19th of June 2013
"We did activities like when we were learning about degrees on the compass or something, we would actually follow a compass and go somewhere." "...one time we had to measure the size of the cars, so she got some of her cars and drove them to school and we got to measure up them." "She let us go outside and learn more so like we for instance followed compasses and checked how big basketball and netball courts were and see how far everyone could kick a ball." "Our books said go outside and measure your netball court, your basketball court and your soccer court, except the teacher just wrote up random numbers on the board and that's what she said to write down for our answers."
Interview with Peter – 14th of June 2013
"I mean you're gonna need them (maths skills) some day."

These students seem to value being able to experience mathematics in a meaningful and concrete way. There are also indications of the role enjoyment plays in engagement here, and in particular, there are hints in Jay's responses that he is engaged when learning about things that actually interest him (sports and cars for instance). Furthermore, the theme of getting outside is prevalent throughout the student responses above, which indicates the sense of enjoyment and authentic learning experiences that venturing beyond the walls of the classroom can lend itself to.

However, Jay also recalled a teacher who "just wrote up random numbers" instead of taking the opportunity to experience learning outside in a more meaningful and enjoyable context. This may be an indication of disengagement being caused by teachers who "don't see a point in doing work outside" and would "rather them (students) be at their desk, inside, in comfort, supervised", as Mr Jackson stated in his fourth interview. This seems to hinder the CoL through possible factors such as a lack of immersion and exposure to

authentic learning, an expectation that learning about mathematics is not fun or meaningful, as well as preventing students from employing what they have learnt. This may also be an indication that the teacher lacks engagement and a desire to approximate in their own teaching practices. All of this may indicate the benefits of catering for students' particular needs and interests, and hence show the requirement for teachers to not only look past their own preferences for learning, but to develop relationships with their students and get to know them personally.

Although the above data indicates the students' perceptions of enjoyable learning and how it can improve their engagement, there is a hint that these are fond memories of how learning used to be, rather than how it is today. Perhaps this indicates these students' struggle with a sense of disengagement and learning becoming increasingly unenjoyable as they have progressed through the primary school years. This was somewhat apparent by observations of the teacher of these students beginning lessons by directing students to immediately pay attention to the whiteboard or to complete work from their textbooks without providing any meaningful introduction to the lesson or even greeting them (observation 3, 4).

This is also indicated in the data below, where these students outlined what they would like to see changed in their learning to make it more engaging for them.

Interview with Jay - 19th of June 2013

"I hate how teachers just sit up there and just yap on the same subject for like half an hour."

"I find this really annoying about teachers, all they really want you to do is work, so like... they never really like active games."

"They could make it better by like sort of making us do it although like making a game out of it."

Interview with Peter – 14th of June 2013
"Maybe we could like... do stuff that we haven't done before… we use the same methods to like do it, like it's always either gluing stuff into our workbook or like writing in our workbook or on the board."

The students' statements above essentially seem to summarise their desire for: fun in learning, 'different' learning experiences (beyond board and book work) and teachers who visibly enjoy and value learning. There also appears to be a perception here of teachers often being very directive and restrictive in the learning they set up, as evident by the feelings that they "yap on the same subject", only want students to do work and overuse learning from the whiteboard or workbook. This appears to indicate disengagement through boredom and perhaps the lack of a sense of inquiry to drive students to actually be interested in learning. This was also evident in observations of students being unproductive because they were either waiting for the teacher's assistance or perhaps simply because they were bored with the activities presented to them (observation 6, 7 and 10).

Perception of Achievement

The next area of interest regarding what students revealed about their engagement in the classroom relates to their sense of achievement and what effect this has, as evident in the interview data on the following page.

Intentionally left blank

Interview with Jay – 19th of June 2013
"..you come to a question that's really hard but you wanna do well in maths, so you sit there for a little while and you can't work it out and then when you walk out of the classroom and then it just comes into your mind and you remember the right answer."
"Sometimes you know more than the teachers know about certain subjects and that's kinda cool going 'no, that's not right, this is right' and then they're agreeing with you."
"I don't really get pushed enough."
Interview with Peter – 14th of June 2013
"I felt a little bit bored because we'd done the exact same thing yesterday."
"...my brain doesn't work in the same way as other people I've got this thing called dyslexia. It's where your brain doesn't function like other people's brains."

Jay's response of wanting to "do well in maths" seems to indicate his desire to succeed and the motivation that he draws from this. It also seems that reflection is an important part of this, as he describes coming to understand a difficult concept after he has left the classroom. This may also suggest the benefit of experiencing learning beyond the confines of the classroom and the benefits that this can have on reflective practices as a part of learning. The engagement behind success is also apparent in Jay's response of enjoying being able to teach the teacher. This perhaps indicates the importance of positive student/teacher relationships in the classroom, where students feel safe and supported in contributing to the learning of others, rather than this being simply the responsibility of the teacher. As will explored in the next section, the engagement that comes from success also seems to be promoted by experiencing achievement in collaboration with others, which was occasionally evident in this class through observations of students sharing success by working together and discussing answers (observation 4, 5, 7).

However, Jay's statement that the he does not "really get pushed enough" as well as Peter's recollection of being bored when he was taught something he already knew may indicate that a lack of challenging students and giving them opportunities to succeed is harmful to students engagement. This was somewhat evident in an observation of students who had finished their working being told that they'd "just have to wait for today" (observation 3). This also perhaps implies that students' inquisitive approach to learning can be hindered by a suggestion that their learning is not as important as the need to follow the teacher's plan. Peter's feeling that his "brain doesn't work in the same way as other people" may also indicate that he does not view himself as being capable to learn properly and hence expects to not succeed. This may also possibly suggest that his personal needs aren't catered for in his learning, which would most likely have a negative impact on his engagement and sense of value in learning.

Perception of Collaboration

When exploring students' understanding of engagement in this classroom, their perceptions on collaboration also appeared to have importance. While there seems to be a desire for students to be able to experience learning with their teacher (as indicated above in Jay's interview response highlighting his enjoyment of 'teaching the teacher'), there also appears to be important and informative perceptions regarding student collaboration. The interview responses below outline what these particular students feel about collaborating with their peers as part of their learning.

Interview with Jay - 19th of June 2013

"I like working with my friends more because I'm always with them I know how they work so I can adjust to them and they can adjust to me so that way we can work properly and get our answers right."

"I probably think we should choose who we help. Coz like when I help ***** I don't give him the answer but I help him through it."

Interview with Peter - 14th of June 2013

"I like sitting next to my friend... sometimes we help each other."

The data above indicates these students' enjoyment of collaborating with their friends as part of learning. There is also a possible indication in these responses that teaching others through the processes of demonstration, approximation and response is beneficial for increasing engagement and making learning seem more meaningful. Related to this is the sense of wanting to be able to choose who to work with, which may be another indication of the importance of considering students' individual needs and preferences in order to provide them with authentic learning experiences. The benefits that relationships have for learning also seem to be prevalent here, and may possibly be a significant factor in satisfying these students' apparent preference to learn in collaboration with their peers.

Although the above data outlines the apparent benefits that collaboration has for these students, their perceptions of what teachers expect regarding them working together do not seem to align with this, as indicated in the interview data below.

Interview with Jay - 19th of June 2013

"If you don't understand the question he probably just wants you to put up your hand and ask about it... Coz it's what most teachers do."

"..thinks that I just normally talk... doesn't think that I'm actually helping him."

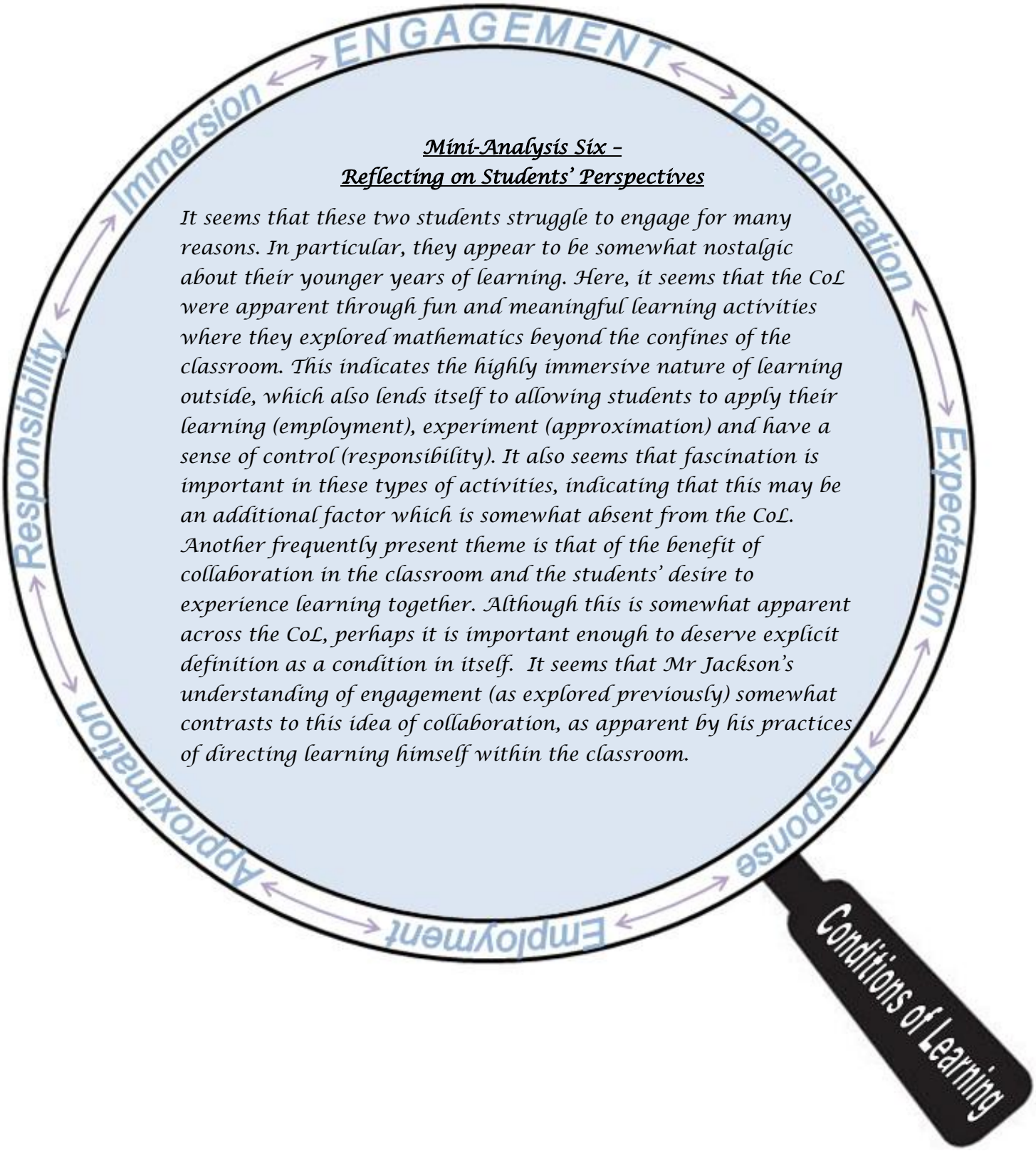
"Teachers, no offence to anyone, sometimes they don't have the best hearing... and they could be standing in the other half of the classroom and hear you whispering and think you're talking about a video game or something, so then they'll go 'alright, you two separate you've both got pink warning cards' or something like that, when we're really trying to help each other."

Interview with Peter – 14th of June 2013
"We usually work by ourselves."
"No, we don't know if we're allowed to talk about it."

These responses seem to suggest confusion around what students feel is expected of them regarding collaboration in the classroom. Jay's statement that most teachers want students to come to them for help and Peter's indication that students usually work individually may suggest a teacher-directed classroom structure in which collaboration is discouraged. Furthermore, beyond just confusion, there seems to be a sense of anxiety related to these students' perceptions of collaboration in their classroom, as evident by Jay's indication of teachers misinterpreting his attempts to help his peers as him being off task and behaving inappropriately. This anxiety may possibly be a cause of disengagement, in which students lack responsibility to direct their own learning, do not feel safe to approximate and experience learning together, receive negative responses regarding their attempts to collaborate with others, and feel expected to only learn from the teacher.

Another factor impacting the apparent absence of collaboration in learning may be the learning environment that these students are exposed to, in which they lack a room to call their own and therefore do not seem allowed much freedom in seating arrangements and physical organisation of the class. Furthermore, in this situation the class group only meets for 45 minutes per week which, along with the teacher's perceived focus of needing to get through work and directly instruct his students (as discussed earlier), may prevent collaboration through a lack of connection and relationships amongst the class. It also seems that this lack of collaboration may prevent students' sense of inquiry in learning, which they seemingly try to share with their peers but lack encouragement from doing so.

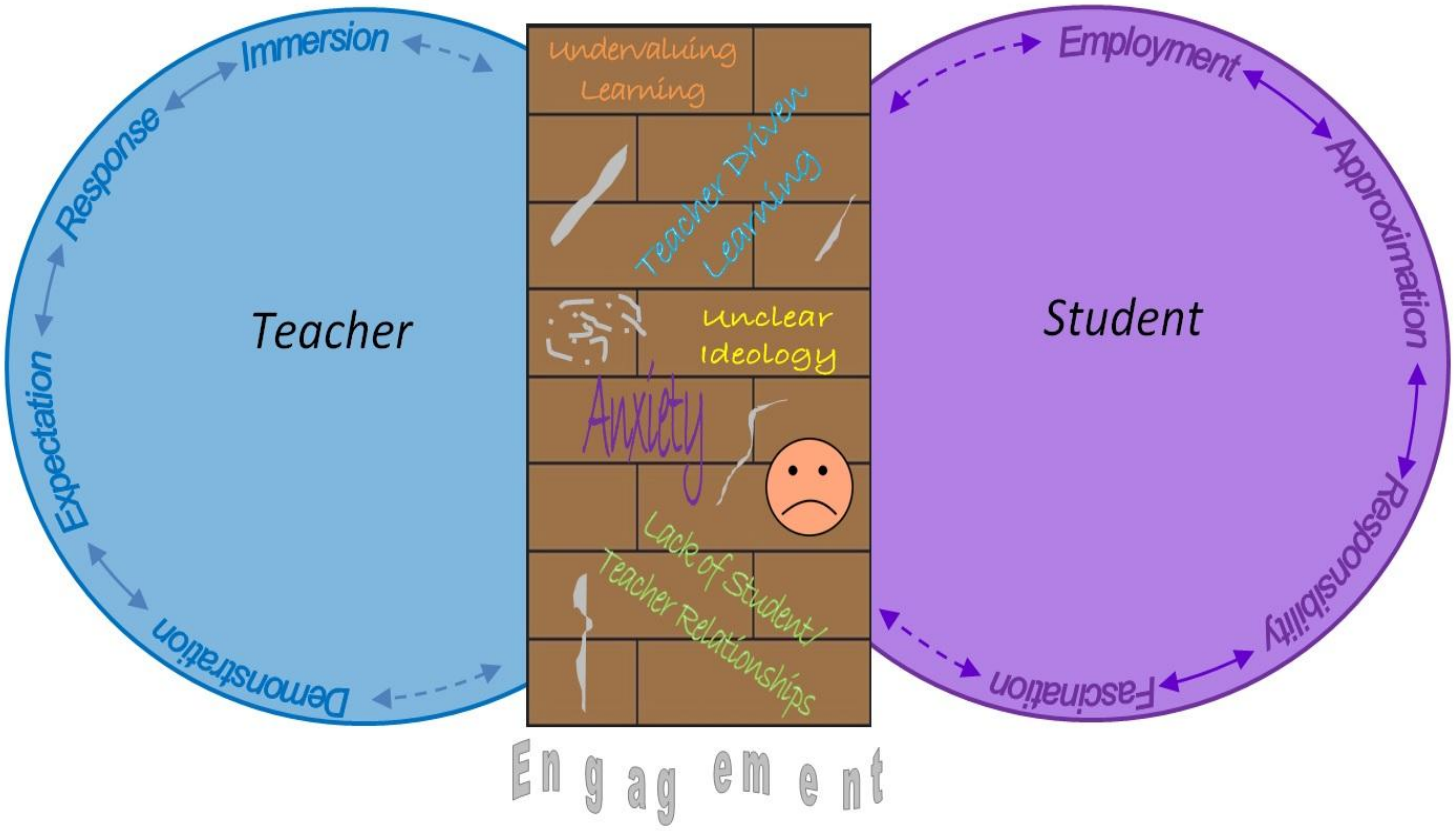
Diagram 4.7: Mini-Analysis Six – Reflecting on Students' Perspectives



Conclusion

We have now explored the understandings in this classroom which seem to indicate a lack of engagement. Although the CoL were quite apparent in this teacher's previous learning structure in which he taught 'rocketry', they do not appear to be as prevalent in his current teaching. This may possibly be caused by a lack of reflection during his development and has perhaps also been affected by his current situation in that the perceptions and expectations that both he and his colleagues have of the learners of this group may have influenced his own engagement and approach to teaching. To summarise the somewhat fractured nature of engagement and the CoL in this classroom, as well as represent what factors are actually prohibiting this, I would like to offer the following diagram.

Diagram 4.8: The Hindered Conditions of Learning in this Classroom



As explored throughout this chapter (particularly within the mini-analyses through the lens of the CoL) and displayed above, it seems that in this situation there are factors that are blocking engagement and authentic learning experiences from occurring. This diagram also strongly represents the misalignment between teacher and student connection in learning as being a prevalent factor in this classroom. As indicated earlier, this may also have been influenced by this teacher's development and training, as well as the expectations of him in his current role.

Having now explored the perceptions of engagement and their effect in this classroom, the next step is to use this data to determine a model for optimal learning conditions. This will occur through using what we have found here and linking it with the findings of the literature review (from Chapter Two) to see how engagement actually occurs. While the findings of this chapter do indicate the importance of the CoL in engagement, we have also seen hints of two additional conditions – that of fascination and social/emotional learning (referred to as collaboration or relationships throughout this chapter). As stated, although these conditions seem to be somewhat prevalent throughout all of the CoL, they seem significant enough to require distinct designation, which also seems justified given that the CoL are all interconnected.

Chapter Five: Investigation Debriefing

In maintaining my detective like role (Merriam, 1998), I have now provided a background of the field of investigation by exploring the literature in the Chapter Two, and have also reported the findings of this investigation in Chapter Four. As you will recall, this investigation was driven by the following question:

"What is the relationship between one teacher's understanding of engagement and his students' experience of this understanding in a middle school mathematics class?"

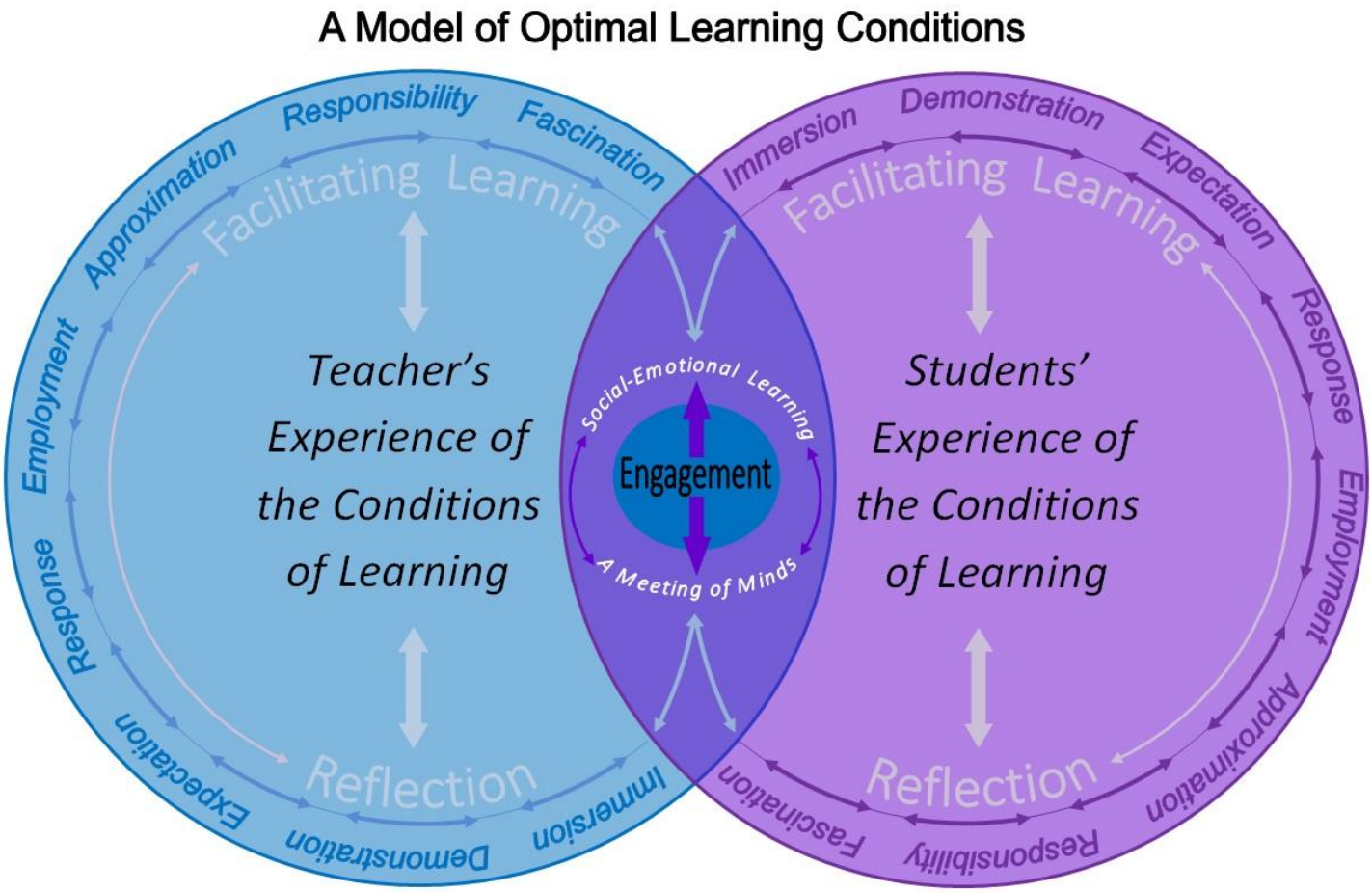
This question was somewhat answered in Chapter Four in which I explored an example of a mathematics learning environment where both engagement and the CoL seemed only partially evident. Throughout this previous chapter I provided previews of data analysis and concluded with a diagram indicating the hindrance of engagement in this mathematics classroom as well as what this was caused by. In following on from this, the purpose of this chapter is to pull together the information and clues I have gathered to present a case for what optimal learning and engagement in a mathematics classroom should look like in the context of Cambourne's (1995) CoL.

The 'Revised' Conditions of Learning

Having highlighted what the literature says about engagement, as well as considering data arising out of a somewhat ineffective learning environment, I would like to reveal what my evidence indicates to be the conditions for optimal learning in mathematics by elaborating on the existing model of the CoL. While the data obtained during this research project largely supports and confirms the CoL and its benefits in the context of mathematics, my findings also suggest the need to redefine and redevelop this model in which engagement

occurs. The diagram below serves the simultaneous purposes of displaying this updated model for the CoL and providing an overview for the structure of this chapter.

Diagram 5.1: Updating the CoL - A Model of Optimal Learning Conditions



Within this chapter I will use the above diagram as a guide to explain my findings and identify where they confirm areas of modern views of engagement and optimal learning as well as where they indicate the need for a revision of these perspectives. Although this investigation focussed on the understandings of engagement in a mathematics classroom, these findings have both purpose and transferability (Cambourne, 1995) across other learning contexts as well. For this reason, throughout this chapter I will explain and define each of the conditions listed in the above diagram in a general sense, but will also elaborate on how each of these occur in the specific domain of mathematics.

It has already been made clear how important engagement is for allowing meaningful learning to occur (Axelson & Flick, 2010) as well as what processes or conditions promote engagement (Cambourne, 1995). However, as noted in the literature review, the definition of what engagement actually is and what it actually involves is something that lacks specificity in the realm of education beyond simply defining engagement as "the amount of time students devote to learning" (Borich, 2011, p. 12). Furthermore, the literature review also identified the apparent absence of some key factors which promote authentic learning in the modern definitions and constructions of how engagement works, as have been hinted at previously and will be illuminated throughout this chapter.

The result of this investigation is to adjust these previous understandings and provide a working structure for how engagement and optimal learning best occurs in the classroom, particularly in the context of a mathematics learning environment. This primarily involves a 'meeting of minds', as indicated in the diagram above, in which both a teacher and their students facilitate optimal learning and engagement through the listed conditions. As is also apparent in this graphic, this largely relates to the need for social-emotional learning and a connectedness between students and teachers to promote authentic learning. The continuous impact reflection has throughout the learning cycle is also prevalent in this. Finally, I have also somewhat extended the original list of the CoL to include the notion of 'fascination', which relates to students' deep and personal interest in the learning. What, how and why these factors actually are will become clear throughout this chapter.

Conditions for Optimal Learning Experiences

I will now answer the question driving this investigation by exploring each of the conditions for optimal learning present in the above diagram and explaining how they should occur in an authentic learning environment. This will initially involve using the literature and the data I have gathered to make interpretations of the conditions from the existing model for the CoL (Cambourne, 1995). Following this I will also use this evidence

to suggest fascination as an additional condition in this model, as well as propose that social-emotional learning is the central condition in this framework for optimal learning.

Engagement

As was prevalent in the previous model of the CoL, engagement in the above diagram is indicated as the core of authentic and meaningful learning. Essentially, engagement is defined in this structure as being a collaborative set of the conditions which will be explored below. However, I would like to provide a definition of engagement to overview what this actually involves. As a reminder, the definition that was constructed for engagement as a result of the literature review was:

> *"Engagement is a state of intimate involvement and extended attentiveness which a group or individual experiences in being entirely devoted to and secure in that which they are focussing on."*

However, now that I have collected and analysed the data in this investigation, I would like to offer the following updated definition:

> *"Engagement in an educational context entails feeling deeply and intimately absorbed, supported, fascinated, safe, involved and emotionally connected to those around you in learning."*

As engagement is seen as the core of this model for optimal learning, this definition is essentially an overview of the conditions which will now be explored. However, in mathematics particularly, engagement seems to involve explicitly connecting concepts, skills and strategies (Keng & Kian, 2010) to explore authentic, relevant and meaningful problems (Arnold, 2012). Engagement also seems to be promoted in mathematics by immersing students in an inquiry based environment which involves reflective practices (Fielding-Wells & Makar, 2008) and learning through social interactions with more competent others (Tan & Lim, 2010). A primary factor of engagement in this sense involves experiencing deep immersion in learning, as will now be explored.

Immersion

The condition of immersion essentially involves being constantly exposed to and saturated in learning (Cambourne, 1995). This also has ties to the notion of 'Flow', in that it also appears to be 'an optimal state of immersed concentration in which attention is centred and distractions are minimized' (Whitson & Consoli, 2009, p. 41). However, while this notion of 'Flow' is regarded as an 'individual and autonomous state' (Whitson & Consoli, 2009, p. 41), immersion seems to lend itself to collaboration in learning, as will be elaborated on further below when the condition of social-emotional learning is explored. Furthermore, the idea that engagement relates to 'the quality of a student's connection or involvement with the people, activities, goals, values, and place that make up a school' (Roorda, et al., 2011, p. 494) also indicates that immersion involves a deep connectedness to the various aspects of the schooling experience, beyond just an involvement in individual learning.

Further evidence about immersion appears in the data snippets below, which illuminate the perceptions of immersion uncovered in this investigation.

Table 5.1: Evidence to Develop the Condition of Immersion

First Interview with Mr Jackson – 29th May 2013:

"Seeing the class actually working on the work given to them."

"I like the kids to usually work, not silently, but without interrupting other people around them."

"...that gives me the buzz, when the kids, when I see the kids involved, in it."

"That's not to say you can't ask questions and help each other and work on work.. but.. kids shouldn't be interrupting the learning of others. So, I like to have a, now, a working environment."

This data seems to suggest the idea of immersion being related to deep attentiveness and focus in learning. There is also an indication here that this teacher actually experiences

immersion and a "buzz" through seeing his students involved, indicating the relationship between his engagement and that of his students. Furthermore, while Mr Jackson seems anxious about students distracting each other, as indicated above and explored in the previous chapter, he also hints here that communication and helping each other can be key aspects of learning. This role of emotion and connection in an immersive learning environment is also apparent by the idea that a positive teacher-student relationship involves 'security and warmth as a precursor to students actually exploring the learning environment and absorbing in learning activities' (Roorda, et al., 2011, p. 495).

Also related to this state of being 'saturated in learning' seems to be the way the brain responds to the physical classroom environment. This is related to the idea that immersion involves stimulating the senses and making emotional connections to indicate to the brain that it is worthwhile paying attention (Rushton, et al., 2010). The focus classroom for this investigation seemed to suffer a deficiency in regards to this due to the inconsistency, instability and lack of ownership of their learning space. However, the data below provides perceptions of what an optimal learning environment should look like.

Table 5.2: Further Evidence to Develop the Condition of Immersion

First Interview with Mr Jackson – 29th May 2013:

"Around the classroom there needs to be posters that reinforce learning and, you know, those sorts of things, so that kids can see them constantly; some of the mathematical skills, shapes.. fractions, those sorts of things. You know, so the environment needs be.. pretty stimulating. There needs to be... ready access to concrete materials, .. counters and dice and.. shapes and.. protractors and rulers and all, you know, all those sorts of things, so you need.. you need the equipment. And that's all part of the classroom environment."

Interview with Jay – 19th June 2013:

"In Mrs Smith's room it's not very comforting because.. there's pictures of like.. no one you know, like.. and you can't find anything when you need it."

The response above suggests the need for having stimulating displays and concrete materials on hand in an immersive classroom environment (Arends & Kilcher, 2010; Borich, 2011). Feeling a sense of ownership and comfort in the learning space also seems to be key part of this, as evident by the description above of the uneasiness and confusion of being in an unfamiliar classroom. This also indicates that immersion involves a personalised classroom environment in which students' work is meaningfully displayed and constantly referred to. However, other data here also indicates that an engaging learning environment can extend beyond the walls of the classroom. This seems to indicate that being outside can lend itself to highly immersive and meaningful learning through engaging students in experiencing mathematics in a fun, hands on and meaningful way. Furthermore, it appears that this promotes the authentic contexts and activities required for engaging and meaningful learning to occur (Herrington & Oliver, 2000).

From the points explored above, I would like to propose immersion as being defined as:

> *"Deep involvement and absorption in a learning environment which is meaningful, interactive, collaborative and lends itself to authentic learning experiences."*

In regards to this definition, it seems that immersion in an optimal mathematics learning environment involves students collaborating together as they engage in authentic problem solving experiences (Arnold, 2012) that they are personally interested in and perceive as being valuable (Fielding-Wells & Makar, 2008, p. 8). This also seems to have connotations of the use of concrete materials (Tan & Lim, 2010) and technological equipment (Hughes & Riccomini, 2011) as students immerse in authentic learning. For a student to truly immerse in learning, it seems that their individuality and person interests must be catered for (Bobis, et al., 2011) to ensure the learning is seen as meaningful and is therefore engaging. This condition also appears to be directly related to that of demonstration, in that part of being engaged through immersion appears to involve observing more competent others as a means for learning (Tan & Lim, 2010).

Demonstration

The next condition that we will explore is called demonstration, which has been previously said to involve learning from observations of what is heard, witnessed, experienced, felt, studied or explored (Cambourne, 1995). In the classroom I investigated, demonstration seemed to involve the teacher explaining concepts and his thought processes, as evident in the data presented below.

Table 5.3: Evidence to Develop the Condition of Demonstration

Interview with Peter - 14th June 2013:

"Mr Jackson is a good teacher because it's like really good to understand him.. I mean, you can actually understand him... like, some other teachers will just tell you... and then they... tell you once in a really awkward way."

Observation 2:

Informs students that they will do some questions together on the board before allowing them to do them on their own (Demonstration → Responsibility).

Observation 9:

Teacher sits with grade 6 group and directs them through their questions, demonstrates what he thinks. Ensures all students are following along.

The data above suggests that authentic demonstrations require teachers to provide clear explanations and model their thought processes for solving problems. The teacher's role in this respect is to model an expert learner by demonstrating learning strategies and managing students as they engage in directing their own learning (Brady & Scully, 2005; Herrington & Oliver, 2000). Also indicated in the data above is the need for teachers to be understandable as well as the importance of having a teacher who explains concepts in a way that students personally understand, which suggests the importance of a connection between student and teacher. The observation data above also shows the goal of

demonstration as being to shift responsibility onto students as they begin to engage with what the teacher has explained or modelled. In this regard, the condition of demonstration also becomes directly linked to approximation, as students attempt to mimic what has been demonstrated before mastering it (Cambourne, 1995).

Beyond simply explaining and modelling learning strategies, the teacher's role in demonstration seems to also include exhibiting their enjoyment and understanding of the relevancy of what is being learned, as evident in the data below.

Table 5.4: Further Evidence to Develop the Condition of Demonstration

First Interview with Mr Jackson – 29th May 2013:

"It's up to the teacher to make sure that they're showing to the kids that maths is real."

Observation 4:

Demonstrates how to do and test this, shows that it adds up to 360. Explains how this works for any quadrilateral, "isn't that amazing?"

Observation 10:

Teacher shows grade 6s how today's activity is very similar to something they already know how to do – banking.

This data above indicates the aspect of demonstration also involving a teacher displaying their involvement in learning (Roorda, et al., 2011) by exhibiting their own sense of engagement. This also relates to the need to show kids that "maths is real" by demonstrating the relevance and importance of learning, as well as the risks and outcomes involved with undertaking such a task (Metallidou & Vlachou, 2007).

In considering all of this, it seems that demonstration is best defined as:

> *"Modelling an engaged and involved 'expert learner' by exhibiting learning procedures and concepts through highlighting their relevance and the thought processes involved, with the goal of encouraging responsibility and approximation as students use what they have observed to experience learning for themselves."*

Demonstration seems particularly important for mathematics, in that students are often said to engage in learning through observing and then imitating the steps used by someone more competent than themselves as they attempt to solve a problem (Tan & Lim, 2010). Learning in this manner may involve not only observing demonstrations of the teacher, but of fellow students (Tan & Lim, 2010), which indicates the benefit of collaboration in learning mathematics (Arnold, 2012). Furthermore, engaging with such demonstrations seems to require reflection as a part of learning, to ensure that what is observed is deeply understood and meaningful for the individual (Fielding-Wells & Makar, 2008). This definition of demonstration also shows the importance of using a variety of methods, resources and strategies in teaching mathematics to cater for the diversity of students within a classroom (Bobis, et al., 2011), each of whom will have different interests, background and abilities. Teacher demonstration also seems to be a means of somewhat incidentally communicating to students that what is being demonstrated is important for them to learn, which ties into the condition that will now be explored.

Expectation

In the traditional model of the CoL, expectations are essentially seen as messages communicated to students (either directly or indirectly) about what they are both expected to learn and are capable of learning (Cambourne, 1995). Lent (2006) states that expectations have a close relationship to both a student's engagement and their beliefs in their own abilities, known as self-efficacy (Elias, et al., 2011). This author also indicates that it is important to note that these messages go beyond shallow statements and involve

all of the attitudes, nonverbal clues, intonations and actions that students may interpret (Lent, 2006), which indicates the need for teachers to be aware of the impact that everything they do can have on their learners. The data snippet below further highlights this aspect of expectation, as the teacher of the investigated classroom saw it:

Table 5.5: Evidence to Develop the Condition of Expectation

First Interview with Mr Jackson – 29th May 2013:

"The kids need to want to learn which means you need to enthuse them about the importance of the learning."

The above response reinforces the idea that the teacher's role in encouraging students to 'want to learn' involves communicating that learning is valuable and enjoyable. This indicates the importance of a teacher's own engagement in their craft, which is related to the idea that "what teachers actually do when engaged in the act of teaching is motivated by what they believe about learners and what they believe about the processes which underlie learning" (Cambourne, 1988, p. 17). From this idea, another aspect of the condition of expectation appears to be the impact that a teacher's ideology and beliefs, as well as how explicitly defined these are, have on these messages they communicate, as will be explored later on. Furthermore, it also seems that expectation acts as a means for promoting engagement through imparting the meaning of learning and what students can expect from it (Elias, et al., 2011).

Another aspect of this condition of expectation is revealed in the data presented on the next page.

Table 5.6: Further Evidence to Develop the Condition of Expectation

First Interview with Mr Jackson – 29th May 2013:

"My goal is to try and make them feel positive about themselves... to not make them feel dumb, but to really try and challenge them, to succeed as much as they can."

Interview with Jay - 19th June 2013:

"I don't really get pushed enough."

Interview with Peter - 14th June 2013:

"I felt a little bit bored because we'd done the exact same thing yesterday."

This data indicates that the teacher's role of giving clear expectations also seems to relate to the need to provide students with feedback and an appropriate level of challenge in their learning (Whitson & Consoli, 2009) for it to be both meaningful and interesting (Sousa, 2008). This relates to the importance of developing students' self-efficacy (Elias, et al., 2011), as it has the potential to improve learning by encouraging students to 'seek challenge, persist in the face of challenge, and adopt effective strategies to handle challenge' (Elias, et al., 2011, p. 1186). Students' self-efficacy is also connected with expectations through it being promoted by a classroom environment that encourages mastery, challenges learners and is noticeably caring (Fast, et al., 2010). This in turn relates to the comment in the interview response above of needing to make students "feel positive about themselves", as this appears to indicate the importance of knowing students and the level they are at in order to provide them with effective individual expectations (Cambourne, 1988). This again suggests the importance of social-emotional connection and positive student-teacher relationships in an authentic learning environment (Lent, 2006).

As a summary, I would like to define the condition of expectation in optimal learning as:

"The variety of messages communicated to a learner, regardless of intent or modality, that express the value of learning, challenge students to improve as learners and promote positive self-efficacy."

One of the primary roles of expectation in mathematics seems to be to communicate the importance and meaning behind what is being learned by ensuring both the content and the processes used for learning are relevant (Keng & Kian, 2010). This also indicates the need to move away from a restrictive approach to learning mathematics (Rowan-Kenyon, et al., 2012) and instead allow students to take control of their own learning (Bobis, et al., 2011), which also requires teachers to personally know and connect with their students in mathematics (Lewis & Forsythe, 2012). Furthermore, it appears that the use of expectation as a means for promoting self-efficacy requires teachers to trust students' 'potential and ability to learn, regardless of their perceived mathematical abilities' (Archambault, et al., 2012, p. 319). Apart from expectations, another form of communication that students receive during their learning involves feedback as a means for responding to learning, which will now be discussed.

Response

The condition of response relates to the feedback that students receive during their learning (Cambourne, 1995). This feedback is said to be most beneficial for a student's learning and their engagement when it is appropriate, timely and nonthreatening (Lent, 2006). In this way it seems that response is perhaps simply an outgrowth of the condition of expectation, as it involves messages communicated to students which impact their engagement and learning. Also related to this is the idea that students become more engaged through support, which is indicated by the teacher's apparent level of care and willingness to assist (Patrick, et al., 2007). The data presented on the next page further elaborates on the condition of response as it appeared in this investigation:

Table 5.7: Evidence to Develop the Condition of Response

First Interview with Mr Jackson – 29th May 2013:

"..pat them on the back when they got it right."

"Try and get kids to talk out loud their thoughts as they go through work, try and ask them questions, find out what they're thinking and why they're doing it, you know, what's gone wrong in their learning."

Third Interview with Mr Jackson – 18th June 2013:

"…teaching's about constant feedback...feedback just comes into everything, it just becomes part of the conversation and the tone of the class."

Observation 6:

Teacher continues to check and direct students, "well done (student name)". Often sits with them at their desks, at eye level.

The perceptions above indicate that this condition of response involves encouragement of students through the teacher providing positive reinforcement and feedback. This, as well as the observation data indicating that this teacher provided response by connecting with his students at their eye level, appears to suggest the importance of relationships and collaboration in this aspect of optimal learning environments (Fast, et al., 2010). However, there is also an indication that the purpose of this conversational feedback is not only for praise but also for the teacher to get to know their students as well as to challenge them to improve and develop mastery (Fast, et al., 2010).

The interview comment about feedback becoming the "conversation and tone of the class" relates to the idea that evaluation is a constant process by which learners are given feedback on their learning from self-reflection, teacher evaluation or even peer response (Cambourne, 2002b). This indicates the necessity of reflection to make this feedback meaningful, and also seems to indicate the importance of response not only from teacher

to student, but between students as well. This is also apparent in the idea that response relates to students' self-efficacy, which is said to be promoted through them experiencing repeated successes in learning, being allowed to evaluate their own abilities, as well as when teachers deliberately note their successes or achievements (Hughes & Riccomini, 2011). Again, this notion of evaluation being a present feature throughout the class appears to suggest the importance of social-emotional connection in an authentic learning environment.

To summarise, I would like to offer the following description of the condition of response as it appears in this model for optimal learning:

> *"The constant conversation of meaningful and nonthreatening feedback and evaluation between the members of a class which is coupled with reflection in order to meet the common goal of improving learning and efficacy in students."*

This condition of response seems to be a means for teachers to combat the seemingly common perceptions of mathematics being threatening and difficult (Metallidou & Vlachou, 2007) by promoting students' 'self worth and positive attitudes about school' (Archambault, et al., 2012, p. 320). The role of response in mathematics also appears to involve social interaction and reflective practices as students defend, justify, modify, concede or relinquish their position, ideas or understandings of the mathematical world around them (Fielding-Wells & Makar, 2008). This seems to be particularly supported in 'Project Based Learning', in which students work collaboratively to solve problems through discussion and have 'voice and choice' in their learning (Arnold, 2012), hence facilitating the use of response as a conversation amongst the class about their learning. Response also seems to be particularly important when learning shifts into allowing students to direct and explore learning themselves, as is characterised by the condition that will now be explored.

Employment

The condition of employment refers to the opportunities that students are given to practise and apply what they have learnt (Cambourne, 1995). This essentially seems to involve the transition from teacher demonstrations into allowing students to engage in exploring and making meaning from learning on their own, as is evident in the data below.

Table 5.8: Further Evidence to Develop the Condition of Response

First Interview with Mr Jackson – 29th May 2013:

"I think they particularly become engaged when they have initial success. So it's that 'Ahhh... I get it' moment."

"My focus is teaching kids skills that they can apply"

"They become engaged when they recognise the reason for their learning."

Interview with Jay - 19th June 2013:

"...she let us go outside and learn more... followed compasses and checked how big basketball and netball courts were and see how far everyone could kick a ball."

The above responses indicate the relationship between the condition of employment and constructivist approaches to teaching, which have been shown to be 'successful for building skills and engagement due to developing a sense of relevance and application in the learnt skills' (Jameson, 2009, p. 3). More specifically, it has been highlighted that employing learning can also translate into combating the 'dreary connotations of abstract mathematics by actively involving students in exploring, predicting, reasoning and conjecturing to create real world connections' (Borich, 2011, p. 260). This, as well as the student interview response above, seems to indicate the connection between engaging students through employment and providing students with an immersive and relevant learning environment which has the potential to extend learning beyond the walls of the classroom. It also appears that 'Project Based Learning' (Arnold, 2012) is related to this

means of engaging students, as it involves student-centred inquiry in which they explore real life situations and develop their own learning goals (Rotgans & Schmidt, 2011).

This also seems to indicate the importance of developing students' fascination in learning, and the teacher's role of 'creating opportunities that are real and relevant to the students in order to provide possibilities to generate authentic engagement in mathematics' (Bragg & Nicol, 2011, p. 8). Furthermore, the need for students to see the relevance of learning challenges educators to foster confidence in students as they encounter mathematics (Bragg & Nicol, 2011). This appears to indicate the need for students to feel supported, safe and responsible as they employ and experience success in their learning, which directly relates to the conditions explored further below.

In collaborating the above points, I will define the condition of employment as:

> *"Student-directed experiences of applying, practising and making meaning in learning through an environment where they are safe and supported in exploring, experimenting and reasoning."*

Allowing students to employ their learning in mathematics appears to be of upmost importance in order to combat the recurring problems of learning in this subject area being burdened with rote learning and irrelevant learning experiences in general (Klein, 2010; Rowan-Kenyon, et al., 2012; Sousa, 2008). In particular, this condition of employment seems to promote authentic learning in mathematics through allowing students to 'explicitly connect mathematical concepts, skills and strategies to purposeful, relevant and meaningful contexts' (Keng & Kian, 2010, p. 305). This process of learning also seems to promote engagement through catering for students' varied preferences, interests and concerns in learning (Bobis, et al., 2011). Furthermore, being able to personally explore and experiment allows students to feel a sense of ownership in learning (Perry, et al., 2011), which also relates to the need for them to feel safe to do this, as the following condition describes.

Approximation

The condition of approximation involves allowing students to feel safe to take risks as they engage in and apply their learning (Cambourne, 1995). In this way, approximation appears to relate to (and perhaps even somewhat precedes) the condition of employment explored above, as it seems students need to actually feel safe to apply their learning before they can do this successfully. This aspect of allowing students to approximate in learning also seems to relate to students' involvement and the need to invest themselves in learning (Astin, 1999; Park, et al., 2012). The data below outlines the perceptions from the focus class of this investigation of students taking risks and how this can occur:

Table 5.9: Evidence to Develop the Condition of Approximation

First Interview with Mr Jackson – 29th May 2013:

"The work needs to be sort of challenging but not too challenging."

Third Interview with Mr Jackson – 18th June 2013:

"…by persevering through the struggles...they can get to that end result."

Interview with Jay - 19th June 2013:

"Sometimes you know more than the teachers know about certain subjects... and that's kinda cool going 'no, that's not right, this is right' and then they're agreeing with you."

Observation 1:

Endeavours to question a variety of students, rather than the same ones. Looks out for new students who raise their hands but also addresses students directly.

This data appears to indicate the aspect of challenging students in encouraging them to approximate as a part of their learning. However, the focus in this seems to be to provide students with an appropriate level of challenge to allow them to persevere and grow in their learning, hence improving their self-efficacy and resiliency (Elias, et al., 2010). The

data above also seems to suggest that the teacher's role in this is to ensure the active involvement of all students, as evident in the observation above where the teacher questioned a range of students.

Furthermore the data above highlights that, from a student's perspective, engagement can come from teaching others, and in particular having the confidence to display expertise over the teacher. This indicates the need to develop a classroom environment that allows students to safely engage in interactions both with their teacher and each other in which they express how they are feeling, hence promoting a means for more successful navigation of future social interactions as a part of learning (Lanphar & Fitzsimmons, 2010). This, yet again, suggests the importance of relationships across the classroom for the purpose of engagement and authentic learning.

In considering all of this, I would like to propose that approximation be defined as:

> *"Establishing and promoting a learning environment where students are safe to experiment and take risks as they employ their learning, collaborate with others and are provided with an appropriate level of challenge."*

Supporting the condition of approximation in an authentic mathematics learning environment involves building up students' perceptions of both mathematics as a subject and themselves as learners of mathematics in order to 'engage in learning and persist in the face of challenges' (Bobis, et al., 2011, p. 34). This seems to indicate the need for teachers to promote students' self-worth and encourage them to direct their own learning (Archambault, et al., 2012). The use of open-ended questions and tasks to explore mathematically rich situations also seems to relate to this need of ensuring that learners feel safe to participate in their learning (Bobis, et al., 2011) and supports an inquiry based approach to learning mathematics (Fielding-Wells & Makar, 2008). However, for this to occur it appears that students need to take responsibility in their learning, as is the next condition to be discussed.

Responsibility

In the existing model of the CoL, responsibility refers to the decisions that a learner makes regarding what they will choose to engage with (Cambourne, 1995). This appears to involve a shift from learning through observing others (in the condition of demonstration) to making learning more self-directed, which also indicates its relationship to employment and approximation. In particular, this idea seems to relate to the notion that 'students are internally motivated and interested in learning when they are given the opportunity to have personal choice and take responsibility' (Elias, et al., 2011, p. 1181). The evidence gathered about the condition of responsibility in this investigation is displayed below:

Table 5.10: Further Evidence to Develop the Condition of Approximation

First Interview with Mr Jackson – 29th May 2013:

"Give them the opportunity to do it and to try and succeed themselves."

"My favourite lessons are ones where the kids are doing it, and challenging themselves and doing math... they see maths as a game rather than a chore."

Observation 1:

Sends them off to work individually on the next few questions - still verbally directs them through the process for the first question.

The data above indicates the teacher's role in this condition of being to shift responsibility onto the students to direct their own learning. This seems to relate to the condition of approximation and student involvement (Astin, 1999), as it involves students taking the risk of stepping out on their own and taking charge in their own education. Self-efficacy also seems to be a connected factor here, as positive beliefs in one's capabilities in a particular area are said to promote conscious decisions to engage in future activities of a similar nature (Jameson, 2010).

The interview response about students being involved in the learning and enjoying it indicates the importance of viewing students as "active agents who have an impact on what is happening in their classroom" (Nurmi, 2012, p. 179) to allow them to essentially engage themselves. This also has connotations of the relationship between engagement and allowing students to have a choice in what they learn about, as this not only caters for varied learning styles (Jameson, 2010) but also instils a sense of empowerment and responsibility in learning (Brady & Scully, 2005; Jameson, 2009). Furthermore, this idea indicates the importance of an immersive learning environment in encouraging students to take responsibility in their learning, and also suggests the importance of allowing students to choose to what level they work in collaboration with others (Rotgans & Schmidt, 2011).

To summarise, it seems that the condition of responsibility involves:

> *"Moving away from learning through observation towards self-directed learning in which students take charge by making choices about what they will engage with, how they will approach learning and who will experience learning with them."*

In regards to responsibility in mathematics, it seems important for teachers to move away from needing to completely direct students' learning and trust their ability to achieve by their own means (Archambault, et al., 2012). Another important facet of students taking responsibility in their learning seems to involve the use of errors and misconceptions as an important part of the learning process to allow a deeper and more meaningful understanding of mathematics (Bobis, et al., 2011). An optimal form of this appears to relate to the use of 'Project Based Learning' (Arnold, 2012), as this involves students taking a high level of responsibility through choosing not only what they will learn about, but how they will do this and who they will work with. In this way, responsibility promotes engagement and authentic learning in mathematics through allowing students to have 'voice and choice' in their own education (Arnold, 2012), which seems to be linked to and even somewhat preceded by students' curiosity in learning, as will now be explored.

Fascination

The first of the two new conditions which I would like to add in elaborating on the CoL is that of fascination. This essentially refers to the aspect of engagement in which students are curious, interested and itching to discover more in their learning (Litman, 2008). As I perceive it, this condition of fascination is largely recognised by students' demeanour in learning, which can be interpreted by their facial expressions and the brain activity this represents (Rushton, et al., 2010). In many ways this is related to the other existing conditions, but I feel deserves explicit distinction in response to the need to spark students' excitement, interest and enthusiasm in learning related to the factor of intrinsic motivation (Nilsen, 2009). Furthermore, all of the other conditions have already been acknowledged as interrelated (Cambourne, 1995), and do not seem to directly address this need, indicating the appropriateness of defining fascination on its own.

The data presented below further explores this concept of fascination in optimal learning:

Table 5.11: Evidence to Develop the Condition of Fascination

First Interview with Mr Jackson – 29th May 2013:

"They become engaged when they're learning something new."

Interview with Peter - 14th June 2013:

"Maybe we could like... do stuff that we haven't, done before... we use the same methods to do it, like it's always either gluing stuff into our workbook or like... writing in our workbook or on the board."

Observation 5:

Student asks – "What about 4D?"

Observation 6:

One student begins measuring angles of objects around the room without being asked to.

The data above seems to indicate that students become engaged through the curiosity and opportunities to experience learning in a new way. This is particularly evident by the observations of students asking questions about learning and directing their own learning experiences without even being prompted to. In this way, the condition of fascination seems related to approximation but involves actually sparking students' curiosity to take risks which is related to the need of allowing them to experiment as a part of their learning (Rushton, et al., 2010). This also appears to involve students' motivation to fill in gaps of knowledge, and is evident by question asking behaviour (Jirout & Klahr, 2012). The idea of curiosity as an aspect of authentic learning also appears to not only relate to engagement resulting from learning new things but to experience learning in new ways, as indicated in the interview responses above. This may further suggest the importance of catering for students' individual learning styles and interests in attempts to engage them and also indicates the need to allow students to direct their own learning at times so that it is meaningful and engaging to them.

More about this condition of fascination is revealed in the interview responses below:

Table 5.12: Further Evidence to Develop the Condition of Fascination

First Interview with Mr Jackson – 29th May 2013:

"I love the games, in maths... I love the dice games and the risking the counters and... the challenges...building a battle ship board on the computer and then playing a game of battle ships."

Interview with Jay - 19th June 2013:

"... she'd turn everything into like a game and made it very fun although we were still learning."

"... she got her cars and drove them to school and we got to measure them."

"I find this really annoying about teachers, all they really want you to do is work, so like... they never really like active games."

This evidence reveals the emotional aspect of fascination in engagement, which involves 'enjoyment, enthusiasm and interest' (Skinner, et al., 2008, p. 766). The perceptions evident above indicate the benefit of learning in the context of games and hence the sense of enjoyment and interest that the teacher needs to model in learning (Arends & Kilcher, 2010). In this way, fascination also seems to relate to an immersive learning environment and, in particular, the concept of 'Flow' (Csíkszentmihályi, 1990; Elias, et al., 2010) as evident by the idea of reaching such a level of enjoyment that one does not even realise learning is taking place. There is also an indication throughout the above responses of the benefit of basing learning on personal interests and relevant contexts to promote engagement and the making of meaning (Cambourne, 1988; Elias, et al., 2011). However, as both of the student respondents indicated, engagement is hindered when teachers prioritise the completion of work through using the "same methods" involving a one-way flow of information (Cambourne, 1988) while seeming to avoid "active games" and other learning activities which lend themselves to sparking students' curiosity and enjoyment.

In summing up, it seems that this 'new' condition of fascination involves:

> *"Sparking students' curiosity and enjoyment in learning by catering for their individual interests and learning styles, which requires the teacher to model an interest in learning, provide exciting learning experiences and allow students to direct their own learning at times."*

The condition of curiosity as a means for promoting engagement in mathematics indicates the importance of basing learning around students' individual interests and concerns (Bobis, et al., 2011). This appears to suggest the benefits of an inquiry based approach to learning mathematics (Fielding-Wells & Makar, 2008) to encourage students' curiosity of how mathematical knowledge and skills can connect to meaningful learning contexts (Keng & Kian, 2010). Curiosity in this regard also seems to lead to deep learning through

effective collaboration (Arnone, et al., 2011), indicating the importance of relationships within a class, as related to the final condition to be discussed here.

Social-Emotional Learning

As evident in the diagram above, engagement in this framework involves a 'meeting of minds' between the students and their teacher, indicating the importance of collaboration (Kohn, 2011) and social-emotional support (Fitzsimmons & Lanphar, 2011) in creating an authentic learning environment. However, despite findings that positive emotions promote student attentiveness, involvement as well as a broadening of viewpoints and capabilities (Fitzsimmons & Lanphar, 2011; Lewis, et al., 2011; Skinner, et al., 2008), in general emotional development seems to be lacking in the schooling experience (Fitzsimmons & Lanphar, 2011; Kohn, 2011).

The importance of teachers emotionally supporting their students has been hinted at throughout the conditions described in this chapter. Essentially, these conditions suggest that students engage and commit to learning when they feel valued and supported by their teacher (Doll, et al., 2010). Lent (2006, p. 52) states that a teacher's expectations 'go beyond shallow statements and involves all of the attitudes, nonverbal clues, intonations and actions that students may interpret', indicating that effective expectations must be coupled with positive student-teacher relationships. Furthermore, while it has been argued that immersion involves stimulating emotional connections in the brain (Rushton, et al., 2010, p. 355), it seems that the importance of emotion in an authentic learning environment indicates the need for it to be distinctly represented in a model of optimal learning. It is for these reasons that my diagram specifies social-emotional learning as a central element for optimal learning and engagement, which in turn indicates the true role of the teacher – 'to be there for the learner' (Churchill, et al., 2011, p. 462).

Although emotion was somewhat lacking in the focus classroom of this investigation, the data below hints at how social-emotional support can appear in an authentic learning environment:

Table 5.13: Evidence to Develop the Condition of Social-Emotional Learning

First Interview with Mr Jackson – 29th May 2013:

"I see value in peer supported learning... if that's what you want to call group work... where individuals help each other or, you know, do something together and discuss things and stuff."

Interview with Jay - 19th June 2013:

"I like working with my friends more because... I'm always with them I know how they work so I can adjust to them and they can adjust to me so that way we can work properly and get our answers right."

"I'd like to see maths teachers who are optimistic and enthusiastic about things and like, are really happy to teach something fun."

Interview with Peter - 14th June 2013:

"I like sitting next to my friend... sometimes we help each other."

Observation 8:

*"****'s stuck, who's going to come out and help him?"*

Observation 9:

Teacher expresses that they are working together "let's do it".

The data above clearly indicates the importance of collaboration and social interaction in authentic learning and the construction of knowledge (Herrington & Oliver, 2000; Jameson, 2009), whether it be between the student and teacher (as indicated in observation 9) or amongst fellow students (as indicated in observation 8 and the interview data). Much of this data suggests the importance of students collaborating with their peers

in order to promote their interest and active involvement in learning (Doll, et al., 2010). The idea that working with friends is beneficial because you "know how they work" and 'can adjust to each other' indicates the importance of developing relationships in order for support and collaboration to occur in authentic learning.

In this sense it also seems that encouraging cooperation instead of competition is far more beneficial for authentic learning (Cambourne & Turbill, 1987). However, although group work has been said to assist in engagement (Rowan-Kenyon, et al., 2012), it seems that the level of collaboration required for authentic learning is dependent on the individual student's needs (Rotgans & Schmidt, 2011). This seems to indicate that social-emotional support does not occur through forced collaboration and instead involves the development of relationships in the classroom and building a sense of collaborative learning. Also, the data response above stating a desire to see enthusiastic, optimistic and happy teachers indicates the role of the teacher being to not only provide emotional support, but also to model positive emotions in an authentic learning environment, which provides further insight into what this relationship involves.

A positive teacher-student relationship is said to involve 'emotional security and closeness (high warmth and openness) as a precursor for students exploring the environment and engaging in learning activities', whereas a negative teacher-student relationship is associated with a 'lack of security as well as conflict-ridden interactions which results in hindered attempts at coping with school demands' (Churchill, et al., 2011, p. 495). It is basic intuition that a child will experience learning in a much more meaningful way if they feel safe and supported in the learning environment they are in, as evident in Maslow's hierarchy of needs (Maslow, 1954), which was discussed in the literature review. This shows the need for a teacher to facilitate such a relationship by connecting with their students, respecting them, caring for them and viewing them as equally important members. For this reason, it seems quite clear that an imposing, unrelenting and overly-

authoritative teacher will in no way encourage a productive learning environment, particularly when it comes to students' willingness to learn.

In summarising, it seems that the social emotional aspect of authentic learning involves:

> *"Providing students with emotional support in all areas of learning through the development of relationships between members of the class (including the teacher) and encouraging a collaborative approach to learning."*

In regards to mathematics, it seems that teachers need to be caring, supportive and approachable to make mathematics fun and relevant (Lewis & Forsythe, 2012) in an authentic and engaging learning environment. This also seems to relate to the need for teachers to promote students' positive attitudes towards Mathematics and perceptions of themselves as learners in this subject area (Archambault, et al., 2012). An effective way of using this condition of social-emotional learning as a means for engagement appears to be establishing the learning environment as a community to ensure that multiple voices are heard, hence communicating that everyone's input matters in learning (Perry, et al., 2011). This relates to the benefits of an inquiry approach such as 'Project Based Learning' (Arnold, 2012), as this involves social interaction and peer support as an aspect of meaningfully engaging students in authentic learning (Fielding-Wells & Makar, 2008), which has been hinted out throughout this chapter.

An Overview of the Revised Conditions of Learning

Having now defined all the aspects in this model of optimal learning, I would like to present an overview, on the following page, of each condition's description as they appeared above. Although these conditions are interconnected in their roles of promoting engagement, as indicated earlier, it appears that social-emotional learning is particularly important for ensuring the success of each of the others. This is evident by the discussed need for students to collaborate and engage in relationships for authentic learning of mathematics to occur, as well as to experience positive feelings in this context.

Table 5.14: An Overview of the Revised Conditions of Learning

CONDITION	DESCRIPTION
Engagement	*"Engagement in an educational context entails feeling deeply and intimately absorbed, supported, fascinated, safe, involved and emotionally connected to those around you in learning."*
Immersion	*"Deep involvement and absorption in a learning environment which is meaningful, interactive, collaborative and lends itself to authentic learning experiences."*
Demonstration	*"Modelling an engaged and involved 'expert learner' by exhibiting learning procedures and concepts through highlighting their relevance and the thought processes involved with the goal of encouraging responsibility and approximation as students use what they have observed to experience learning for themselves."*
Expectation	*"The variety of messages communicated to a learner, regardless of intent or modality, that express the value of learning, challenge students to improve as learners and promote positive self-efficacy."*
Response	*"The constant conversation of meaningful and nonthreatening feedback and evaluation between the members of a class which is coupled with reflection in order to meet the common goal of improving learning and efficacy in students."*
Employment	*"Student-directed experiences of applying, practising and making meaning in learning through an environment where they are safe and supported in exploring, experimenting and reasoning."*
Approximation	*"Establishing and promoting a learning environment where students are safe to experiment and take risks as they employ their learning, collaborate with others and are provided with an appropriate level of challenge."*
Responsibility	*"Moving away from learning through observation towards self-directed learning in which students take charge by making choices about what they will engage with, how they will approach learning and who will experience learning with them."*
Fascination	*"Sparking students' curiosity and enjoyment in learning by catering for their individual interests and learning styles, which requires the teacher to model an interest in learning, provide exciting learning experiences and allow students to direct their own learning at times."*
Social-Emotional Learning	*"Providing students with emotional support in all areas of learning through the development of relationships between members of the class (including the teacher) and encouraging a collaborative approach to learning."*

Reflection and Teacher Ideology

Having described the conditions of optimal learning and how they best occur, I would now like to briefly elaborate on this by describing the importance of reflection and the development of teacher ideology in establishing an authentic learning environment. As was discussed in the literature review, everything a teacher does is based on their ideology which informs "what they believe about learners and what they believe about the processes which underlie learning" (Cambourne, 1988, p. 17). In this way, ideology becomes theory into practice (Churchill, et al., 2011, p. 465) which is informed by 'accessing knowledge of others in terms of their practices, researching the art and science of teaching as well as critical reflection on understandings and the actions one takes as a teacher'. This also appears to suggest the need for teachers to continually refine and develop their teaching ideology, indicating that they "must develop and retain the mindset and disposition of a learner" (Churchill, et al., 2011, p. 481).

Unfortunately however, it seems that teachers rarely have opportunities to explain why it is they do what they do and often use teaching practices which are driven by tacit knowledge from their own schooling experiences which may or may not have been "sensibly derived or consciously tested" (Churchill, et al., 2011, p. 465). This indicates the importance of reflection for teachers to explore and critically analyse their perceptions with the purpose of creating coherence and cohesiveness in the use of theory as well as developing explicit understandings of their role as a teacher, the students as learners and the classroom as a learning setting (Churchill, et al., 2011). Ideally, this examination of beliefs and practices should not only be 'reflective', but also 'responsive' in that it should lead to a change in the behaviour, understanding and attitude of a teacher, hence enhancing their professional health and competence (Churchill, et al., 2011, p. 465) and allowing them to better engage their students in learning.

It seems that a teacher's practices of being reflective in explicitly developing their teaching ideology requires their own engagement in the profession of teaching (Cambourne, 1988). This is particularly apparent in the facets of reflection described by Dewey (1933), which seem to link to the CoL. The first of these is open-mindedness, which involves actively seeking new themes and ideas. This seems to particularly relate to the conditions of responsibility, fascination and also somewhat to that of expectation, as it requires teachers' curiosity in how to improve their practices and a sense of being expected to continually develop their competency. The next of Dewey's facets of reflection is a whole-heartedness, which involves complete immersion in problem solving and a willingness to risk discovering answers. This has quite clear ties to the conditions of immersion and approximation, further indicating the relationship between a teacher's engagement and their professional development. The final of these facets is responsibility, which follows on from whole-heartedness by requiring further exploration of new ideas and thoughts as well as considering the consequences of following these up. Apart from the obvious link between this facet of reflection and the condition of responsibility, this seems to involve employment of these new ideas and also appears to possibly involve the condition of response through the practice of basing further reflection on received feedback.

This indicates the importance of reflection in the development of a teacher's ideology and, in particular, the implementation of a model of optimal learning such as that which I have presented in this chapter. However, the practice of reflection for the purpose of deepening knowledge should not be restricted to that of the teacher, but seems to be an important process of learning for students to enter into as well (Cambourne, 1995), as indicated in the diagram. As explored above, reflection ties into the conditions of learning and becomes a vital process in an authentic learning environment.

In particular, it appears of upmost importance for teachers to engage in reflective practices and the development of a personal ideology in regards to the teaching of mathematics, as this subject area seems to be experiencing a decline in engagement due to am apparent lack of competency amongst teachers (Hamlett, 2009). This may also be improved by teachers developing their own self-efficacy in this area, as this seems to result in greater professional accomplishments, more stimulating relationships with colleagues, and higher enthusiasm regarding their role as teachers (Archambault, et al., 2012). Furthermore, it seems important for teachers to reflect on both their role as the teacher and their students' roles as learners in an authentic learning environment, particularly in regards to the apparent need for students to experience mathematics in meaningful and collaborative contexts (Arnold, 2012).

Reflective practices seemed rather absent from the teacher and classroom focussed on for this investigation, which appears to have caused this teacher to lack an explicit ideology driving his teaching practices and may have negatively impacted the engagement of the students in his class. Unfortunately, this has also caused a description of how reflection actually occurs in the model for optimal learning presented here to be primarily based on the literature, which indicates the need to further explore how the process of reflection occurs in an authentic learning environment in order to refine this model. This relates to the purpose of the following chapter, which will be to highlight the recommendations arising from this investigation, including areas in which further research can improve what has been discovered during this investigation.

Chapter Six – Investigation Recommendations

Having now reported the findings of this investigation, as well as demonstrating and explaining the 'Model of Optimal Learning Conditions' arising from this, I will now discuss the implications these findings have for all the stakeholders regarding the teaching of mathematics to middle school students. Furthermore, in this chapter I will also explore what can be done to further improve these results through recommending strategies for future investigations.

Practices to Improve Engagement

The findings of this investigation, and in particular the model of optimal learning conditions offered in the previous chapter, indicate a number of considerations to improve educational practices. Although the implications for middle school mathematics education are particularly prominent, this research also revealed implications for educational practices in general, including that of tertiary education.

Implications for Middle School Education

The model of optimal learning conditions that was unpacked in the previous chapter explored how to best promote student engagement, particularly in mathematics. This primarily revealed the need to move away from the bland and repetitive practices common in mathematics (Klein, 2010; Rowan-Kenyon, et al., 2012; Sousa, 2008) and instead provide students with an authentic learning environment in which they feel supported, safe, motivated and engaged in meaningful learning experiences. Such an environment indicates the importance of an inquiry based approach to learning mathematics in which students engage in learning that they find interesting, relevant and valuable (Fielding-Wells & Makar, 2008) in collaboration with their peers (Arnold, 2012).

In particular, it seems that the role of emotion in authentic learning environments needs to be carefully considered, as this seems to be a central aspect in the conditions of optimal learning and engagement that I suggested in the previous chapter. This appears to indicate the importance of developing relationships across the classroom and establishing a collaborative learning environment in which learning occurs through support and as a result of these relationships. One particular implication related to this and arising from the case studied in this investigation is the need to avoid the separation of students into ability groups as this seems to cause issues in the development of these relationships. In particular, engagement seems to be hindered in this practice due to a lack of time spent together, a lack of ownership in the classroom environment and inconsistencies in learning experiences. Furthermore, such separation may communicate negative messages to students of what is expected of them regarding learning and behaviour, which may in turn influence the value they hold in learning and hence their engagement.

Although some teachers may already incorporate the conditions discovered in this model into their own practices, it seems, from the findings of this investigation and my own experiences, that an explicit understanding of engagement and how to promote it is somewhat lacking in many teachers. In particular, teachers often seem to lack a distinct ideology driving their teaching (Churchill, et al., 2011), which implies the importance of being a reflective practitioner to continually develop and refine practices and beliefs that promote authentic learning. This also has implications for the learning that teachers undergo and how they come to put theory into practice, indicating that these findings are also relevant considerations for the institutions in which teachers experience this training.

Implications for Tertiary Education

There were hints in this investigation that the conditions of optimal learning also have implications for tertiary education, particularly that of teacher training. From the teacher studied in this case as well as personal experience, it seems that this mode of education is

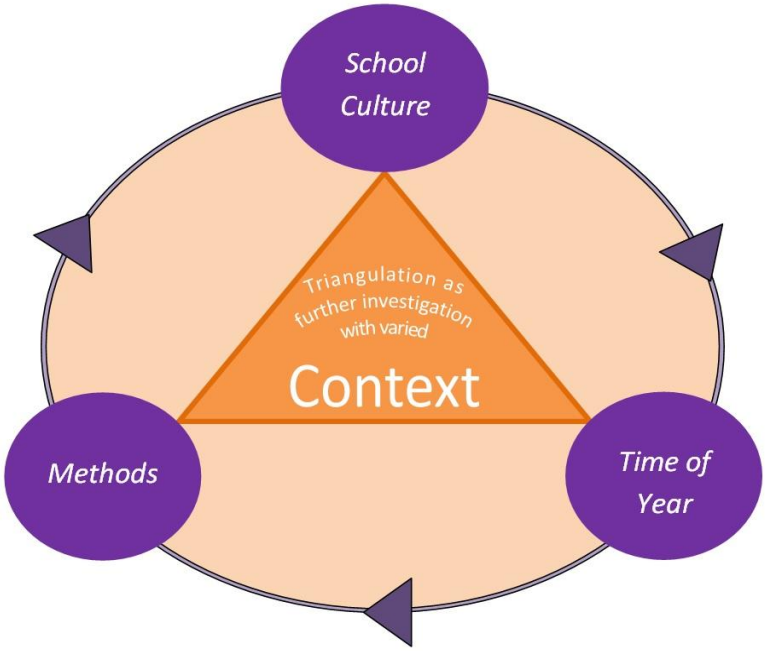
somewhat lacking in providing authentic learning experiences due to old habits and tacit teaching practices causing a hindrance of several of the conditions explored in the previous chapter. For this reason, it seems that tertiary institutions would do well to reconsider their approach to education and provide students with more meaningful, relevant and engaging experiences in supportive and collaborative learning environments. Furthermore, it also appears that there needs to be more of a focus on the practical experiences that tertiary students undergo, and how this facilitates putting knowledge into practice and transferring tacit knowledge into explicit knowledge (Smith, 2001).

In regards to teacher practicums particularly, this indicates the importance of reflection for consolidating and making connections between theory and practice when experiencing teaching. Unfortunately however, in both my own experience as well as that of the teacher studied in this investigation, this seems to be hindered by the focus of completing assignments which often seem to lack meaning in the context of practicing teaching. Furthermore, the teacher in this particular case revealed the importance of pairing trainee teachers with effective mentors to promote their own engagement and meaningful development as an educator. However, while the findings of this investigation do suggest implications for tertiary education, this was not the focus, which indicates the need to further explore this relationship in the context of future research.

Further Research towards a Theory of Optimal Learning

In order to develop and refine the optimal learning conditions suggested in this investigation, it seems that extending this research into further contexts is necessary. While this was not possible in this investigation given the restrictions of an honours thesis, I will briefly explore ideas of how this could occur in the future to further increase the transparency of these findings by triangulating data amongst different contexts of investigation, as evident in the diagram below.

Diagram 6.1: Triangulation as Further Investigation with Varied Context



Apart from conducting the investigation at a different time of year, there is also the potential for this research to shift into investigating other age groups to compare and contrast understandings of engagement across all school grades. Similarly, the site of the research (or 'school culture') could be adapted by exploring different schooling systems as well as comparing findings across subject areas beyond mathematics (as I investigated here) and literacy learning (as the original CoL were based on). This could even involve investigating different levels of education, such as tertiary training, to further explore how the conditions discovered in this investigation apply in these learning contexts.

Finally, and possibly most importantly, the methodology of this research could be extended to improve its transparency. The fact that my investigation occurred in the context of an honours thesis indicated the presence of restrictions relating to both time and experience. Because of this, I recommend that this study be extended in the future to consolidate and refine the findings by introducing a mixed methods approach (McMillan & Schumacher, 2010), and exploring understandings of engagement and the CoL in further contexts. Although I intend to somewhat fulfil this in the near future by continuing this investigation, it would seem that engagement, and in particular the role of emotion, in

the classroom requires much further attention. This aspiration for further research to continue is indicative of the concept of fascination I discovered in investigating optimal learning conditions, and is summed up by the following quote from Albert Einstein:

"The important thing is not to stop questioning.

Curiosity has its own reason for existing."

Epilogue – The Detective's Experience

In looking back at my own attitudes and beliefs towards teaching before beginning this research, I can see how much I have grown. Apart from the benefits my research may have for improving educational practices in the classroom, what this investigation has taught me personally has made it such a valuable experience in my teacher training. For this reason, while the journey of completing honours has in no way been easy, it has without a doubt been the most beneficial undertaking during my development as a teacher.

As I go on to teaching an upper-primary class next year, I look forward to implementing what I have learnt about engagement and using the "Model of Optimal Learning Conditions" to inform my practices where possible. In particular, I feel excited at the prospects of developing relationships with my students and positively supporting them in their learning, as I have discovered the benefits for in this investigation.

In many ways, my original aspirations for this research have come true as I have learnt a lot more about engagement and feel I have a much better grasp of what is required of a teacher hoping to provide their students with an authentic learning environment. This is something I feel like I have only experienced in fragments throughout my educational experiences (both as a student and trainee teacher) so far, and so look forward to discovering more about this. For this reason, I hope to continue my research in the near future to further explore what I have discovered in this investigation, as I discussed earlier. At the very least, I have every intention of being a reflective practitioner as I begin teaching next year by keeping a journal to continually converse with myself about how I can improve my practices and increase the engagement of the students in my class. In this way, I would like to continue the 'detective like role' (Merriam, 1998) I used in this research into my experiences of teaching as I investigate my own practices and the learning of the students in my classroom for the purpose of further developing engagement, meaning and authenticity in learning.

References

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the student engagement instrument. *Journal of School Psychology, 44,* 427-445.

Archambault, I., Janosz, M., & Chouinard, R. (2012). Teacher beliefs as predictors of adolescents' cognitive engagement and achievement in mathematics. *The Journal of Educational Research, 105*(5), 319-328.

Arends, R. I., & Kilcher, A. (2010). *Teaching for student learning: Becoming an accomplished teacher*. New York: Routledge.

Arnold, A. (2012). *The effects of project based learning on middle school students' attitudes and achievement in mathematics education.* California State University, San Marcos.

Arnone, M. P., Small, R. V., Chauncey, S. A., & McKenna, H. P. (2011). Curiosity, interest and engagement in technology-pervasive learning environments: A new research agenda. *Educational Technology, Research and Development, 59*(2), 181-198.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25*(4), 297-308.

Astin, A. W. (1999). Student involvement: A developmental theory for higher education. *Journal of College Student Development, 40*(5), 518-529.

Attard, C. (2012). Engagement with mathematics: What does it mean and what does it look like? *Australian Primary Mathematics Classroom, 17*(1), 9-13.

Auriacombe, C. J., & Schurink, E. (2012). Conceptualising qualitative research through a spiral of meaning-making. *Administratio Publica, 20*(3), 144-169.

Axelson, R. D., & Flick, A. (2010). Defining student engagement. *Change: The Magazine of Higher Learning, 43*(1), 38-43.

Bernard, H. R., & Ryan, G. W. (2010). *Analysing qualitative data: Systematic approaches*. Thousand Oaks, CA: SAGE Publications.

Bobis, J., Anderson, J. C., Martin, A. J., & Way, J. (2011). A model for mathematics instruction to enhance students motivation and engagement. In D. J. Brahier (Ed.), *Motivation and disposition: Pathways to learning mathematics, volume 73*. Reston, VA: National Council of Teachers of Mathematics.

Borich, G. D. (2011). *Effective teaching methods: Research based practice*. Boston: Pearson.

Brady, L., & Scully, A. (2005). *Engagement: Inclusive classroom management*. Frenchs Forest: Pearson Education Australia.

Bragg, L., & Nicol, C. (2011). Seeing mathematics through a new lens: Using photos in the mathematics classroom. *Australian Mathematics Teacher, 67*(3), 3-9.

References

Cambourne, B. (1988). *The whole story: Natural learning and the acquisition of literacy in the classroom*. Gosford, NSW: Ashton Scholastic Pty Ltd.

Cambourne, B. (1995). Toward an educationally relevant theory of literacy learning: Twenty years of inquiry. *The Reading Teacher, 49*(3), 182-189.

Cambourne, B. (2002a). The conditions of learning: Is learning natural? *The Reading Teacher, 55*(8), 758-762.

Cambourne, B. (2002b). Holistic, integrated approaches to reading and language arts instruction: The constructivist framework of an instructional theory. In A. E. Farstrup & J. Samuels (Eds.), *What research has to say about reading instruction*. Newark, Delaware: International Reading Association.

Cambourne, B., & Turbill, J. (1987). *Coping with chaos*. Collingwood, VIC: Renwick Pride Pty Ltd.

Choo, T. L., & Darling-Hammond, L. (2011). Creating effective teachers and leaders in Singapore. In L. Darling-Hammond & R. Rothman (Eds.), *Teacher and leader effectiveness in high-performing education systems*. Washington, DC: Alliance for Excellent Education.

Christensen, B., Johnson, R. B., & Turner, L., A. (2011). *Research methods, design and analysis*. Boston: Pearson Education.

Churchill, R., Ferguson, P., Godinho, S., Johnson, N. F., Keddie, A., Letts, W., et al. (2011). *Teaching: Making a difference*. Milton, QLD: John Wiley & Sons Australia, Ltd.

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research*. Los Angeles: SAGE Publications.

Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches*. Thousand Oaks, California: SAGE Publications.

Csíkszentmihályi, M. (1990). *The psychology of optimal experience*. New York: Harper & Row, Publishers, Inc.

Denzin, N. K., & Lincoln, Y. S. (2005). *The SAGE handbook of qualitative research*. Thousand Oaks, California: SAGE Publications.

Denzin, N. K., & Lincoln, Y. S. (2011). *The SAGE handbook of qualitative research*. Thousand Oaks, California: SAGE Publications.

DeVito, J. A. (2008). *The interviewing guidebook*. Boston: Pearson.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. Boston: D.C. Heath.

Doll, B., Spies, R. A., LeClair, C. M., Kurien, S. A., & Foley, B. P. (2010). Student perceptions of classroom learning environments: Development of the ClassMaps survey. *School Psychology Review, 39*(2), 203-218.

Drew, J. C., Hardman, M. L., & Hosp, J. L. (2008). *Designing and conducting research in education*. Thousand Oaks: Sage Publications, Inc.

Elias, H., Mustafa, S. M. S., Roslan, S., & Noah, S. M. (2010). Examining potential relationships between flow and motivational forces in Malaysian secondary school students. *Procedia - Social and Behavioural Sciences, 9*, 2042-2046.

Elias, H., Mustafa, S. M. S., Roslan, S., & Noah, S. M. (2011). Motivational predictors of academic performance in end year examination. *Procedia - Social and Behavioural Sciences, 29*, 1179-1188.

Fan, W., & Williams, C. M. (2010). The effects of parental involvement on students' academic self-efficacy, engagement and intrinsic motivation. *Educational Psychology, 30*(1), 53-74.

Fast, L. A., Lewis, J. L., Bryant, M. J., Bocian, K. A., Cardullo, R. A., Rettig, M., et al. (2010). Does math self-efficacy mediate the effect of the perceived classroom environment on standardized math test performance? *Journal of Educational Psychology, 102*(3), 729-740.

Fielding-Wells, J., & Makar, K. (2008). *Student (dis) engagement in mathematics*. Paper presented at the Proceedings of the Australian Association for Research in Education Conference.

Fitzsimmons, P., & Lanphar, E. (2011). When there's love inside there's a reason why: Emotion as the core of authentic learning in one middle school classroom. *Literacy Learning: The Middle Years, 19*(2).

Flick, U. (2009). *An introduction to qualitative research*. Thousand Oaks, California: SAGE Publications Ltd.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education*. New York: McGraw-Hill.

Freitas, F. A., & Leonard, L. J. (2011). Maslow's hierarchy of needs and student academic success. *Teaching and Learning in Nursing, 6*, 9-13.

Graziano, A. M., & Raulin, M. L. (2013). *Research methods: a process of inquiry*. Upper Saddle River, New Jersey: Pearson.

Green, J., Martin, A. J., Marsh, H. W., & McInerney, D. M. (2006). *Academic motivation and engagement: Examining relations with key educational outcomes*. Paper presented at the Fourth International Biennial SELF Research Conference proceedings: Self-concept, motivation, social and personal identity for the 21st century.

Hamlett, B. (2009). Supporting pre-service primary teachers to improve their mathematics content knowledge. *eCULTURE, 2*(1).

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development, 48*(3), 23-48.

Herrington, J., Reeves, T. C., & Oliver, R. (2009). *A guide to authentic e-learning*. New York: Routledge.

Hughes, E. M., & Riccomini, P. J. (2011). Mathematics motivation and self-efficacy of middle school students. *Association for Childhood Education International, 24*(1), 1-6.

Iacoboni, M. (2009). Imitation, empathy, and mirror neurons. *Annual Review of Psychology, 60*(1), 653-670.

Jackson, S. L. (2012). *Research methods and statistics: A critical thinking approach*. United States of America: Cengage Learning.

Jameson, M. M. (2010). Math anxiety: Theoretical perspectives on potential influences and outcomes. In J. C. Cassady (Ed.), *Anxiety in schools: The causes, consequences, and solutions for academic anxieties* (pp. 45-58). New York: Peter Lang Publishing, Inc.

Jameson, S. (2009, July 12). *Bringing the real world into the classroom - strategies to motivate learning*. Paper presented at the Wrest Point Conference Centre, Hobart, Tasmania.

Jirout, J., & Klahr, D. (2012). Children's scientific curiosity: In search of an operational definition of an elusive concept. *Developmental Review, 32*(2), 125-160.

Keng, K. N., & Kian, L. H. (2010). Learning mathematic concepts through authentic learning. In L. Sparrow, B. Kissane & C. Hurst (Eds.), *Shaping the future of mathematics education: Proceedings of the 33rd annual conference of the Mathematics Education Research Group of Australasia* (pp. 305-311). Fremantle, WA: Mathematics Education Research Group of Australasia.

Klein, M. (2010, November 28 - December 2). *Igniting and sustaining mathematical proficiency: A poststructuralist analysis of the pitfalls and essentials of classroom practice*. Paper presented at the International Education Research Conference, Melbourne, Victoria.

Kohn, A. (2011). *Feel-bad education: and other contrarian essays on children and schooling*. Boston: Beacon Press.

Kumar, R. (2011). *Research methodology: A step-by-step guide for beginners*. London: SAGE Publications.

Lanphar, E., & Fitzsimmons, P. (2010). Shifts and shapes of emotion: Middle school students' perspectives at San Roque. In L. Hopkins, M. Macleod & W. C. Turgeon (Eds.), *Negotiating childhoods*. Oxford: Inter-Disciplinary Press.

Lent, R. C. (2006). *Engaging adolescent learners*. Portsmouth: Heinemann.

Lewis, D. A., Huebner, E. S., Malone, P. S., & Valois, R. F. (2011). Life satisfaction and student engagement in adolescents. *Journal of Youth Adolescence, 40*, 249-262.

Lewis, G., & Forsythe, S. (2012). Which qualities did aspiring teachers value in their 'best' mathematics teachers. *Teacher Education Network Journal, 4*(3), 46-58.

Lichtman, M. (2013). *Qualitative research in education: A user's guide*. Thousand Oaks, California: SAGE Publications.

Litman, J. A. (2008). Interest and deprivation factors of epistemic curiosity. *Personality and Individual Differences, 44*(7), 1585-1595.

Luttrell, W. (2010). *Qualitative educational research: Readings in reflexive methodology and transformative practice*. New York: Routledge.

Martin, A. J., Anderson, J., Bobis, J., Way, J., & Vellar, R. (2012). Switching on and switching off in mathematics: An ecological study of future intent and disengagement among middle school students. *Journal of Educational Psychology, 104*(1), 1-18.

Maslow, A. H. (1954). *Motivation and personality*. New York: Harper & Brothers Publishers.

McAteer, M. (2012). *Improving primary mathematics teaching and learning*. Berkshire: McGraw-Hill International.

McMillan, J. H., & Schumacher, S. (2010). *Research in education: Evidence-based inquiry*. Upper Saddle River, New Jersey: Pearson.

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass Publishers.

Merriam Webster Online Dictionary. (2013). Engage. Retrieved 20 June, 2013, from http://www.merriam-webster.com/dictionary/engage

Metallidou, P., & Vlachou, A. (2007). Motivational beliefs, cognitive engagement, and achievement in language and mathematics in elementary school children. *International Journal of Psychology, 42*(1), 2-15.

Minichiello, V., & Kottler, J., A. (2010). *Qualitative journeys*. Thousand Oaks, California: SAGE Publications.

Muijs, D., & Reynolds, D. (2011). *Effective teaching: Evidence and practice*. London: SAGE.

Nakamura, J., & Csíkszentmihályi, M. (2002). The concept of flow. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology*. New York: Oxford University Press.

Nilsen, H. (2009). Influence on student academic behaviour through motivation, self-efficacy and value-expectation: An action research project to improve learning. *Issues in informing science and information technology, 6*, 545-556.

Nurmi, J. E. (2012). Students' characteristics and teacher–child relationships in instruction: A meta-analysis. *Educational Research Review, 7*, 177-197.

Park, S., Holloway, S. D., Arendtsz, A., Bempechat, J., & Li, J. (2012). What makes students engaged in learning? A time-use study of within- and between-individual predictors of emotional engagement in low-performing high schools. *Journal of Youth Adolescence, 41*, 390-401.

Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of Educational Psychology, 99*(1), 83-98.

Perry, M., McConney, M., Flevares, L. M., Mingle, L. A., & Hamm, J. V. (2011). Engaging first graders to participate as students of mathematics. *Theory Into Practice, 50*(4), 293-299.

Punch, K. F. (2009). *Introduction to research methods in education*. London: SAGE.

Reeves, S., Albert, M., Kuper, A., & Hodges, B. D. (2008). Why use theories in qualitative research? *BMJ, 337*, 631-634.

Reio, T. G., Petrosko, J. M., Wiswell, A. K., & Juthamas, T. (2006). The Measurement and conceptualization of curiosity. *The Journal of Genetic Psychology, 167*(2), 117-135.

Ribeiro, J. J., & DeMagistris, D. (2009). *Does a co-learner delivery model in a mathematics methods course affect pre-service teacher candidates' self-efficacy in teaching mathematics?* Paper presented at the Annual meeting of the New England Educational Research Organization.

Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher-student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research, 81*(4), 493-529.

Rotgans, J. I., & Schmidt, H. G. (2011). Cognitive engagement in the problem-based learning classroom. *Advances in Health Sciences Education, 16*(4), 465-479.

Rowan-Kenyon, H. T., Swan, A. K., & Creager, M. F. (2012). Social cognitive factors, support, and engagement: Early adolescents' math interests as precursors to choice of career. *Career Development Quarterly, 60*(1), 2-15

Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data*. Thousand Oaks, California: SAGE Publications.

Rugg, G., & Petre, M. (2007). *A gentle guide to research methods*. Berkshire: Open University Press.

Rushton, S., Juola-Rushton, A., & Larkin, E. (2010). Neuroscience, play and early childhood education: Connections, implications and assessment. *Early Childhood Education Journal, 37,* 351-361.

Sahlberg, P. (2011). Developing effective teachers and school leaders: The case of Finland. In L. Darling-Hammond & R. Rothman (Eds.), *Teacher and leader effectiveness in high-performing education systems*. Washington, DC: Alliance for Excellent Education.

Saldana, J. (2013). *The coding manual for qualitative researchers*. London: SAGE Publications Ltd.

Scott, G., & Garner, R. (2013). *Doing qualitative research: Design, methods, and techniques*. Upper Saddle River, New Jersey: Pearson Education, Inc.

Shernoff, D. J., & Csíkszentmihályi, M. (2009). Flow in schools. In R. Gilman, E. S. Huebner & M. J. Furlong (Eds.), *Handbook of positive psychology in schools*. New York: Routledge.

Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology, 100*(4), 765-781.

Smith, E. A. (2001). The role of tacit and explicit knowledge in the workplace. *Journal of Knowledge Management, 5*(4), 311-321.

Sousa, D. A. (2008). *How the brain learns mathematics*. Thousand Oaks, California: Corwin Press.

Stoessiger, R., & Edmunds, J. (1989). Metaphors for mathematics. *Journal of Reading, 12*(2), 123-128.

Strebe. (2010). *Engaging mathematics students using cooperative learning*. Larchmont: Eye On Education.

Tan, S. F., & Lim, C. S. (2010). Effective mathematics lesson from the lenses of primary pupils: Preliminary analysis. *Procedia - Social and Behavioral Sciences, 8*, 242-247.

Toukonen, K. (2011). *The dynamic electronic textbook: enhancing student's learning experience*. Unpublished Masters Thesis, Kent State University.

Whitson, C., & Consoli, J. (2009). Flow theory and student engagement. *Journal of Cross-Disciplinary Perspectives in Education, 2*(1), 40-49.

Wolcott, H. F. (2009). *Writing up qualitative research*. Thousand Oaks, California: SAGE Publications Inc.

Wu, W. (2012). *The relationship between incentives to learn and Maslow's hierarchy of needs*. Paper presented at the Physics Procedia, Nanjin, China.

Yun, R. Y. (2011). *Qualitative research from start to finish*. New York: The Guilford Press.

Appendices

Appendix A – Student Information Letter

Factors Influencing the Process of Student Engagement During Mathematics Lessons in a Grade 6 Classroom

This cover sheet is intended to inform students participating in the study.

DESCRIPTION OF THE PROJECT
This research project is being completed for an honours thesis. The results from the research will provide valuable information about engagement with the possibility of revealing teaching practices to make mathematics lessons more motivating. Data from this study will be collected through surveys, interviews and observation and analysed in comparison to Cambourne's "Conditions of Learning".

INVITATION
You are being invited to participate in this research project which is being conducted by Paul Goossens. Paul is a research student in the Faculty of Education at Avondale and his research project is being supervised by Associate Professor Phil Fitzsimmons.

PURPOSE AND IMPORTANCE OF THIS RESEARCH
The purpose of this research is to explore the apparently untouched domain of engagement in mathematics. The aim of this process is to identify factors impacting engagement during mathematics lessons in order to both reveal teaching practices that will assist in this area as well as promote further research opportunities to explore this paradigm in a variety of contexts.

WHO IS BEING INVITED OR SELECTED TO PARTICIPATE?
Participants for this project include a teacher at Avondale Primary School and the students of a grade six class at Avondale Primary School

WHAT DOES PARTICIPATION INVOLVE?
If you agree to participate, you will be observed during several mathematics lessons. These lessons will also be video recorded. If you choose, you may also volunteer to be invited to participate in four interview sessions.

HOW MUCH TIME WILL IT TAKE?
Interview sessions will be approximately 30 minutes each, which totals two hours across the four sessions.

POSSIBLE RISKS OR INCOVENIENCES
The time taken to participate is the only inconvenience in participating in this study.

BENEFITS
We cannot and do not guarantee or promise you any individual benefits from participating in this research we do however, hope this research will improve the way that mathematics is taught.

CONFIDENTIALITY, ANONYMITY AND DISCLOSURE OF INFORMATION
All names will be removed from the data and you will be allocated a numerical code which will be used for all observations, interview and questionnaire data.

The data will be stored for five years in a locked cabinet in my office. At the end of the five year period after the research is completed, hard copies will be shredded and electronic data will be erased from discs, servers and hard drives.

All aspects of the study including results will be stored securely and only accessed by the researchers unless you consent otherwise.

USE OF INFORMATION COLLECTED
The information collected will be analysed and reported in a thesis, scientific papers and professional conferences. Confidentiality of individual participants and organisations will be assured. In any publication, information will be provided in such a way that you cannot be identified. Participants will be sent a summary of the final results.

FREEDOM OF CONSENT
Participation in this research is voluntary. It is completely up to you whether or not to participate. Only people who give their informed consent will be included in the study. Even if you agree to participate you may withdraw at any time without giving a reason. If you decide not to participate, or wish to withdraw from the project at any time, you will not be disadvantaged. If you chose to withdraw and if it is possible to retrieve, your data will be returned to you.

Please read this information statement and be sure you understand its contents before you consent to participate. After you have read this information, if there is anything you do not understand, or you have questions, please contact Paul.

If you would like to participate please sign the consent form and complete a survey. Participants for interviews will be requested in the near future.

FURTHER INFORMATION
If you would like further information please contact Paul Goossens at
s09005575@student.avondale.edu.au

Thank you for considering this invitation.

Paul Goossens

Appendix B – Parent/Teacher/Principal Information Letter

Factors Influencing the Process of Student Engagement During Mathematics Lessons in a Grade 6 Classroom

This cover sheet is intended to inform parents, teachers and principals participating in the study.

DESCRIPTION OF THE PROJECT
This qualitative investigation will be conducted in order to complete a thesis for an undergraduate honours degree. The results from the research will illuminate valuable information about engagement in mathematics with the prospect of revealing teaching practices to facilitate engagement and paving the way for further research to occur at a PhD level to explore this idea in different contexts. Data from this study will be collected through surveys, interviews and observation and coded according to a qualitative paradigm using the theoretical lens of Cambourne's "Conditions of Learning".

INVITATION
You are being invited to participate in this research project which is being conducted by Paul Goossens. Paul is a research student in the Faculty of Education at Avondale and his research project is being supervised by Associate Professor Phil Fitzsimmons.

PURPOSE AND IMPORTANCE OF THIS RESEARCH
The purpose of this research is to explore the apparently untapped domain of engagement in mathematics through the means of a qualitative investigation. The aim of this process is to identify factors impacting engagement during mathematics lessons in order to both reveal teaching practices that will assist in this area as well as promote further research opportunities to explore this paradigm in a variety of contexts.

WHO IS BEING INVITED OR SELECTED TO PARTICIPATE?
Participants for this project include one teacher at Avondale Primary School and the students of a grade six class at Avondale Primary School.

WHAT DOES PARTICIPATION INVOLVE?
If you agree to participate, you may be asked to complete two surveys about your impression of engagement in mathematics lessons. If you choose, you may also volunteer to be invited to participate in four interview sessions.

HOW MUCH TIME WILL IT TAKE?
Interview sessions will be approximately 30 minutes each, which totals two hours across the four sessions.

POSSIBLE RISKS OR INCOVENIENCES
The time taken to participate is the only inconvenience in participating in this study.

BENEFITS
We cannot and do not guarantee or promise you any individual benefits from participating in this research we do however, hope this research will shed light on how to engage and motivate students during mathematics lessons, which will hopefully pave the way for improving teaching practices and allowing further research in this area to occur.

CONFIDENTIALITY, ANONYMITY AND DISCLOSURE OF INFORMATION
All names will be removed from the data and you will be allocated a numerical code which will be used for all observations, interview and questionnaire data.

The data will be stored for five years in a locked cabinet in my office. At the end of the five year period after the conclusion of the research, hard copies will be shredded and electronic data will be erased from discs, servers and hard drives.

All aspects of the study including results will be stored securely and only accessed by the researchers unless you consent otherwise.

USE OF INFORMATION COLLECTED
The information collected will be analysed and reported in a thesis, scientific papers and professional conferences. Confidentiality of individual participants and organisations will be assured. In any publication, information will be provided in such a way that you cannot be identified. Participants will be sent a summary of the final results.

FREEDOM OF CONSENT
Participation in this research is voluntary. It is completely up to you whether or not to participate. Only people who give their informed consent will be included in the study. Even if you agree to participate you may withdraw at any time without giving a reason. If you decide not to participate, or wish to withdraw from the project at any time, you will not be disadvantaged. If you chose to withdraw and if it is possible to retrieve, your data will be returned to you.

Please read this information statement and be sure you understand its contents before you consent to participate. After you have read this information, if there is anything you do not understand, or you have questions, please contact Paul.

If you would like to participate please sign the consent form and complete a survey. Participants for surveys will be requested in the near future.

FURTHER INFORMATION
If you would like further information please contact Paul Goossens at s09005575@student.avondale.edu.au

Thank you for considering this invitation.

Paul Goossens

Appendix C – Student Consent Form

STUDENT CONSENT FORM

Factors Influencing the Process of Student Engagement During Mathematics Lessons in a Grade 6 Classroom

I agree to participate in the above research project and I give my consent freely.

I have read and understand the information provided in the Information Statement.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have been given to keep.

I understand that I can withdraw from the project at any time and do not have to give any reason for withdrawing.

The procedures required for the project and the time involved have been explained to me. I have had the opportunity to ask questions and have had them answered to my satisfaction. I understand that any further directions may be directed to Paul Goossens.

I consent to:

- Participate in a series of four interviews, the audio of which will be digitally recorded.
- Be observed and video recorded during mathematics lessons.

I understand that my personal information will remain confidential to the researchers except as required by law.

Print name _____Signature_____Date_____

Paul Goossens
Avondale College of Higher Education
Email: s09005575@student.avondale.edu.au
Phone: 0403919381

This research project has been approved by the Avondale College of Higher Education Human Research Ethics Committee (HREC). Avondale requires that all participants are informed tat if they have any complaint concerning the manner in which a research project is conducted it may be given to the researcher, or if an independent person is preferred, to Avondale's HREC Secretary, Avondale College of Higher Education, PO Box 19, Cooranbong NSW 2265, or phone (02) 4980 2121 or fax (02) 4980 2117 or email: research.ethics@avondale.edu.au

Appendix D – Teacher Consent Form

TEACHER CONSENT FORM

Factors Promoting Student Engagement During Mathematics Lessons in a Grade 6 Classroom

I agree to participate in the above research project and I give my consent freely.

I have read and understand the information provided in the Information Statement.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have been given to keep.

I understand I can withdraw from the project at any time and do not have to give any reason for withdrawing.

The procedures required for the project and the time involved have been explained to me. I have had the opportunity to ask questions and have had them answered to my satisfaction. I understand that any further directions may be directed to Paul Goossens.

I consent to:

- Complete a questionnaire
- Participate in a series of four interviews, the audio of which will be digitally recorded.
- Be observed and video recorded while teaching mathematics lessons.

I understand that my personal information will remain confidential to the researchers except as required by law.

Print name _____Signature_____Date_____

Paul Goossens
Avondale College of Higher Education
Email: s09005575@student.avondale.edu.au
Phone: 0403919381

This research project has been approved by the Avondale College of Higher Education Human Research Ethics Committee (HREC). Avondale requires that all participants are informed tat if they have any complaint concerning the manner in which a research project is conducted it may be given to the researcher, or if an independent person is preferred, to Avondale's HREC Secretary, Avondale College of Higher Education, PO Box 19, Cooranbong NSW 2265, or phone (02) 4980 2121 or fax (02) 4980 2117 or email: research.ethics@avondale.edu.au

Appendix E – Principal Consent Form

PRINCIPAL CONSENT FORM

Factors Influencing the Process of Engagement During Mathematics Lessons in a Grade 6 Classroom

I agree to participate in the above research project and I give my consent freely.

I have read and understand the information provided in the Information Statement.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have been given to keep.

I understand I can withdraw from the project at any time and do not have to give any reason for withdrawing.

The procedures required for the project and the time involved have been explained to me. I have had the opportunity to ask questions and have had them answered to my satisfaction. I understand that any further directions may be directed to Paul Goossens.

I consent to:

- Allow four of the students and one of the teachers of my school to participate in a series of three interviews, the audio of which will be digitally recorded.
- Allow a year 6 class observed and video recorded during mathematics lessons.

I understand that my personal information will remain confidential to the researchers except as required by law.

Print name _____Signature_____Date_____

Paul Goossens
Avondale College of Higher Education
Email: s09005575@student.avondale.edu.au
Phone: 0403919381

This research project has been approved by the Avondale College of Higher Education Human Research Ethics Committee (HREC). Avondale requires that all participants are informed tat if they have any complaint concerning the manner in which a research project is conducted it may be given to the researcher, or if an independent person is preferred, to Avondale's HREC Secretary, Avondale College of Higher Education, PO Box 19, Cooranbong NSW 2265, or phone (02) 4980 2121 or fax (02) 4980 2117 or email: research.ethics@avondale.edu.au

Appendix F – Parent Consent Form

PARENT CONSENT FORM

Factors Promoting Student Engagement During Mathematics Lessons in a Grade 6 Classroom

I agree for my child to participate in the above research project and I give my consent freely.

I have read and understand the information provided in the Information Statement.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have been given to keep.

I understand my child can withdraw from the project at any time and do not have to give any reason for withdrawing.

The procedures required for the project and the time involved have been explained to me. I have had the opportunity to ask questions and have had them answered to my satisfaction. I understand that any further directions may be directed to Paul Goossens.

I consent for my child to:

- Participate in a series of four interviews, the audio of which will be digitally recorded.
- Be observed and video recorded during mathematics lessons.

I understand that mine and my child's personal information will remain confidential to the researchers except as required by law.

Print name _____Signature_____Date_____

Paul Goossens
Avondale College of Higher Education
Email: s09005575@student.avondale.edu.au
Phone: 0403919381

This research project has been approved by the Avondale College of Higher Education Human Research Ethics Committee (HREC). Avondale requires that all participants are informed tat if they have any complaint concerning the manner in which a research project is conducted it may be given to the researcher, or if an independent person is preferred, to Avondale's HREC Secretary, Avondale College of Higher Education, PO Box 19, Cooranbong NSW 2265, or phone (02) 4980 2121 or fax (02) 4980 2117 or email: research.ethics@avondale.edu.au

Appendix G – Sample of Observation Data

Observation 3

Time: 9:45am – 10:30am **Date**: 22/05/2013

Teacher: Mr Jackson **Class**: 5/6 Mathematics Support

Time and Engagement Rate (ER)	Observations
9:50am – 10:00am ***ER:*** 60%	• Third different classroom in as many observation sessions. • Classroom is attractive, has several simple mathematical displays (at low grade level). No student work displayed. Room is relatively well lighted. This is a support classroom, used for a variety of different groups. • Students come in quietly, a few at a time from different classes. • Teacher immediately gives direction – "Page number 48, we're going to finish off our work on triangles from yesterday". • Students allowed to sit where they please – some groups, some individuals. • Sits directly across from one student while directing the class. • Draws and displays different triangles on the whiteboard. Questions specific students. Not everyone has arrived yet. • Year 5 and 6 on different work, same topic. • "I don't want you here.... stealing learning from the rest of the class...you're being a learning thief." – when a student is making a lot of noise and interrupting the class. • Displays and discusses how to find the third angle of a triangle. • Directs grade 5 through work by reading from one student's book, at eye level with that group. Grade 6 is going on with their own work. • Class is very quiet. • "For those who are done, you'll just have to wait for today..." – doesn't have protractors needed for next page. • Fabricates an activity for fast finishers – draw lines of symmetry. • Students working well and quietly, but a low energy level.
10:00am – 10:10am ***ER:*** 70%	• Continues to display, demonstrate, question specific students. • Some students raise hands enthusiastically to answer questions. • "I've got some sad news".... test. Some students respond with "yay", others groan. • "I think that today's is easier than the last one you did". • Timed speed test. "Don't expect to get through to the end... most grade 6 kids don't.... do as many as you can". • Some kids recognise my last name as they had my wife as their prac teacher last year.

Appendix H – Sample of Memoed Observation Data

Time and Engagement Rate (ER)	Observations
9:50am – 10:00am ***ER:*** 75%	• Teacher collects students from outside as usual. This is always a difficult process as teachers allow students to leave at different times, it is an awkward transitional period. • As we walk to the class the teacher tells me that he wishes he just had his own class to teach, or at least that teachers let their kids out at a more specific time. He says that a lot of time is wasted here. • Firm instructions to students as they enter the class. • Students who are late need to make up time to him at recess. • Hurries class along, tells individual students to 'come on'. • "Well done PJ, you're doing awesome here" – not a very different vocal tone to the rest of his directions. • Instructs a student exactly how to measure the angles – tells him every step. Heavily guides them through the first question, allows them to do the rest. • Uses a much quieter, yet still firm tone when addressing individual students. • As students finish they want to check their work with the teacher, no students checking with each other. • A rather slow start, but students seem to enjoy measuring angles. A sense of rush and urgency is conveyed by the teacher throughout this first section, no clear instruction. • Students just waiting for his assistance. • One student who has finished begins tapping the desk, beatboxing, not helping others.
10:00am – 10:10am ***ER:*** 75%	• Teacher gives responsibility to two boys who are finished to go around and check the work of others around the room. These students are doing the role that the teacher had been doing previously. Teacher delegates them to particular students, and they also find students who they see need to do questions again. • Teacher informs that this work makes up about 1/3 of their test. • Teacher asks students to stop, relax, 'chillax'. Uses their language. • Starts asking students about the names of features of a circle from a diagram that he has drawn on the board. Teacher is obviously excited about this, students are enthusiastically raising their hands, sharing answers. Teacher praises some students, but not very consistent. • Teacher informs the students that they are expected to know these parts of the circle in year 4, so they should know it now and that it will be in their test tomorrow.

Comment [P1]: Continual struggle of starting the lesson on time and together.

Comment [P2]: Desires ownership of a class group, despises segregation.

Comment [P3]: Anxiety over wasted time.

Comment [P4]: Clear direction but lack of emotional connection.

Comment [P5]: Expresses the value of time and that students need to be responsible. Doesn't follow up on this.

Comment [P6]: Positive verbal encouragement, but fairly shallow – only expressed with words.

Comment [P7]: Teacher guidance, moving into giving student responsibility.

Comment [P8]: Students rely on his approval, don't value the approval of others.

Comment [P9]: Valuing time over learning. Uncomfortable atmosphere.

Comment [P10]: Students rely on this, absence of it is chaos.

Comment [P11]: Some students have no value in learning beyond finishing their work.

Comment [P12]: Students as assistants to the teacher. Saving time, engaging them, other students learn better.

Comment [P13]: Teacher indicates the time to pause and refocus.

Comment [P14]: Teacher models interest and excitement, rubs off onto students.

Comment [P15]: Verbal encouragement.

Comment [P16]: Teacher indicates that they are behind in their learning.

Comment [P17]: Value given to learning, shows where it will be used.

Appendix I – Schedule for First Interview with Mr Jackson

Start off by explaining the purpose of this interview – to find out about mathematics is taught effectively and in an engaging way. Reassure that this is not a judgment of their personal teaching abilities, and that they can feel secure to share anything with confidentiality.

Core Questions

1. How do you think children learn most effectively?
2. How do you think students learn maths and how does this fit with your view of learning?
3. How do you go about planning lessons for mathematics?
4. What does engagement mean to you?
5. What do you think makes students engaged, excited or interested during Mathematics?
6. What is it about Mathematics that makes it important to learn?
    a. Listen and pick up on elements of his response, and ask for more information
    b. Language used in mathematics
    c. Further application of mathematical skills? Essential for everyone?
7. What was it like when you first started teaching Mathematics & how have you grown and changed? What led to these changes occurring?
8. What do you think bores or confuses students during Mathematics lessons?
9. How often do you utilise group work in Mathematics? Why do/don't you include it as part of teaching Mathematics?
10. What impact do you think the overall classroom environment has in the teaching of Mathematics?
    a. Physical environment – displays, student work, seating arrangement
    b. Organisational environment – teacher authority, lesson structure
    c. Social environment – communication between students and student-teacher

Further Questions

11. Why do you think these students are in this class? How do you think they feel about this?
12. What makes a student 'good' in mathematics?
13. Is there a particular teacher or mentor who inspires your teaching practices in Mathematics? What was it that they did?
14. What has been your favourite maths lesson to teach? What was it that you liked about teaching this?
15. What's something you've always wanted to try when teaching Mathematics that you think would really engage students in learning? Do you ever get a chance to teach this?

Appendix J – Sample of Notes Taken During Second Interview with Mr Jackson

1. Could you please briefly tell me again what you think engagement is and how you recognise it?
    - On task, actively involved in the learning they are supposed to be doing
    - Recognised by: independent work = quiet, partners talking – about the right thing
    - Touching, laughing general means off task
    - Interest level, asking questions, excitement, achieving something for the first time.
2. How engaged do you feel the students in your class are in general?
    - Not very – in the class because they are reluctant learners.
    - Students see maths as a chore, difficult to change that.
    - Kids keen on doing games, can't do that all time.
    - Don't understand, too hard, too easy also leads to disengagement.
    - Foundation stuff is necessary.
3. What do you think leads to engagement in students?
    - In general – tests, challenges, rewards, competitions motivate students
    - These kids – aren't motivated by challenge, tests. Motivated by rewards.
    - If students get it wrong – send them back to try again, points out where they've gone wrong.
    - Tries not to motivate by rewarding fastest. Goal is to get to minimum competence. Tries to rewards competence and achievement rather than speed.
4. How do you feel you use your voice when teaching?
    - Loud usually, for board demonstrations, answers one students question loud enough so everyone can be heard
    - Quiet for one-on-one
    - Expects students to be quiet while he's talking, models respect, while demonstrating.
    - Can use his voice to tell kids off - a well timed temper tantrum can be beneficial.
5. What is your belief about the use of concrete materials?
    - Really important, hard to do in numeracy though, will do more later in the year.
    - Getting out protractors, using materials, showing how they work.
    - Shows relevance of doing maths, takes beyond just board work.

Appendix K – Sample Transcription of Interview with Mr Jackson

Paul - Hmm. So what is it about mathematics that you think makes it important to learn?

Mr Jackson - Well.. it, it, it's an essential life skill. I mean, kids will use mathematics... forever. So they have to learn to do it. It, it.. You can't be a, a, a, you know, a valuable member of society without having.. adequate mathematical skills. So, it just becomes something that you have to do. Umm.. and that's where I see the value in it, you know. The value in, the value within the ability to do things.. Umm.... And.. And the kids need to see that now. Then it's up to the teacher to make sure that they.. they're showing to the kids that maths is real.. It, you know.. It has value, that, we're doing this because.. of its relevance. Umm.. you know, otherwise it becomes like university maths, when you do the maths just for the sake of the maths. (Laughter). Yeah that's right.. it becomes (?).. and that's all it is. University maths is.. puzzle solving. That's all it is. There's no, there's very little relevance to the general real world. I mean, there might be for computers and.. you know, complex engineering problem solving stuff, but it has no real relevance to, to real people in the real world. Whereas, what we do in primary school.. is, absolutely important.. always. Umm.. there's not much stuff we teach kids that they won't need to know.. Yeah, so that’s really what it comes down to.

Appendix L – Sample of Memoed Interview Transcription

Paul - Yep. Alright. Umm, looking at, like, a few specific part of a classroom environment; what about like a physical environment in a mathematics lesson.

Mr Jackson - (clears throat) Well... It... I like the kids to usually work, not silently, but without interrupting other people around them. To need that.. one of the more important things. Now, that's not to say you can't ask questions and help each other and work on work.. but.. kids shouldn't be interrupting the learning of others. So, I like to have a, now, a working environment. Group work's different or, you know, activities where you're using.. things is different but, but generally I like kids to work.. put their hand up if they have trouble, or ask their friends or, put their hand up if they have trouble and, and get the teacher.. to come and help them. You know, the, around the classroom there needs to be posters that reinforce learning and, you know, those sorts of things, so that kids can see them constantly; some of the mathematical skills, shapes.. fractions, those sorts of things. You know, so the environment needs be.. pretty instimulating. There needs to be... ready access to concrete materials,.. counters and dice and.. shapes and.. protractors and rulers and all, you know, all those sorts of things, so you need.. you need the equipment. And that's all part of the classroom environment I guess. Umm.. you know.. I, I'm not, I've never had.. group, I don't like groups,.. desks set out in groups of.. more than two or three. Umm, because kids tend to, you know, if, if, if you do that you've got.. one kid disturbing six kids.. instead of if they're in just partners of two, you've got

which the teacher directs, instructs and monitors students. What about the other aspects?

Comment [s101]: Prioritises students not interrupting each other. How is this determined? How does the teacher judge interruption over positive collaboration?

Comment [s102]: Allows students to collaborate, but is this encouraged?

Comment [s103]: What does this mean? Students focussed on their own work?

Comment [s104]: Does this really happen?

Comment [s105]: Students learning dependent on teacher assistance.

Comment [s106]: Acknowledges need for physical materials and displays around the classroom. Immersion. Are these used or referred to at all?

Comment [s107]: Accessible by whom? Are the students only allowed to use these with the teacher's permission?

Comment [s108]: Equipment as part of the classroom environment

Comment [s109]: Anxious that group work can lead to one child hindering learning for the rest. Much more willing to allow students to work in pairs.

Appendix M – Sample of Reflective Journal Entry

18/08/2013	During comparing my coding to the observations I have done I have decided to create a new category "student/teacher relationships", which somewhat splits off from the teacher responsibility one I had. I don't have much interview data to show this category at this stage, but it will be there. Also, during this coding I have noticed several things which align with what Mr Jackson said in his first interview. However, I have also noticed some discrepancies. For example: Mr Jackson spoke about students being 'unorganised in their learning', yet in the 4th lesson I observed he had forgotten/misplaced his teaching folder which caused a significant amount of lost time in which students were not given any directions. A similar incident occurred in which Mr Jackson was significantly late to class. Of course everyone has their bad days and is allowed to make mistakes, but there was something hypocritical about what I observed in those instances, which made me think about the effect of this misalignment between what the teacher expects and what he actually does. Relating to this, in revising my observations I have noticed a key theme in this class – inconsistency. Inconsistency seemingly appears in many forms within this class: • Attitudes to learning (structured and transmission or open and exploratory) • Learning experiences (book work or games/concrete learning) • Teacher demeanour (strict and structured or friendly and playful) • Learning environment (lack of certainty of where they will be and a distinct lack of ownership of the room) • Student collaboration (is it allowed or not? What are the rules?) • Attitudes to mathematics (is it boring/tedious or fun/interesting?) These factors seem confused in this classroom, which is evident by the variation of what is presented in each lesson and the students' response to this. This is even more evident from interview data with students (which I am just coming to fully realise now, but will unpack more later when I come to comparing it to these codes). This inconsistency causes a definite hindrance to learning and engagement in this classroom, and could be a sign of a teacher who is confused or possible inconsiderate of his teaching beliefs and philosophy. I also believe it is both a cause and effect of the lack of student/teacher relationships evident in this class.

Appendix N – Mr Jackson's Ideology, Knowledge and Practice

There are several pieces of evidence which lend themselves to understanding Mr Jackson's ideology of teaching, which I will list below. In these snippets I will highlight significant pieces of information using different colours to indicate what Mr Jackson says about his ideology (blue), knowledge (green) and practice (yellow) as a teacher.

"I'm a very traditional chalk and talk type teacher... I do the talking then we do the work"
"All of the theories and.. all of that stuff, I mean, they're all in the back of my head there somewhere. You know, 20 years ago.. I forget most of them.. occasionally you bump into fancy.. physiological words that you use.. you know, you go to a teachers meeting and they talk about, you know, Bloom's Taxonomy and,.. you know, this sort of (?).. Oh what's that again, and that's right. I, I think it has very little to do with real.. day to day teaching, to be honest. Umm, it's not like I, I, I set my classroom up on a particular model or style.. I just try and.. teach as well as I can teach. Umm, try and make.. teaching as interesting as I can make it without going overboard and, spending too many hours, preparing lessons and stuff. Umm, you've got to draw a line somewhere. And try and make the teaching as interesting as I can make it, as relevant as I can make it, and at the kids level. That's, that's my goal really."
Paul: Umm, multiple intelligences, have you heard of that? Mr Jackson: I have heard of that, it's one of those theories. Paul: Yea. So that's something you particularly cater for in your lessons? Mr Jackson: No. But having said that, I mean, I certainly in my lessons will, will do things where we're active and visual and, and auditory, and, and try and use all of those things, you, you know, that sort of stuff. But don't deliberately say, 'Right, I've got kids who need kinaesthetic learning so therefore I've got them up and moving, and making lessons or something for this lesson'. I don't, I don't do that. Umm, yea.

Appendix O – Sample of Emergent Themes from Interview

This table summarises the classroom teacher's beliefs regarding engagement as taken from the initial interview and compared to the literature.

Factors Promoting Engagement	Factors Hindering Engagement	Confused/Potentially Misinformed Ideas	Other Factors
• Importance of learning (employment) • Challenging but not too challenging (responsibility, expectations) • Students need to want to learn (responsibility) • Students experience self-success+4 (approximation) • Skills that students can apply (employment) • Concrete materials+2 (immersion) • Games+1 (enjoyment) • Interesting (enjoyment, intrigued) • Keep lesson flowing (CoL as a whole) • Brain break (reflection) • Fun activities (interest) • Reason for learning (employment, intrigue) • Learning something new (intrigue) • Teacher discussion, negotiated learning (collaboration)	• Learning seen as a chore (interest) • Repetition (+3) (interest) • Boring (+4) (intrigue) • Struggle to get through work load (expectation) • Individuals interrupting the engagement of others (responsibility, immersion) • Reluctant learners (approximation) • Lacking intrinsic motivation (interest, intrigue) • Don't see a need to better their brains (intrigue) • Advanced maths has little relevance • Students already knowing what to do (intrigue) • Students having no idea (approximation – anxiety) • Reluctant group participant (collaboration, responsibility) • Disorganisation of students, effects learning	• Need some repetition • Teachers guide learning • Structured teaching • Teacher guides kids through what he would be thinking • Repetition as learning for certain students +1 • Beginning learning from the basics • Engagement seen as students working, doing what they're asked to (forced immersion?) • Engagement as separate from student interest • Reward and punish+3 (extrinsic motivation) • Lack of awareness of teacher development and ideology • Teaches how he would like to learn • Students become disengaged when the teacher doesn't have time to help them • Teacher anxious about structured group work, doesn't see benefit, maths	• Adaptive and responsive teaching • Can't rely on the textbook • Structured learning • Multiple ways to get the same answer • Range of abilities in class • Amount of work based on showing him that they know how to do it, rather than a set amount of work • Maths as progressive knowledge • Break learning up • Logical sequence • Employment of knowledge as a future goal. • Why are certain kids disruptive? (aware of individuals) • Try different strategies to keep all kids involved • You've got to get through the work (curriculum constraints) • Sets manageable goals for students to complete work. • Mathematics as an

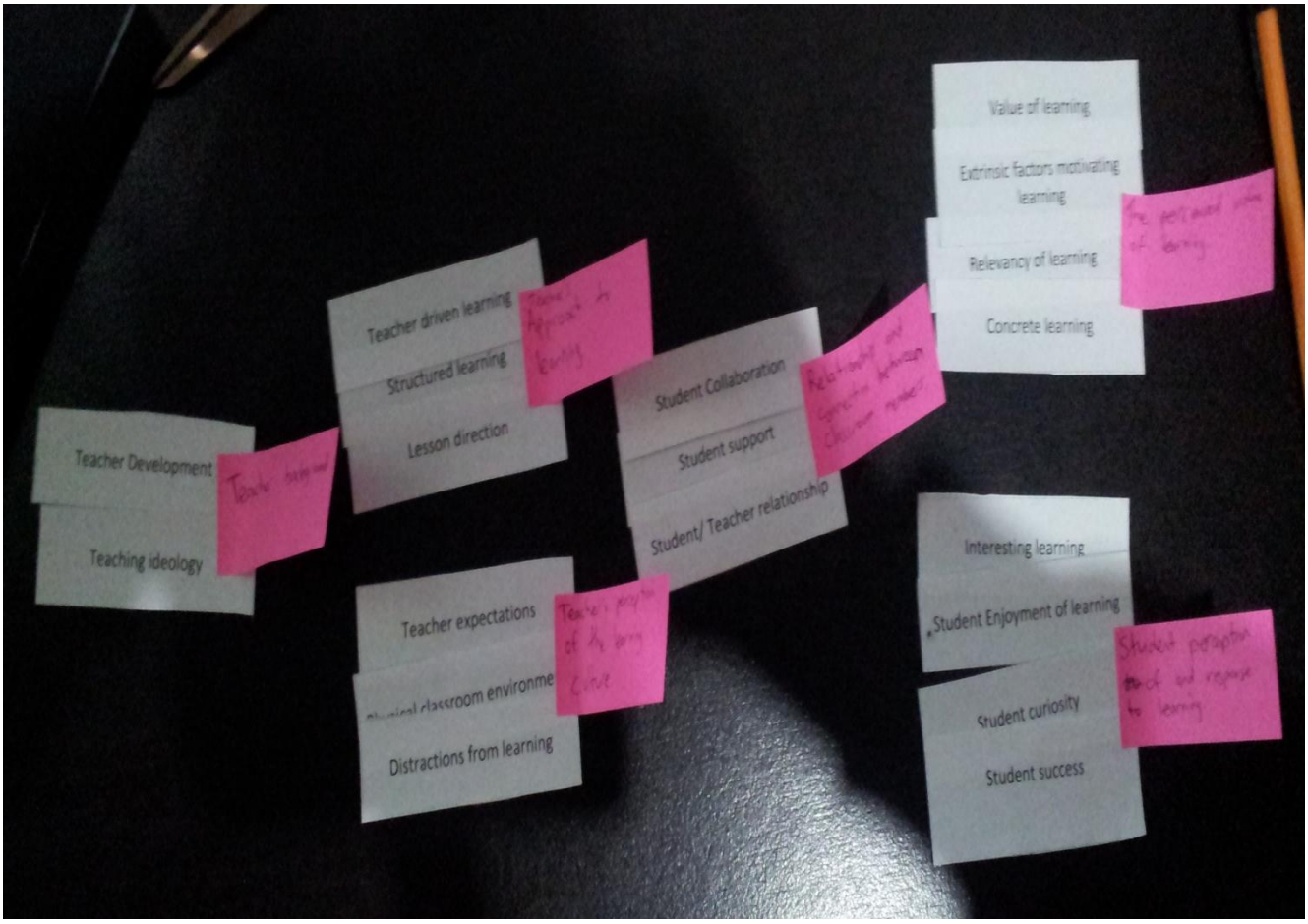
Appendix P – Sample of Categorising Data

What are the perceived processes of engagement in one grade six classroom?				
Categories	***Data sources***			
	Teacher Interview	**Observations**	**Student Interviews**	**Reflective Journal**
1. Interesting learning	Interview 1 The learning itself needs to be interesting... not too much repetition. Learning is a really difficult chore. How could I make this interesting, how could I break up my lesson into little pieces to keep the lesson flowing. It's up to the teacher to make that work interesting. I love the games, in maths. I love the... I, I love the dice games and the risking the counters and.. the challenges, and, and,.. you know.. and, and building a battle ship.. boardd on the computer and then playing a game of battle ships.	Observation 4: Displays how to draw and cut out a quadrilateral. Reminds students how they proved that the angles of a triangle add up to 180 (in a previous lesson). Asks them what they think the angles of a quadrilateral will add up to. Demonstrates how to do and test this, shows that it adds up to 360. Explains how this works for any quadrilateral, "isn't that amazing?" Observation 5: "How many diagonals does an octagon have? Do you reckon I'm going to get to ten?" Teacher has a very excited and passionate tone of voice.	Albert I like shapes coz, you can do anything with shapes. Maybe we could like.. do... stuff that we haven't, done before... we use the same methods to like do it, like it's always either gluing stuff into our workbook or like.. writing in our workbook.. or on the board. Jamie Well I enjoyed first of all coz we got to go outside and have fun in a maths lesson and.. we.. sort of.. coz I know and knew how to use the compass, so and then at the end there was lollies for whoever found them and so, I found that fun. I find this really annoying about teachers, all they really want you to do is work, so like.. they never really like active games.	19/06/2013 Many interesting points came out *(in a student interview)*. One of the most striking was the relation between enjoying maths and students' personal interests. Jamie talked about many opportunities where engagement could have occurred but was hindered by the teacher, and in particular was the theme of him wanting to learn about maths in the context of things that he enjoys.

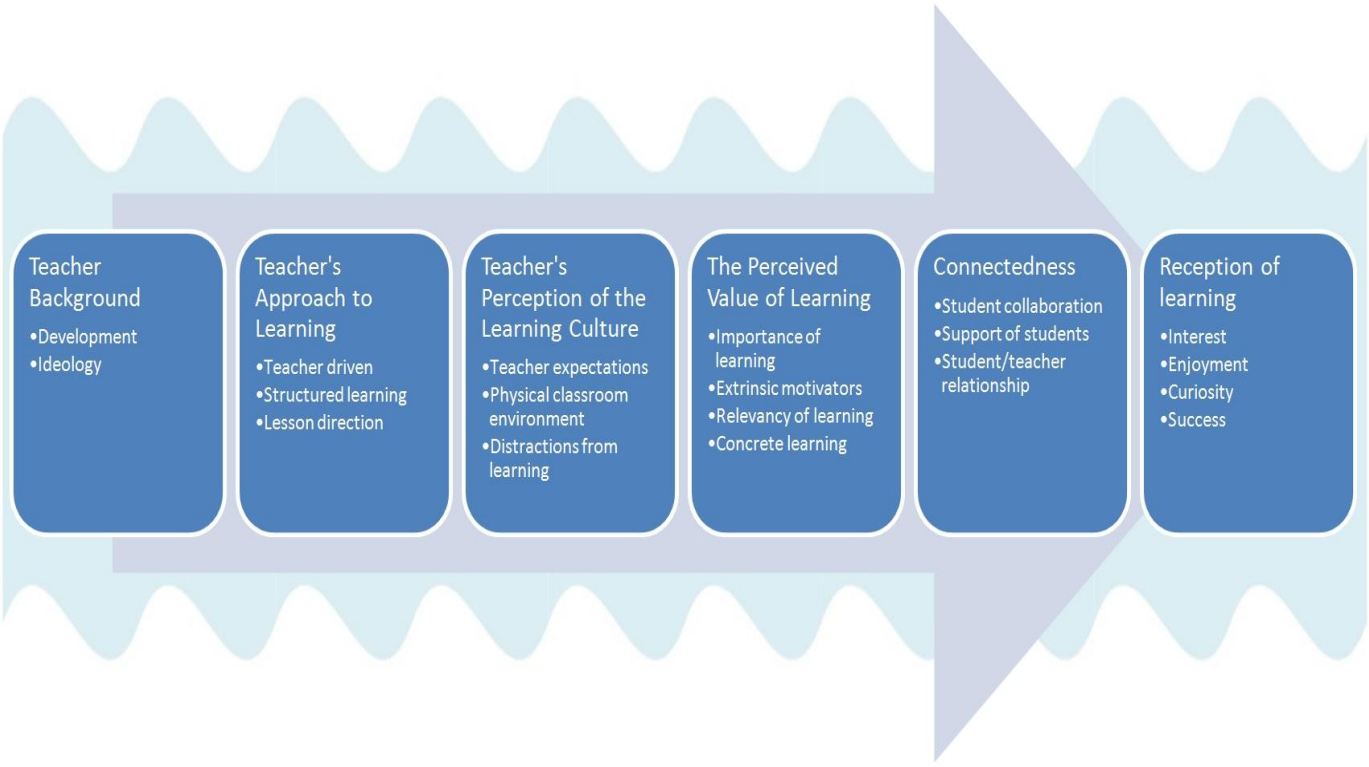
Appendix Q - Initial Codes

Interesting learning	Teaching ideology
Student Enjoyment of learning	Concrete learning
Relevancy of learning	Distractions from learning
Student success	Extrinsic factors motivating learning
Teacher driven learning	Student curiosity
Teacher expectations	Teacher Development
Value of learning	Student Collaboration
Student/ Teacher relationship	Student support
Lesson direction	Physical classroom environment
Structured learning	

Appendix R – Categorising Codes

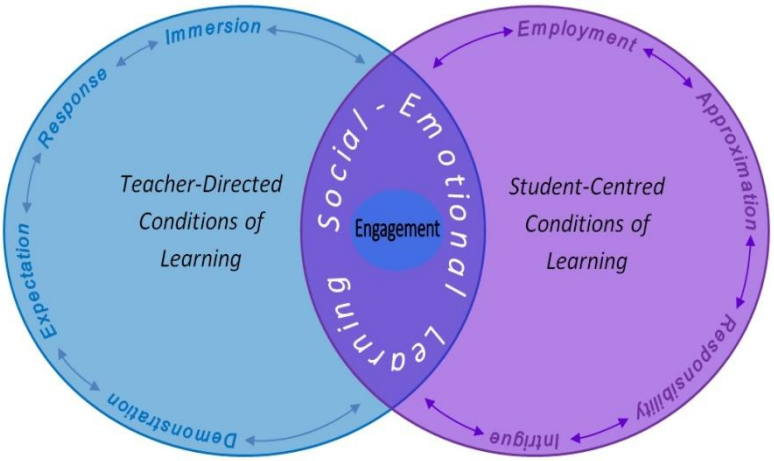


Appendix S – Initial Coding Diagram – The Flow of Learning

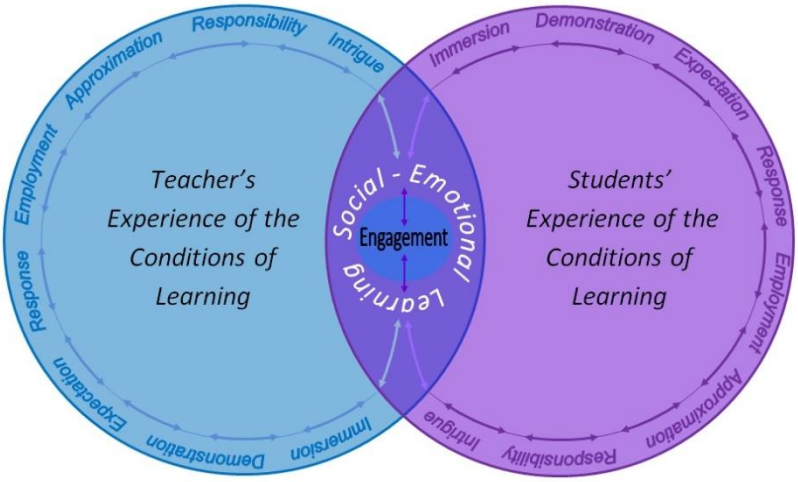


Appendix T – Development of the 'Figure Eight Diagram'

14th August 2013



27th August 2013



30th August 2013

