

Avondale College of Higher Education

School of Education

A QUALITATIVE INVESTIGATION INTO STUDENT AND
TEACHER PERCEPTIONS OF MOTIVATION AND
ENGAGEMENT IN THE SECONDARY MATHEMATICS
CLASSROOM

An Honours Thesis

Presented in Partial Fulfilment of the Requirements of the Degree of
Bachelor of Arts/Bachelor of Teaching (Honours)

by

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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.

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Dedication

To my loving parents,
who inspire me to take “the road less travelled by”

Abstract

This qualitative case study aimed to investigate what teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom. A year ten mathematics class was selected within a school in the Lake Macquarie region of NSW. Observations were made of the class and interviews were conducted with the teacher and four students. From the data it emerged that the key factor driving student motivation and student engagement in the mathematics classroom is the learning environment and particularly the notion of relationships, specifically the student-teacher relationship. This relationship, when based on the qualities of authenticity, belief, empowerment and life-long learning, enhances student motivation and engagement.

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Chapter One

Introduction

Throughout the study of mathematics in secondary education the repetitive phrase “Why do we have to learn this?” echoes from students’ lips. This question alerts the teacher to the fact that they may have lapsed in providing students with motivation, relevance and engagement for the chosen topic. However, is it solely the role of the teacher as educator to provide motivation for their students? At what point do students become involved in the process, and even become responsible for their own motivation? What are the classroom factors that contribute to students being engaged and motivated?

These questions are relevant to most mathematics teachers and it is anticipated that this small research journey will provide some insights and contribute to finding answers to these questions. In this way the study will inform teachers (including myself) on how to better facilitate learning in the mathematics classroom.

Rationale

Enhancing students’ motivation is a continual process and specific strategies need to evolve with each new generation of students. This study aims to contribute to the literature already present on motivation and engagement by examining motivational and engagement factors with Australian students in a mathematics classroom in 2013. This is an area of importance because as Willis (2010) acknowledges, mathematics is frequently disliked and is at the bottom of a list of subjects in which people feel interested or successful. With an increasingly complex society, Australia needs a well-equipped and well-educated workforce. Mathematical thinking builds skills that are crucial to employers in the 21st century, for example; personal responsibility, creative problem solving, planning, prioritizing, self motivation and personal initiative. As educators facilitate the learning and development of a workforce with these skills, they need to utilise specific strategies that enhance student motivation and engagement to maximize the effectiveness of the learning in the classrooms in which they teach (Dornyei, 1994). Therefore, as this study intends to explore factors of engagement and motivation, it is significant because of

individual, society and world needs. Motivation, the focus of this study, is a central enabler in satisfying these needs (Willis, 2010).

Purpose

The purpose of this study is to conduct a qualitative investigation (Bogden & Biklan, 2007) into teachers' and students' perceptions of motivational and engagement factors present in a secondary mathematics environment. In particular, the specific research question that the study seeks to answer is:

What do teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom?

Context

While Chapter Two explores the literature surrounding motivation and engagement in-depth, a brief context for the study will be provided here for clarity and direction.

Mathematics education is important (Willis, 2010; The Chief Scientist, 2012). As previously discussed, Australia needs citizens that are numerate and are able to function at various levels of mathematical complexity. However, Australia's numeracy levels are falling. There are also declining participation rates in mathematics courses. These factors indicate the need to further understand motivation and engagement in the context of the mathematics classroom despite the myriad of literature already present on motivation and perceptions of motivation.

Understanding teacher and student perspectives of motivational and engagement factors in mathematics requires a knowledge of the past and current theories of motivation, and of the strategies that are presently employed in Australian schools. The term 'motivation' is simply a factor determining the extent of people's desire to do an activity (Oxford Dictionaries.com, 2013). Curwin (2010) expands on this by defining motivation as wanting to do something rather than having to do it. Motivation has been well researched and is considered to be one of the most

powerful factors in academic achievement and learning. It is to be noted that the motivational strategies required in mathematics are not necessarily the same as for another subject area (Metsisto, 2005).

On a personal note, the knowledge that motivation is important, and the desire to be an effective mathematics teacher is a key reason that this study is being undertaken.

Research Design

Curwin (2010) reasons that motivation cannot be inferred by measuring achievement and it is clear that attempting to quantitatively measure the desire or willingness of an individual to act or behave in a particular way is a complex and problematic task.

When the goal of the researcher is to understand how participants make meaning of a situation or a phenomenon, Merriam (1988) suggests a qualitative framework. This study therefore, will be directed through a qualitative constructivist framework. The framework encompasses and values multiple perspectives, having suitable facets to access the wealth of knowledge embedded within the collected data. Accessing this wealth of information will be achieved in the qualitative paradigm through a 'bricolage' (Denzin & Lincoln, 1994) of case study and ethnography.

Location

The case study is composed of one school. Initially, the researcher planned to conduct the research at the same school that she was completing her fourth year practicum, however through the process of emergent design it became evident that the findings from the data collection process could be compromised. The students, having a new relationship with a preservice teacher, may not be able to hold a candid dialogue regarding their perceptions of mathematics, motivation and engagement.

So, to ensure validity and authenticity the school selected was one where there was no prior relationships between the researcher and the staff and students. The school was selected due to its geographical location and is a private Christian school located in the Lake Macquarie region.

Participants

The participants in this project are one Stage 5 mathematics class and their teacher. To maintain anonymity, pseudonyms will be used. The class teacher Mr Gray contributed his perceptions of motivation and engagement in semi-structured interviews.

A small selection of students from this class then contributed their perceptions of motivation and engagement in a focus group and semi-structured interviews. The students were selected based on their willingness to participate and their ability to effectively communicate. It is essential that the participants be an accurate sample of the class regarding attitudes and achievement. Therefore, consideration was given to gender and mathematical competence to ensure a representative sample.

Data Collection

As a constructivist researcher it is necessary to acknowledge that the nature of the inquiry process is interactive and therefore requires the utilization of a range of more personal and interactive modes of data collection (Mertens, 1998). To obtain a deep understanding of student motivation and engagement, data must be gathered and evaluated using these personal and interactive modes. Creswell (2005) and Frankael & Wallen (2006) describe various data collection tools including; observations, interviews, document analysis and journals.

To ensure validity and authenticity a process of triangulation will be applied and several data collection tools will be employed in this project. The main source of information will be gathered from semi-structured interviews. Perceptions and feelings about motivation and engagement cannot be directly observed and Patton (1980) suggests using interviews to understand the interviewee's 'inner perspective'. The interviews will provide a basis for understanding individual 'emic constructions' (Creswell, 2002). Observations and a research journal will supply the remaining data.

The data will be analysed during and after its collection. The interviews will be transcribed and coded and triangulated with the observations and research journal. A

description and synthesis of results is examined in Chapters Four, Five and Six.

Structure of the Thesis

This thesis is formed on Perry's (1998) model.

Chapter One is a synopsis of the thesis. It introduces notions that are critical for comprehending the research and provides a grounding to the research question.

Chapter Two is a discourse and analysis of the literature surrounding the study of motivation and engagement factors in secondary mathematics environments. It examines literature documenting previous attempts to understand student motivation and engagement factors. The chapter provides a framework for the research topic.

Chapter Three outlines the journey of "how" in terms of researching the topic. The framework and specific tools employed for gathering data are identified and explored. The variety of data collection methods demonstrates the aim for a valid and reliable data set to assist in answering the research question.

Chapter Four is a presentation of the findings drawn from the methods outlined in the previous chapter. These findings are divided up into two sections; staff perceptions and student perceptions. The chapter will briefly compare student and staff responses to provide clarity leading up to the in-depth discussion in chapter five.

Chapter Five discusses the findings in detail. The concepts drawn out in the literature review provide a solid foundation for the analysis of the findings. The chapter concludes with a summary of the key findings.

Chapter Six draws conclusions and gives recommendations that teachers can implement. It highlights the relevance of the findings and suggests areas for further research.

Chapter Two

Introduction

This chapter aims to provide background information to the research topic of motivating and engaging students in mathematics, by examining and discussing a range of relevant research literature.

Importance of Education

Education plays a vital role in Australian society and has occupied a central position in the formation of adulthood (Behrman, 1997). For decades, the primary argument used to justify education has been its direct economic effects. While economists have long recognised and measured the lifetime benefits of education, more recent studies have focused on the effects education has on society. Del Ser, Hachinski, Merskey & Munoz (1999) found education is related to higher socioeconomic status and a more advantaged and healthy lifestyle. Lochner's (2011) suggestion of education reducing crime, improving health, lowering mortality and increasing political participation implies sizeable social benefits and The Global Partnership for Education (2013) agrees, stating that education improves health, promotes gender equality, raises income, reduces poverty and fosters peace. Education also encourages transparency, good governance and stability. Clearly education plays an important role in society, but does that mean all education? What of mathematics education?

Importance of Mathematics Education

The World Bank (2007) found that an increase of one standard deviation in student scores on international assessments of literacy and mathematics is associated with a 2% increase in annual GDP per capita growth. It is also known that mathematical thinking builds skills that are crucial to employers in the 21st century, for example; personal responsibility, creative problem solving, planning, prioritising, self motivation and many more (Willis, 2010). ACARA (2009) lists some of the aims of mathematics education to be; to educate students to be active, thinking citizens, interpreting the world mathematically, and to use mathematics to help form their

predictions and decisions about personal and financial priorities. There are serious concerns from higher education, government and industry groups in Australia about the growing lack of mathematically skilled young people (STEM skills, 2012). This has the potential to significantly affect our communities, not only in the need to fill occupations that require the use of high level mathematics, but also on a personal level where lowered engagement with mathematics can limit ones capacity to understand life experiences through a mathematical perspective (Sullivan, Mousley & Zevenbergen, 2005). These worrying implications aren't limited to Australia. National surveys in America suggest that Americans are not proficient in mathematics and lack the kinds of numeracy skills necessary for tasks such as making informed medical decisions (Reyna, 2007). For example many adults lack the skills necessary to calculate the dosage of a child's medication based on body weight. Numeracy is essential for making health and other social judgements in every day life.

Current Issues with Numeracy

Of recent concern in Australia is the language, literacy and numeracy skills of the Australian population. The Australian Bureau of Statistics 2006 Adult Literacy and Life Skills Survey (ALLS) revealed that Australian language literacy and numeracy levels have shown little improvement in the decade since the 1996 International Adult Literacy Survey (IALS) (Skills Australia, 2010). This survey found approximately 53 percent (approximately 7.9 million) of Australian adults to have numeracy scores below the minimum needed to 'function fully in life and work'. This could imply a significant failure of the Australian education system and these failures are noticeable. Australia participates in a range of international assessments of mathematics achievement such as PISA and TIMSS. The 2009 PISA mathematics results showed that the performance of Australian students had remained strong since the 2006 PISA, however the ranking of the full cohort of Australian students in mathematics had declined. Thomson, de Bortoli, Nicholas, Hillman and Buckley (2010) reported this decline to be mainly due to a fall in the proportion of students achieving at the top levels. In the 2007 TIMSS study, particular groups of Australian students performed less well comparatively than those groups in some other

countries and at Year 8, Australian students were outperformed by countries with whom they had previously been level (Sullivan, 2011). The difficulties and frustrations of mathematics teaching in schools have been widely recognised (Whitebread, 1995). He notes that far too many of our young children find learning mathematics in school difficult, lose their confidence in mathematics, and go on to join that large swathe of the adult population who panic at the first sight of numbers.

Decline in Participation

The concerns about mathematics education in Australia have also highlighted declining participation levels (The Chief Scientist, 2012). At the moment mathematics in Australia is a compulsory subject until the end of year 10. The decline in participation occurs in stage 6 and in tertiary education. The Chief Scientist warns that Australia's current performance in mathematics compares poorly with our Asian neighbours (Department of Industry, Innovation, Science, Research and Tertiary Education, 2012). Girls are underrepresented in mathematics enrolments in both high school and university, particularly the advanced courses (Watt, 2007) and each year less secondary students are studying advanced mathematics and fewer university students are attaining mathematics qualifications (Ainley, Kos, & Nicholas, 2008). According to the Ministerial Council on Education Employment Training & Youth Affairs (2003) this occurrence is magnified in regional areas and the shortage of mathematics teachers leaves students in regional areas disadvantaged and showing less mathematical literacy compared to students in metropolitan areas (Thomson, Cresswell, & De Bortoli, 2004). The decline in participation may contribute to Australia's declining levels of numeracy.

Low Levels of Engagement

Engagement levels in the mathematics classroom may contribute to the problem of declining levels of numeracy in Australia and this notion often dominates conversations regarding mathematics education. Attard (2012) indicates the low levels of engagement with mathematics experienced by students have been of some

concern to Australian mathematics educators. Barkatsos, Gialamas & Kasimatis (2009) found low levels of mathematics achievement to be associated with strongly negative levels of affective engagement and behavioural engagement and also low levels of mathematics confidence, low confidence in using technology, and a negative attitude to learning mathematics with technology. Taylor and Parsons (2011) warn that disengagement in mathematics leads to a reduction in the range of higher education courses available to students and also limits their capacity to understand life experiences through a mathematical perspective.

The Need to Understand Engagement

From the issues described above, there is an obvious need to better understand the factors that engage students in the mathematics classroom. This may not be a simple task as engagement varies widely between schools and classrooms (Way, Bobis, Martin, Anderson, Vellar, Skilling & Reece, 2011). With a better understanding of engagement, however, educators may be able to respond and utilise strategies that combat the decline in participation, poor numeracy skills, and low levels of engagement in the mathematics classroom.

What is Engagement?

There is no one concise definition of engagement and the literature notes several types of student engagement; academic, cognitive, intellectual, institutional, emotional, behavioural, social and psychological. Fredricks, Blumenfeld & Paris (2004) acknowledge the multi-faceted nature of engagement but recognise three types of engagement; cognitive, affective and behavioural. They define cognitive engagement as involving the idea of investment, recognition of the value of learning and a willingness to go beyond the minimum requirements. Affective engagement includes students' reactions to school, teachers, peers and academics, influencing their willingness to become involved in schoolwork. Behavioural engagement encompasses the idea of active participation and involvement in academic and social activities. Skinner, Kindermann, & Furrer (2009) agree but add a fourth element to

engagement; agentic engagement. This represents the extent to which students contribute constructively and proactively into the flow of instruction they receive to create for themselves a more supportive learning environment.

Need for Student Engagement

Engaging disengaged pupils is one of the biggest challenges facing educators (Harris, 2008). Engagement is crucial as it is claimed that students who are engaged with school are more likely to learn, continue with higher education and have a rewarding experience (Marks, 2000). Schlechty (1994) says students who are engaged exhibit three characteristics. The students are attracted to their work, they persist in their work despite challenges, and they take visible delight in completing their work.

Classroom engagement contributes to students' academic achievement as well as cognitive and social development (Finn, 1993). Silver & Robinson (1995) describe engaged students as being energized by four goals; success (the need for mastery), curiosity (the need for understanding), originality (the need for self-expression) and satisfying relationships (the need for involvement with others).

The way that schools response to low levels of engagement may be the key to student success (Taylor & Parsons, 2011). Students today appear to have different needs, goals and learning preferences than students in the past and we must better understand the young people to discern how best to engage them in learning. Taylor and Parsons (2011) remind us that students experience a world that engages them differently than the one in which their parents lived. Considering the changes in world particularly with regards to technology over the last 20 years it is not surprising the way in which students are engaged has been affected. While the majority of literature embraces the idea of the changing nature of education not all share this opinion and some critics do not believe the students of today require special educational concessions. Their thought is that we are 'dumbing down' an entire generation through coddling (Young, 2006; Bennett, Maton, & Kervin, 2008). However the consequences of not engaging students in learning are alarming (Gilbert, 2007; Claxton, 2007).

*“Today’s world absolutely requires collaborative critical thinkers,
creative and courageous innovators, and true lifelong learners”*

(Taylor & Parsons, 2011).

Gilbert (2007) warns that if the pedagogy, curriculum and assessment strategies remain unchanged, educators will fail their students, leaving the students incapable and unprepared for a productive and healthy life and jeopardising the educators own futures. Student engagement is a rich research area and Claxton (2007) stresses educators to continue to seek to understand and apply specific strategies that support student engagement in learning.

Aspects Contributing to and Influencing Student Engagement

Motivation

It is important to consider motivation as it contributes to engagement. The term ‘motivation’ is defined as a factor determining the extent of people’s desire to do an activity (Guthrie, Wigfield & VonSecker, 2000). This definition, while succinct, seems simplistic and Dornyei (2010) debates that researchers strongly disagree on almost every concept concerning motivation. This is not surprising as humans are complex beings and attempting to explain why humans behave the way they do cannot be narrowed down to straightforward answers. Within a school setting, motivation can be defined as the process in which students initiate and persist in classroom activities (Schunk, Pintrich, & Meece, 2008). This definition appears similar to those given for student engagement however an awareness of the difference is critical. Although the constructs of engagement and motivation are used collaboratively and are very much connected they remain different (Lee & Reeve, 2012). Motivation contributes to one’s engagement. Martin (2003) asserts the term ‘motivation’ to refer to the ways in which a student chooses to behave, their self-efficacy, their ability to overcome challenges and their capacity to recover from setbacks. It is the student’s motivations that decide whether they will engage (Eccles & Wigfield, 2002; Martin, 2006).

It is motivational theories that endeavour to provide us with some understanding of

our actions and motives (Atkinson & Birch, 1978). There is a wide range of theoretical viewpoints that seek to explain student academic achievement and involvement and because of this, interpreting motivational research has the potential to be difficult due to the variety of constructs.

Some of the constructs include attribution and control (Skinner, Wellborn, & Connell, 1990; Weiner, 1985), self-worth (Covington, 1992), self-efficacy (Bandura, 1986, 1997), the need for achievement (Atkinson, 1964; McClelland, 1965), expectancies and values (Ryan & Deci, 2000; Wigfield, & Eccles, 2000). No psychological theory has ventured to combine the plethora of motivational theories into one that will address all the issues. Weiner (1984) believes this is because any theory based on a single concept, regardless of how fundamental that concept is, will be insufficient to deal with the complexity of classroom activities. Dornyei (2010) agrees that it would be unwise to adopt one model while ignoring the valuable information contained in the others.

Each of these motivational constructs offers an effective contribution to unlocking the complexities of academic motivation. Pintrich and De Groot (1990) found motivational factors to comprise three components; affective, expectancy and value components. The affective element pertains to students' feelings or emotional reactions to either the task or the school in general. To suppress concerns or anxieties, students need extra processing capacity before they can turn back to the current task. The expectancy element is often referred to as students' academic self-efficacy. This is the student's beliefs about their ability to perform a task. According to (Pintrich and Garcia 1996; Bandura 1997; Zimmerman 2000) previous research has demonstrated that self efficacy is linked to a student's level of effort. The student works harder and persists longer, using more cognitive and meta-cognitive strategies. The value element comprises the student's goals and beliefs about a task and its importance.

Increasing students' self-regulation is another effective approach which research has recently confirmed. The research suggests that increasing students' self-regulation has a positive influence on students' motivation and performance. (Oostdam, Peetsma, and Blok 2007) Boekaerts (2010) agrees, describing motivation and self-regulation as "two close friends" that are inextricably linked.

Within motivational theory a number of distinctions have been made. Examining the distinction between intrinsic and extrinsic motivation is critical and unavoidable (Pintrich and De Groot, 1990).

Extrinsic/Intrinsic

One of the most common divisions in motivation theories is the notion of the intrinsic versus the extrinsic and this distinction has been studied among social and educational psychologists since the 1970's. Traditionally extrinsic motivation is thought to undermine intrinsic motivation (Deci, 1971). Strong, Silver & Robinson (1995) concur revealing that external motivation (a motivator that is external to the student or task) has often been perceived as the "bad boy" of motivational theory. This is likely due to the knowledge that extrinsically motivated students do something only because it leads to a separable desired outcome however intrinsically motivated behaviours are performed out of interest, do not require an external reward and result in high-quality learning (Ryan and Deci 2000). However Deci and Ryan (1985) also argued that if extrinsic rewards are sufficiently self determined and internalised, they can be combined with and may even lead to intrinsic motivation. Kohn (1999) disagrees. He lays out the arguments against extrinsic rewards like grades and gold stars, maintaining his view that reliance on external factors consistently fails in producing a deep and long-lasting commitment to learning within the student.

There is much discussion in education circles about the role rewards play in motivating student work. One of the main concerns is the notion that if rewards are regularly used, students will only exhibit the learning behaviour to gain the reward. If a teacher feels compelled to give rewards, it is much better practice to give the reward spontaneously after the behaviour (Kohn, 1999).

Grades could be likened to a reward system and some students respond accordingly, only doing the minimal about possible to receive the desired grade. Jones (2008) makes the comment that some students openly avoid doing any work that is not tied to a grade. This indicates the student perceives little or no relevance in learning without grades or rewards, regardless of the actual relevance of the task.

Teachers are grossly misguiding students as to what is important if they attempt to spur student engagement by tying a boring and meaningless activity to a grade (Jones, 2008).

In relation to rewards, the goal of teachers should be to build stronger student perspectives on intrinsic motivation. Kohn (1999) recognises that while intrinsic motivation is generally considered more durable and self-enhancing it still has its weaknesses. He believes that because intrinsic motivation is a concept existing only in the context of the individual, the suggestions its supporters offer the teacher are often far too individualised, too bland and abstract, for application in a classroom setting.

It has already been noted that Deci and Ryan (1985) support the notion that extrinsic rewards, if sufficiently self determined and internalised, can be combined with and may even lead to intrinsic motivation. They are not alone in this thought. Sternberg and Lubart (1995) claim that a blend of both types of motivation is necessary based on the examination of the work of highly creative people. “Perhaps it is the tradition of separating extrinsic and intrinsic motivation that is flawed.”

Since motivation contributes to engagement and quality learning, there is a need to maximise motivation. It seems that using only extrinsic motivators or only intrinsic motivators is not as effective as a blend of both and if educators can find this balance for their unique learning environments then engagement may be improved.

Self-Efficacy

Self-efficacy is another contributor to student engagement and has emerged as a highly effective predictor of students’ motivation (Zimmerman, 2000). For clarification, Bandura (1997) describes self-efficacy as a future oriented belief about the level of competence that a person expects they will display in a certain situation. Evidence suggests that students with a strong sense of self efficacy participate more readily, persevere longer, work harder and show more resilience when faced with difficulties than students who doubt their abilities (Bandura, 1997). Not only this but self-efficacy also influences students’ methods of learning (Schunk, 1981).

Zimmerman (2000) suggests that educators focus on fostering a positive sense of personal efficacy rather than reducing scholastic anxiety. Educators misunderstand if they continue to diminish task and content difficulty in their hope to reduce scholastic anxiety. Instead the focus should be on increasing student efficacy.

Within the literature review thus far, the important role of education has been discussed along with the current issues in Australian mathematics education. One of the issues identified has been a lack of engagement in the mathematics classroom. The review has explored factors that contribute to engagement, but what are the implications for educators teaching mathematics in a classroom? Clearly, there is a need to improve student engagement in the classroom.

Improving Student Engagement

Quality Teaching

Quality teaching is an important consideration in any classroom (Martin & Dowson, 2009). Dornyei (2010) comments that the teacher's level of enthusiasm and commitment is one of the most important factors that affect learner motivation. A teachers' self-efficacy beliefs make up an important part of this process (Caprara, 2006) as they . may influence students' motivation and achievement (e.g. Midgley, Feldlaufer, and Eccles 1989; Ross, Hogaboam- Gray, and Hannay 2001). At times teaching can be discouraging and it is a significant advantage if the teacher has a high sense of self-efficacy. Teachers who possess this characteristic are more creative in their work, intensify their efforts when their performances fall short of their goals and persist longer. According to Tschannen-Morana (2001) a teachers' sense of self-efficacy has to do with their belief in their ability to influence the learning and motivation of students, even if their students were unmotivated or considered difficult. This self-efficacy may affect student motivation directly and indirectly via the 'instructional strategies they use to create a supportive learning environment' (Ashton and Webb, 1986). It is the teachers with a strong sense of efficacy who regularly plan more, better organise, are open to new ideas, more

willing to experiment with new methods and work longer with students who are struggling. (Tschannen-Moran & Woolfolk Hoy, 2001).

A teacher's choice of classroom strategies also affects student motivation Dornyei (2010). The NSW Quality Teaching Model (Gore, 2003), identifies three areas of pedagogy that have been linked to improved student outcomes. These areas are promoting high levels of intellectual quality, promoting a quality learning environment and making explicit to students the significance of their work. These three dimensions can operate in all stages and key learning areas and will now be explored further.

High Levels of Intellectual Quality

Structuring Lessons

Reynolds & Farrell (1996) warn that much of the problem of learning failure appears to stem from the quality of teaching. Kamii (1994), Pound (1999) and Whitebread (1995) are only three among many mathematics educators who suggest that the cause of children's turning away from mathematics lies in the way that mathematics is taught. Traditionally, mathematics as with most other subjects has traditionally been based on a 'transmission' model of instruction. The teacher is the expert who transfers knowledge to the learners' minds. Many including Stigler, Fernandez and Yoshida (1996) argue against this model of teaching and learning. They make it clear that, 'The student is not an empty vessel into which knowledge must be loaded but an active participant in the process of knowledge construction and learning mathematics results from students' own thinking, not from training them in specific processes'.

According to Sullivan (2011) current issues in mathematics can be partly attributed to teaching arithmetic procedures, with little attention being given to developing conceptual understanding and problem-solving strategies.

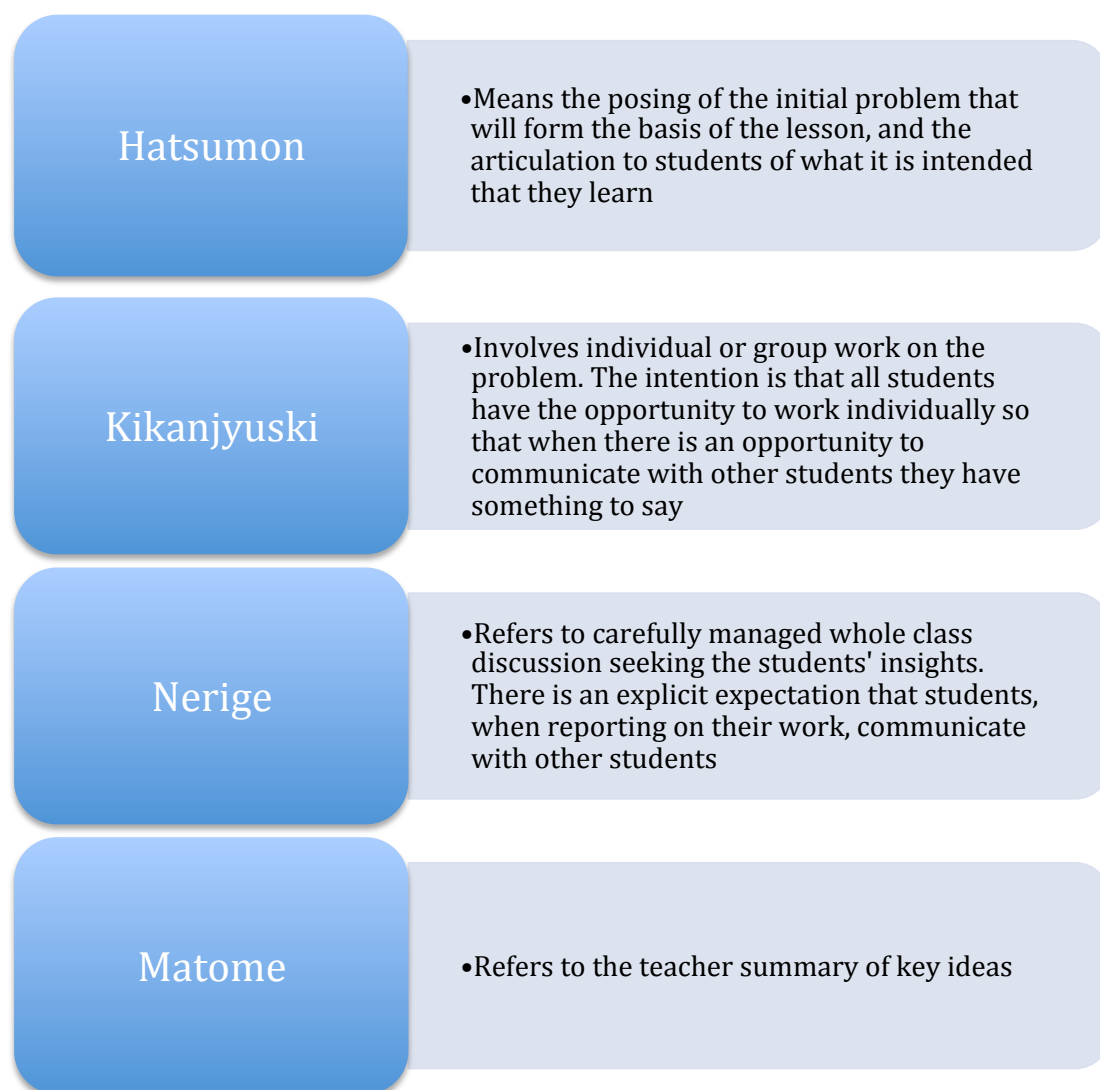
Stigler and Hiebert's (1997) compared Japanese and US teaching approaches. They revealed that Japanese teachers emphasise critical thinking and reflecting, whereas

US teachers appeared to be pre-occupied with only the first two stages of learning, that is, acquisition and application. They felt US teachers spent too much time getting students to memorise procedural knowledge, rather than developing conceptual understanding. Unlike Japanese teachers, US teachers lead their class for less than half the time allocated for mathematics and children spend most of their time doing worksheets or other independent work. The teacher spends most of the time moving around the room helping individuals. Sullivan (2011) recognises a similar trend in Australian teachers. A lesson format commonly recommended to Australian teachers is summarised as: Launch, Explore, Summarise, Review. The Japanese way of describing the structure of their lessons uses four terms: *hatsumon*, *kikanjyuski*, *nerige* and *matome* (Inoue, 2010) (See Diagram 2.1). Sullivan (2011) and Stigler and Hiebert (1997) note that the last two elements are the least practised by Australian mathematics teachers.

Some observers argue the complex pedagogy used by teachers in the West that seeks to cater for individual differences actually increases these differences over time (Reynolds & Farrell, 1996). But, good teachers are aware that each student brings a unique set of characteristics to the classroom. The teacher also knows that personalised learning is an important tool for engaging students because each student has difference background knowledge, a unique learning style, a variety of interests and varied parental support and expectations.

It is important to note that differentiation is an extremely useful tool in the structuring of lessons and helping students feel successful. It is the role of the teacher to know that each student has the skills to complete the task set and if they don't, to differentiate the learning. This is by no means coddling students, it is simply a way of addressing students having different backgrounds, abilities, parents, interests and learning styles (Jones, 2008). Constructivist conceptions of learning acknowledge these differences and add that students vary in learning due to ethnicity, social and cultural capital, and cognitive strategies (Verschaffel and de Corte 1999). Thoonen, Slegers, Peetsma & Oort (2011) comment "through attuning their instruction to the potential competence of students, often referred to as Vygotsky's zone of proximal development, teachers stimulate students' competence and learning".

Diagram 2.1: The elements and structure of Japanese mathematics lessons (Sullivan, 2011)



Quality Learning Environment

Classroom Environment

The classroom environment is crucial to student learning and although good instruction can take place in a variety of settings, there is no question that well designed and maintained classroom facilities have a positive impact on student engagement (Jones, 2008). Classrooms should be comfortable for students in regards to temperature, furniture, structural organisation and space and teachers should make

their classrooms mentally stimulating and include samples of student work (Jones, 2008; Willis, 2010)

The perceived ‘classroom atmosphere’ is an equally if not more important tool than the physical environment with respect to student motivation. A positive classroom atmosphere allows students to feel safe and extra processing capacity is not wasted on suppressing feelings of worry or anxiousness before they can refocus on their learning tasks. Jones (2008) acknowledges that most students are not able to do their best in classes where they feel teachers have little interest in them or their future. A student is capable of sensing whether a teacher genuinely cares. When teachers take an interest in students as individuals, students show an increased effort in classroom activities (Fredericks, Blumenfeld, & Paris, 2004; Curwin, 2010).

Students desire work that enables them to demonstrate and improve their sense of competence and success as human being. This is known as the drive toward mastery (Strong, Silver & Robinson, 1995). If a student is to succeed the teacher will provide a learning environment in which they define and clearly articulate the criteria for success and also provide immediate and constructive feedback. Students must be able to see that the skills they need to be successful are within their reach and that success is a valuable aspect of their personalities. When a student experiences success and attributes it to the effort they exerted in completing the task, the student’s confidence in their ability to successfully complete future tasks increases (Palmer, 2005).

Significance Explicit to Students

Relevance

The current generation of students isn’t alone in their need for relevancy in learning. Dewey at the beginning of the twentieth century argued that education should provide student with opportunities to work on realistic and situated activities (Dewey, cited in Roelofs, Visser, and Terwel 2003). One of the barriers to high levels of student engagement is the lack of relevant instruction (Jones, 2008). Irvin, Meltzer & Dukes (2007) findings are in agreement and they highlight that connecting

to the students' personal world significantly affects their motivation to learn. Relevance assists students with intrinsic motivation and can help create conditions where students are able to make the personal investment required for optimal learning.

When relevance is lacking students find it more difficult to motivate themselves and hence the likelihood of the student experiencing success declines. Booker, Bond, Sparrow and Swan (2009) comment,

“If the mathematics to be introduced cannot be related to the child’s experiences, it simply will not make sense and the child will be reduced to manipulating meaningless symbols using rules that are not understood”.

Constructivism argues that children learn best when they participate in relevant activities that hold their attention and require them to make meaning for themselves. Students must ultimately ‘construct his or her own mathematics’ (Richards, 1996). Boaler (1997) agrees commenting that approaches to mathematics need to become more ‘authentic’ and less ‘algorithmic’. These approaches are more likely to produce knowledge that can be adapted to real-world contexts. It is argued that in many classrooms mathematics is still restricted.

The issue of realism and relevancy in mathematics is exceedingly important. Sparrow (2008) acknowledges that bringing realism and relevancy into the classroom is not an easy task. It is more than asking students to calculate the amount of carpet squares needed to fill a room of a certain size. Although this problem is certainly based on real life it holds no interest for most high school students. Mathematics content must be based on ideas and problems that are of interest to the students (Ball, 1977 & Curwin, 2010). Conversations regarding the relevancy of mathematics need to be encouraged and not stifled (Farren, 2008).

Lonergan (2007) theorises if teachers engage students the right way in mathematics, the students will be too busy to stop and question the content and its usefulness. To engage the students he advocates injecting creativity into mathematics lessons and steering away from the traditional mode of mathematics teaching. While creativity is crucial in a quality mathematics classroom and Lonergan’s emphasis on it has merit,

it is difficult to identify with his motivational strategy that aims to keep students from questioning their learning. When realism and relevance are brought into the mathematics classroom students become engaged in quality learning. The focus shifts from the strategies encouraging students to engage in the learning to the actual content engaging students (Ricks, 2010). In other words motivation becomes intrinsic.

Without employing these authentic approaches (high levels of intellectual quality, quality classroom environment, significance explicit to students), we reach the issue of student disenchantment (Wain, 1994). Some students dislike mathematics and lose confidence to the extent of developing an ‘almost pathological dread’ of the subject. Students’ negativity is so intense that they become very anxious and stresses in situations that call for the use of numbers. They suggest that failures are due to their own lack of ability rather than poor teaching. This has been labelled ‘maths anxiety’ (Tobias, 1978). Salend (1994) notes that as people get older their attitudes and difficulties intensify and their confidence and motivation become severely eroded.

From the review of literature it can be concluded that mathematics education is important. With declining levels of numeracy and declining levels of participation in mathematics courses, Australia faces some real challenges. Engagement levels in the mathematics classroom may contribute to these declining levels and needs to be addressed. The NSW Quality Teaching Model (Gore, 2003), identifies three areas of pedagogy that have been linked to improved student outcomes including levels of engagement. These areas are promoting high levels of intellectual quality, promoting a quality learning environment and making explicit to students the significance of their work. How are these factors linked in the mathematics classroom. The next chapter explores a research design that investigates factors associated with student motivation and engagement in the mathematics classroom.

Chapter Three

Introduction

From the literature review, it is evident there are important issues associated with engagement and motivation in the mathematics classroom. The purpose of this chapter is to explore an appropriate methodology for the research project and describe a vehicle adept in addressing the main research question of “What do teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom?”

The Research Paradigm

The goal of educational research is to improve education and determine how education works in a variety of contexts and situations. Lodico, et al. (2010) describes the goal of basic research is to test, refine, modify or develop theories. When conducting research three main approaches are available to the researcher. These are quantitative, qualitative and mixed methods approaches to research (Bell, 2010; Creswell, 2008; Gay, Mills & Airasian, 2009). To ensure authenticity, the approach selected must be appropriate for addressing the study. This project is located within a qualitative paradigm for reasons which will now be identified.

Qualitative research

According to Creswell (2008) the development of the quantitative and qualitative approaches was not a case of one replacing the other. It reflected the need for both, and today each are legitimate modes of educational research. To gain an understanding of the distinctions between the two paradigms, and to ensure we are in the appropriate paradigm, consider Table 3.1 adapted from (Creswell 2008; Gay, Mills & Airasian, 2009).

Components in the Research Process	Quantitative	Qualitative
Goal of research	Prediction, explanation, generalizability	Understanding, contextualization, interpretation
The researcher	Etic; objective, neutral and detached	Emic; personal involvement and partiality
Identifying a problem	Description and explanation oriented	Exploratory and understanding oriented
Participants	Randomly selected sample	Small number of non-representative cases
Collecting Data	Predetermined instruments (questionnaires, surveys, tests), numeric data, large numbers of participants	General, emerging form, small number of participants or sites, written documents from field work, interviews, observations
Data Analysis	Statistical analysis, description of trends, deductive process	Text analysis, description, theme development, codes, inductive
Reporting research	Standard, fixed, objective and unbiased	Flexible, emerging and biased

Table 3.1: Qualitative and Quantitative approaches

Creswell (2008) describes quantitative research as ‘seeking to measure’ while qualitative research is closely associated with inductive reasoning and is best suited for research problems in which the variables are unknown and need exploring. Motivation cannot be inferred by measuring achievement and clearly attempting to quantitatively measure the desire or willingness of an individual to act or behave in a particular way is a complex and problematic task (Curwin, 2010).

This research project aims to explore what motivates and engages students and has many variables that require identification and clarification. Therefore, a qualitative approach is the appropriate choice as it encompasses and values multiple perspectives and has suitable facets to access the knowledge embedded in the data.

Ary, et al. (2010) alerts us to the notion that qualitative research is a generic term and is an umbrella for the array of educational research approaches that come beneath it. These approaches include; ethnography, narrative inquiry, case study, phenomenology, action research and grounded theory (Basil, 2010; Creswell, 2009; Lodico et al., 2010; Punch, 2009).

This research project uses a 'bricolage' (Fraenkel et al., 2012) of case study and narrative inquiry enabling the data to be seen from multiple perspectives that fosters authenticity.

Case Study

Case studies endeavour to study meaning, investigate processes and gain insight and an in-depth understanding of an individual, group or situation (Lodico et al., 2010).

The research question:

What do teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom?

directs us to acquire an understanding of motivation and engagement in the mathematics classroom.

In case studies, detailed information is gathered from multiple sources. As humans are complex creatures, thick descriptions necessitate that researchers conducting case studies use interviews, observations, documents, and artefacts as their primary tools (Lodico et al., 2010). These data collection activities occur in the participants naturalistic setting and are appropriate for the current research project. In particular, data collection tools for the current study include interviews, observations and documents.

Narrative Inquiry Research

Creswell (2008), Lodico, et al. (2010) and Gay, et al. (2009) all agree that narrative research allows researchers to portray the lives of people in a particular setting or context through storytelling. Narrative research is the description and re-storying of a variety of educational experiences. Lodico, et al. (2010) highlights the richness of the data produced from narrative research. Hence the rich data and accessibility to individual's thoughts it provides makes narrative research an ideal choice.

Research Setting

Qualitative research has been characterized as emphasizing the importance of conducting research in a natural setting (Bogdan & Biklen, 1982; Lincoln & Guba, 1985; Patton, 1980; Wilson, 1977). It is known the research setting affects behaviour and perspectives (Cohen, Manion & Morrison, 2000; Stake, 1995) and therefore a description of the setting is important as it may have an impact on the data itself.

Location

The current study took place at a secondary school in Australia. Initially, the researcher planned to conduct the research in her classroom during a practicum, however through the process of emergent design (Ary et al., 2010; Creswell, 2009; Lodico et al., 2010) it became evident that the findings from the data collection process could be compromised. The students' having a new relationship with the researcher as teacher may not be able to hold a candid dialogue regarding their perceptions of mathematics, motivation and engagement. As a result, and to ensure validity and authenticity, a school was selected due to its geographical proximity where there was no prior relationships between the researcher, the staff, or students.

The selected school will remain unnamed to ensure anonymity however the school is located in New South Wales in the Lake Macquarie region. Approximately 600 people live in the school's suburb. It is a Christian school, however, neither the

school itself, its size or faith tradition was significant in its selection. The school campus contains a wide range of modern facilities including an auditorium, library, canteen. Their mission statement says, “(The school’s name) will strive to provide Christ-focused education of excellence, within a positive, creative, challenging and caring community.”

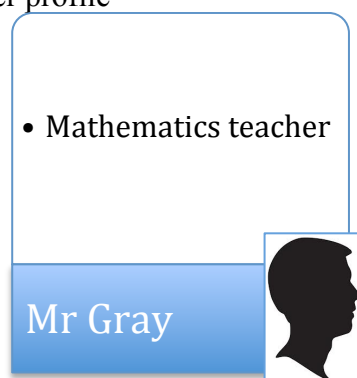
Participants

The participants in this project include a Stage 5 mathematics class and their teacher. To again maintain anonymity, pseudonyms will be used for staff and student names.

Staff

The mathematics teacher Mr Gray, was chosen because of his familiarity with the subject and his willingness to participate in the research.

Diagram 3.1: Teacher profile



Students

The class was made up of 19 students. However, the majority of data was obtained from four students who contributed their perceptions of motivation and engagement in a focus group and semi-structured interviews. The students were selected based on their willingness to participate, their ability to effectively communicate their thoughts and their experiences and information that relate to the research question (Lodico et al., 2010). To ensure validity in answering the research question it is essential that the participants be an accurate sample of the class regarding attitudes and achievement. Therefore, selection of students for the focus group ensured that

there was a balance in the group of gender and mathematical competence.

Diagram 3.2: Student profiles



Ethics

One area that needs careful consideration in any research project is ethics. Creswell (2008) contends the unique contexts of research require the researcher to tailor ethical guidelines for each individual project. He adds that the ethics should be at the forefront of the researcher's agenda at all times. Research ethics are about being clear about the nature of the agreement you enter into with your research subjects. Ethical guidelines are about protecting the rights of the individuals participating in the study (Blaxter, 2006; Creswell, 2008). Individuals need to know the purpose and aims of the study, how the results will be used and that they have the right to refuse to participate or withdraw at any time. Therefore one aspect to gaining ethics approval is obtaining informed consent from participants. The consent form found in Appendix A was distributed and completed by participants before any data was collected.

Creswell (2008) also highlights the importance of respect for the site in which the research takes place. He puts forward that gaining permission before entering the site shows respect. Therefore the permission of the principal was sought and gained before entry to the school. (Appendix B)

Data Collection

Data collection methods reflected the qualitative paradigm within which the research project is located. The majority of the research is built on case study with elements of narrative inquiry. Case studies require detailed information gathered from multiple sources (Lodico et al., 2010). Hence this study contains multiple sources of data and multiple collection methods.

Data collection methods in qualitative research include; observations, interviews, document analysis and questionnaires (Basit, 2010; Creswell, 2008; Lodico et al., 2010 and Punch, 2009).

The present study uses observations and interviews, with the data being collected in two phases. The first phase incorporated interviews and observations, while the second phase included further observations and follow up interviews. The second phase allowed for member checking and prolonged participation at the site. This prolonged participation meant the findings and gaps from the initial phase could guide the collection process in the second phase.

Interviews

According to Mischler (1986), interviews are a major source of data collection and also one of the most difficult ones to get right. The main reason we interview people is to find out things we can't directly observe, and to understand the interviewee's 'inner perspectives' (Patton, 1990). As this research attempts to understand student and teacher perspectives, the choice of interviews for data collection is appropriate. The interviews were developed using Creswell's (2008) interview model under the

headings of that model.

Identify the interviewees

The interviewees include one teacher and four students (two males, two females) from a stage five mathematics class.

Determine the type of interview you will use

Semi-structured interviews were selected as the type best suited to this project (Creswell, 2008). They use a mixture of open-ended and close-ended questions allowing the researcher more flexibility to fully explore the interviewee's perspective (Fontana and Frey, 2000). The project used one-on-one interviews and focus groups as the mode of inquiry (Creswell, 2008 and Gay et al., 2010) and these were conducted over several phases. Phase one of the data collection included one-on-one interviews with the teacher and a focus group with the students. The idea of the focus group was to allow students time within the security of their peer group to get to know the researcher. Focus groups also foster quality data, as they are useful in that students build their responses on the responses of others (Lodico et al., 2010). Phase two of the data collection included one-on-one interviews with the teacher and four students. The one-on-one interviews with the students provided the opportunity to explore in depth and clarify what students had said or indicated in the initial focus group.

Types of interview questions

Having a plan and structure to the interviews enables the interviewer/interviewee to remain focused and on task. The most important element to an interview plan are the types of questions to be asked. The interviews incorporated six types of questions; background, knowledge, experience, opinion, feelings, sensory to gain a rounded perspective (Patton, 1990).

Locate a quiet, suitable place for conducting the interview

A place considered suitable for conducting an interview allows for privacy and confidentiality, is free from distractions and is audio-friendly (Creswell, 2008). The interviews were conducted in a classroom.

Obtain consent from the interviewee to participate in the study

Research ethics require that informed consent is obtained from the participants prior to participation (Ary et al., 2010). Therefore before phase one, an information session was held and participants were given the opportunity to ask questions. Consent was then obtained from all participants.

Take brief notes and record the interviews

Creswell (2008) comments that recording the interviews will give the researcher an accurate record of the conversation. The recording and then subsequent transcribing of the interviews is particularly important for coding in the data analysis stage. Taking notes is beneficial in situations of audio-recording malfunctions and is also useful in the analysis stage. Evidence of the notes can be found in Appendix C

Use probes for additional information

Creswell (2008) identifies two types of probes; clarifying and elaborating, while Patton includes detail-oriented probes as well. Probes are used to get more information from the interviewee, asking them to either clarify or elaborate.. See Appendix D.

Closing the interviews

It is important to thank the participants once the interview is over. Creswell (2008) also suggests assuring the participant of their confidentiality and asking if they would like a summary of the study's results.

Observations

Just like interviews, observations are a frequently used form of data collection (Spradley, 1980). The process of observing is based on Creswell's model (2008) and is outlined in five steps.

Select a site to be observed

The site selected should be significant and relevant to the research questions. Therefore, research observations were conducted in the participant teacher's mathematics classroom.

Determine initially, your role as an observer

There are two main roles the researcher can take as an observer; participant or non-participant (Gay et al., 2010; Creswell, 2008) The most suited role for this research project is non-participant. Non-participant observers visit a site and record notes without involvement in the participants' activities. The choice of non-participant observations was made to complement the use of interviews, comparing what was said in interviews with how participants behaved in the classroom.

Conduct multiple observations over time

The observations were a major part of phase one and two. They were conducted at various times and settings to gain a full picture.

Consider what to observe and record

Creswell writes that researchers often record activities by the teacher, the students, the interactions between the students and teacher and the student conversations. Bogdan and Biklen (2007) also suggest recording personal reactions. The researcher chose to record these aspects and wrote broad ideas and themes that emerged during the observation. Evidence of this is found in Appendix E.

After observing, withdraw from the site

Participants were thanked as Creswell (2008) suggests and observations ceased.

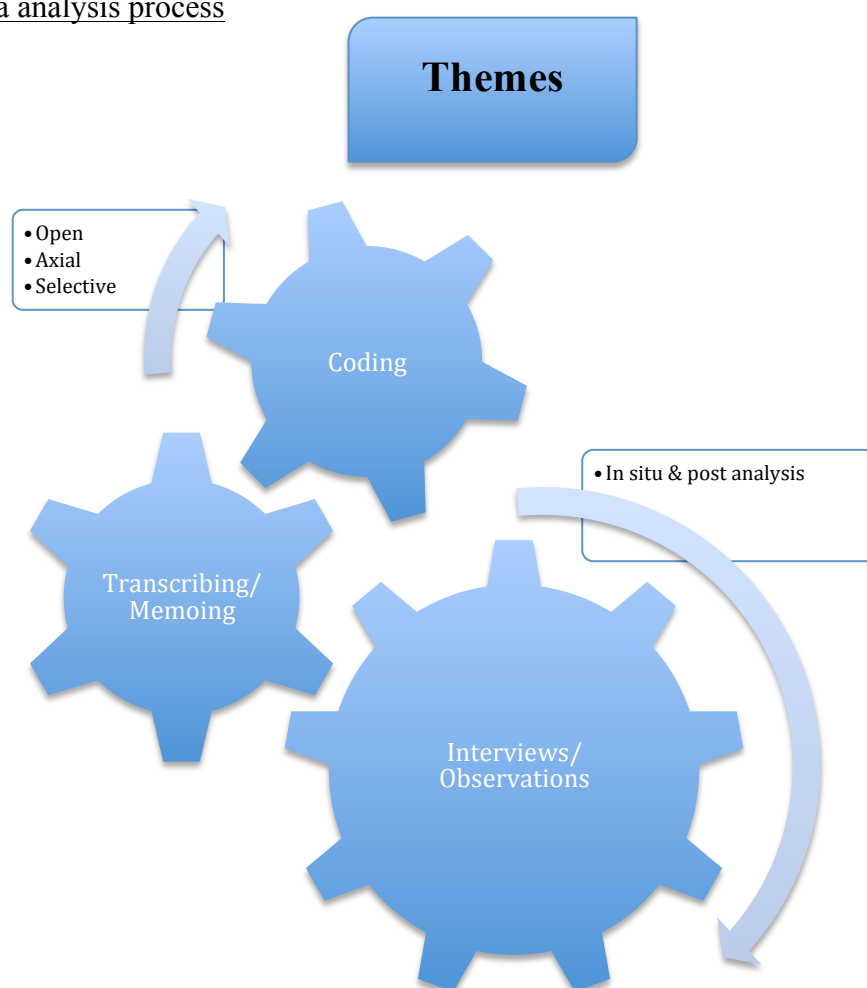
Data Analysis

The next stage in the methodology describes the analysis of the data that took place. The goal of qualitative data analysis is to subdivide the data with the final goal of generating a larger, consolidated picture (Tesch, 1990). Although there is no single

approach to analysing qualitative data, there are several guidelines for the process (Miles & Huberman, 1994). The most important and agreed upon guideline is that the process is inductive and iterative (Creswell, 2008). The iterative nature is paramount to authenticity.

Consider the following diagram portraying the data analysis process for this research project. This diagram was created to aid the explanation of a complex process and each element will be explored in the following sections.

Diagram 3.3: Data analysis process



In Situ Analysis and Post Analysis

The first step in the analysis process is the organisation of the large amounts of collected data (Creswell, 2008; Lodico et al., 2010). Some of this organisation is done in situ and for this research project the observations and data analysis began simultaneously as Gay, et al. (2009) suggests. The strength of this approach

(containing numerous iterations of gathering data, examining data, comparing prior data to newer data, making plans to gather new data) is its contribution to trustworthiness and authenticity. Gay, et al. (2009) notes that it leads to the elimination of less useful data but warns against premature actions based on early analysis and interpretation of the data. The data analysis began in the first interview and field notes were taken (see appendix F) Once the interview was over another step in the analysis process was taken. Post analysis occurred when the data collection had concluded and this incorporated transcribing and memoing. These in turn led to coding; the final step of data analysis.

Transcribing

Transcription is the process of converting audio recordings into text data. Creswell (2008) warns that it is a time consuming process but crucial to memoing and coding. Transcription occurred during phase two of the data collection and the interviews were transcribed directly to avoid potential bias in selection and interpretation. Notes were also included that described the behaviour of the interviewee. Ary, et al. (2010) states that this can give added meaning. As a result, every word or sound was transcribed even if it did not make sense (see appendix G).

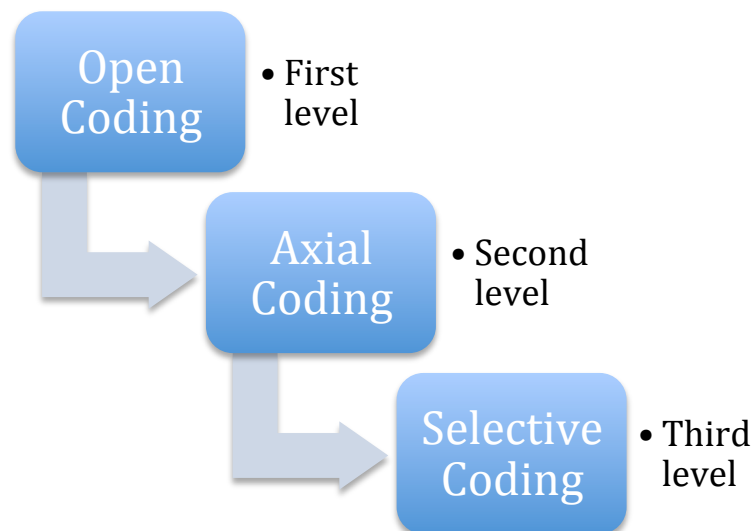
Memoing

After transcribing, a process known as memoing occurs. Bogden and Biklen (2007) recommend reading data over at least several times in order to begin developing a coding scheme. Gay, et al. (2009) suggests finding a quiet place to spend a few hours reading over the organised data. During this time memos are written in margins to gain an initial sense of the data. Some of the initial impressions may not be useful however others will linger throughout, pointing to new patterns and sources of data (Creswell, 2008). At the conclusion of transcribing for this research project, the process of memoing began and initial impressions were written in the margins of transcriptions, while also searching for recurring themes. Appendix H provides an example of the memoing.

Coding

Coding, the final step in data analysis, looks at the interview transcriptions, observation notes and reflective journal. Lodico, et al. (2010) states it is the “process of identifying different segments of the data that describe related phenomena and labelling these parts using broad category names.” Within coding there are different levels of coding. It is widely accepted that coding is made up of the following three steps; open coding, axial coding and selective coding (Ary et al., 2010; Basit, 2010; Creswell, 2008 and Punch 2009).

Diagram 3.4: Levels of coding



Coding schemes are continually added to, collapsed and refined as the study progresses.

Open Coding

The first level of coding is known as open coding. It is used to develop the initial categories and Ary, et al. (2010) suggests this can be achieved by asking what, where, how and why. Therefore when reading through the transcripts these questions were kept in mind and appropriate words that would answer the questions derived. The chosen words were written in the margins as evident in image 3.1.

Image 3.1: Excerpt of open coding process for interview with teacher

Ok there we go cool. Ok so um my first two questions are on the understanding of motivation and engagement so I just wondered what you understand intrinsic motivation to be like your personal definition of it?

Motivation for me or just motivation for the...

Um just...

How to motivate the students or...

Yeah both...

I mean motivation I feel like would come um from either something that you just love, you enjoy um but also if there's some sort of goal that you're trying to reach. Some sort of um you've got a vision for to achieve something and that can happen – cause motivation because you want to get somewhere as well so they're probably the two either ones.

Yeah. Do you find it more powerful in the classroom rather than having to say, use your rewards system or um a punishment system or...

I don't use a rewards system or a punishment system

Really!

Yeah

Cool. So what do you do?

Um I try and make it relevant, so at the start of every topic I try and um show where what we're learning is relevant to life as much as is possible. It's really hard in some times. And I'll be honest about it with them I'll say look like this topic is difficult to relate to real life just as a topic, I mean and then I might talk about how different symbols of what we're learning can be transferred to chemistry or into biology or other parts of maths but also just how problem-solving in itself is um something that can be helpful in all sorts of different jobs and in life as well. Um yeah so

Goals
Vision

Difficult to show relevance.

honest
Integrity-
Authenticity
in maths

Linking to other subjects

"real life" applications

The words that were developed and written in margins became the initial codes and were the basis for the open coding. These initial codes were written as a list and codes that were common had an asterisk placed next to them.

The following two levels of coding used the initial codes that had emerged during the process of open coding.

Axial Coding

The second level of coding is axial coding. After broad categories have been developed from open coding, axial coding aims to reconstruct the data which was broken apart (Ary et al., 2010). The goal of axial coding is to develop main categories and sub-categories. The axial coding process for this study began with the list of initial codes. First the codes were divided up into ten groups.

Teacher Coding		
Goals Vision	Honesty Integrity Authenticity Accountability	Affirmation Rewards Approval
Linking to other subjects Relevance Applicability Practical Meaningful		Success Confident Achievement Self-belief
		Challenge Opportunity ~~Freedom from textbook~~
Syllabus Methods Steps Freedom from textbook Variety		Distractions Atmosphere / Environment Information Overload
Relationships How teacher makes student feel		Practise Implementation

After grouping the codes the interconnecting link was explored and as more interviews went through transcription and then open coding, additional codes were added to the initial coding list and also the groups in image 3.6. The expanded groups of codes were linked with new axial codes (see appendix I).

Selective Coding

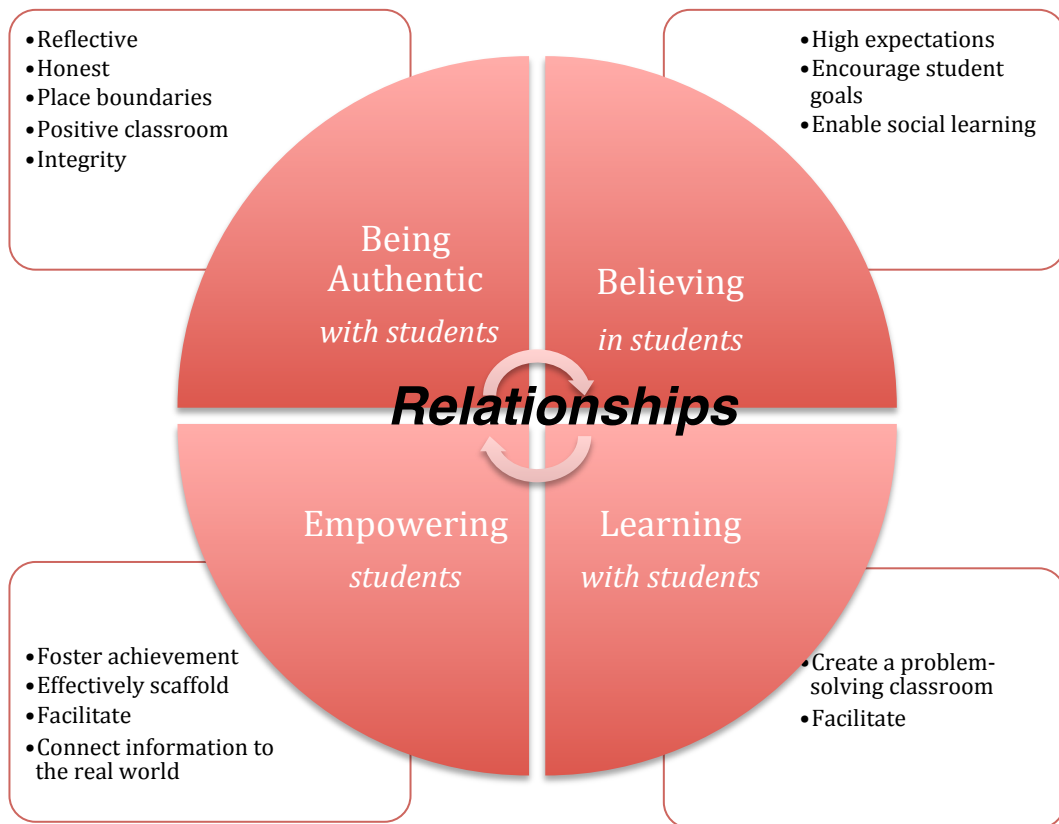
Finally, the purpose of selective coding is to bring the categories together in an overall theory. Like axial coding, it's concerned with demonstrating links and connections in the categories. Creswell (2008) notes that selective coding is the integration, pulling together and writing of the interrelationships of the categories developed in the axial coding process.

At this stage in the coding process a set of categories was developed from the axial coding phase. The forming of a central theory inferred from the codes took many attempts. A diagram was created to clarify the connections (see appendix J) This however did not result in a common theme being found until the number of groups of codes from the axial level was revised and reduced from ten to four groups;

- Being authentic with students
- Believing in students
- Empowering students
- Learning with students

A closer look at the groups revealed that at the core of these codes was the notion of relationships, and particularly the relationship between the student and the teacher. To illustrate how each of the four categories related to the central theme of relationships, a framework was created to inform the answer of the initial research question (see Diagram 3.5).

Diagram 3.5: Theoretical framework



Evaluation Criteria

Throughout the data collection and analysis process the following questions should be asked. How are the findings valid and authentic? Is the quality of the data rigorous? Terms used for examining rigor vary but include; validity, reliability, credibility, transferability, dependability, confirmability, authenticity and trustworthiness (Ary et al., 2010; Lincoln & Guba, 1985). Rigor in quantitative research has often been associated with the terms validity and reliability (Ary et al., 2010). Since this project is framed within a qualitative paradigm, these terms are not used and in their place are the terms credibility, transferability, dependability and confirmability.

Diagram 3.6: Criteria for authenticity





Credibility

Credibility concerns the truthfulness of the research findings and involves how well the researcher has established confidence in the findings based on the research design, participants and context (Ary et al., 2010). Evidence of credibility can take several forms and according to Ary, et al. (2010), Guba (1981) and Lodico, et al. (2010) they can include;

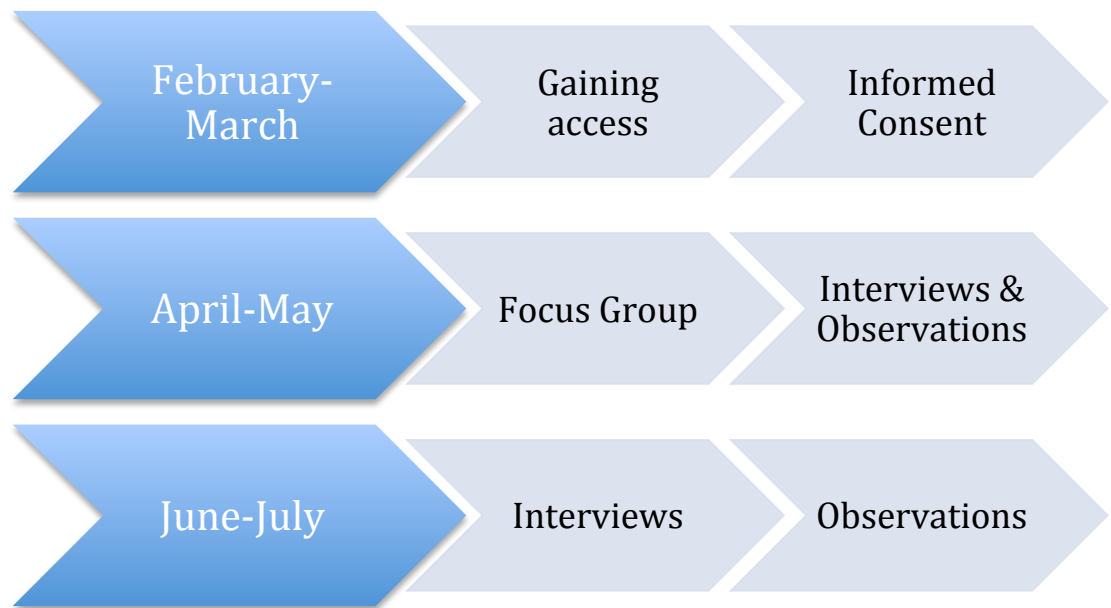
- ⇒ Prolonged and repeated participation at the site
- ⇒ Triangulation
- ⇒ Member checks
- ⇒ Peer debriefing

In this research project an attempt was made to include all of the above methods, each of which will be explained in the following subsections.

Prolonged and repeated participation at the site

Guba (1981) lists prolonged and repeated participation at the research site as criteria for assessing the trustworthiness of naturalistic enquiries. This is to overcome distortions in the setting due to the researcher's presence and gain a complete picture. This research project took place over a prolonged time period as shown below.

Diagram 3.7: Research project schedule

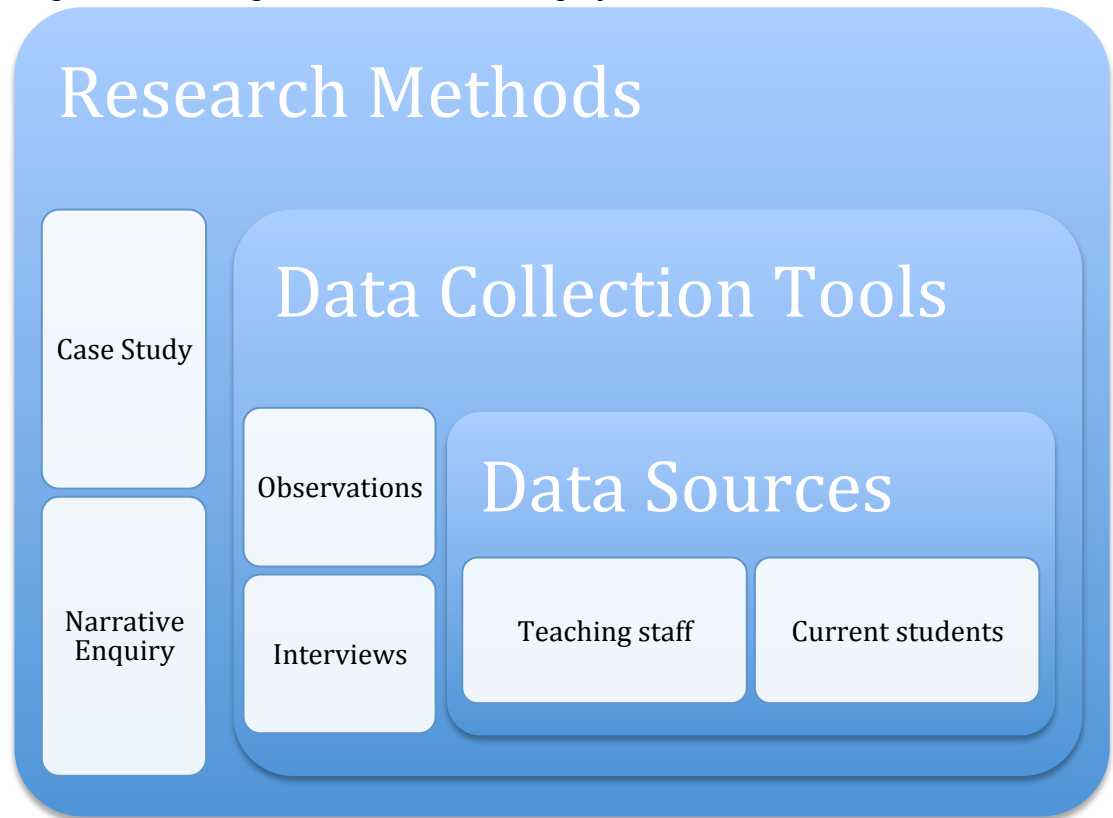


Triangulation

Triangulation is the process of using multiple methods, data collection and data sources to obtain a more complete picture of what is being studied and to cross check information (Gay et al., 2010). Creswell (2008) adds that triangulation ensures the theory being developed has been investigated and observed from several different viewpoints.

This research project incorporated triangulation in all three areas mentioned; methodology, data collection and data sources. Consider the following diagram;

Diagram 3.8: Triangulation in the research project



Member checking

Within a qualitative framework, researchers may not expect all participants to share the same perspective. Therefore seeking and presenting a balanced viewpoint is paramount. The process of member checking is to ensure that the researchers own biases don't influence how the perspectives are portrayed (Lodico et al., 2010). In other words, checking with the participants to see whether they agree with your interpretations made from the data. Member checks involve sending transcribed interviews or summaries to the participants for evaluation. Additionally, the researcher's journal is used to monitor subjective perspectives and biases.

In this project the member checking process occurred in a final interview where participants were asked to discern whether they agreed with the descriptions, themes and interpretation of the findings.

Peer debriefing

Peer debriefing is similar to member checking however instead of the participants reviewing the interpretations and themes, it is a colleague. This colleague examines field notes and meets with the researcher on a regular basis to listen, prompt and question. Peer debriefers may help the researcher to discover new ideas that weren't seen (Lodico et al., 2010). In this project peer debriefing occurred after the initial phase of research. The researcher met with a colleague, shared data and findings and was given feedback on interpretations.



Transferability

The second type of evidence to ensure authenticity is transferability. In quantitative research the term ‘generalizability’ refers to the applicability of findings to contexts and settings other than the one from which they were obtained. Although qualitative researchers don't expect their findings to be generalizable to all settings, they do recognise the findings may be useful in other settings. The term ‘transferability’ is used and refers to the degree of similarity between the research site and others, judged by the reader. The evidence for transferability will be found in rich, detailed descriptions so as the reader is able to determine whether the research is transferable to other contexts.

In this project the rich, detailed descriptions can be found in the background acquired from the site and the participants also from the in-depth questions asked during the interviews.



Dependability

The third type of evidence for authenticity concerns the ability to trace the processes used to collect and interpret data. Lodico et al., (2010) and Ary et al. (2010) describe an audit trail as a way of incorporating dependability. An audit trail includes; providing detailed descriptions of how the data was collected and analysed and a collection of all the data gathered. This complete presentation of procedures allows the reader to judge the dependability of the research by following the audit trail (Ary et al., 2010).

The reader can find the audit trail in this project in the considerable descriptions of the processes used to collect and analyse data and in the thought processes recorded.



Confirmability

The final criteria for authenticity to be discussed is confirmability. This term deals with the researcher's objectivity and neutrality. Ary, et al. (2010) argues that qualitative research may find it impossible to achieve the levels of objectivity that

quantitative studies strive for. Therefore the focus for qualitative researchers shifts from the neutrality of the researcher to the confirmability of the data and interpretations. Research that is confirmable allows others investigating the same situation to draw similar conclusions and confirm the findings. Evidence for confirmability is mainly found in the audit trail and can be enhanced by demonstrating triangulation and peer review. All three have already been shown present in this project and hence it is confirmable.

Conclusion

The methodology has now been described in detail and the results from the data collection processes will be shared to support the codes developed in the analysis stage. Chapter four will begin to create a picture of what motivates and engages students in the mathematics classroom.

Chapter Four

Introduction

As mentioned in the previous chapter, data was collected through multiple methods; observations, interviews, focus groups and journals, in order to form an answer to the research question:

What do teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom?

The purpose of this chapter is to share the findings from each of the data sources. The structure of this chapter can be seen below in diagram 4.1 and will be in two parts: a staff perspective and a student perspective.

Diagram 4.1: Chapter structure



The staff perspective is drawn from the interviews with Mr Gray. The student perspective is drawn from the focus group and interviews conducted with the four students.

A Staff Perspective

The views of Mr Gray were based on his time and experience as a secondary mathematics teacher. During the interviews Mr Gray shared his perspective on how and why students are motivated and engaged in a mathematics classroom. His thoughts follow.

The vision of the teacher and student

One of the first points that Mr Gray suggested as a reason for student motivation and engagement in the mathematics classroom is the vision of both the teacher and the student.

Mr Gray: *Motivation would come from either something that you just love but also if there's some sort of goal that you're trying to reach.*

Clearly Mr Gray recognises that motivation comes from multiple sources and he identifies one source of motivation can come from having a goal that either the student or the teacher is trying to accomplish. Mr Gray also comments that vision is important.

Mr Gray: *You've got to have a vision to achieve something*

Mr Gray is passionate about the fact that having some sort of vision in a mathematics classroom will positively impact student motivation and engagement. He views it as significant that teachers have a vision themselves and that they're able to either pass that vision onto students or inspire students to create their own vision. Without vision there is nothing to head towards and he believes that students need the direction and inspiration of goals and visions.

The applicability of the learning

A second notion affecting student motivation and engagement in the mathematics classroom is the applicability of the learning. Mr Gray notices that students are more

motivated and engaged in the learning if they see it as applicable, and so he adapts his teaching.

Mr Gray: *I might talk about how different symbols of what we're learning can be transferred to chemistry or into biology*

He believes that students need to be able to see how the learning links to other subjects and also that mathematics isn't just limited to the classroom setting.

Mr Gray: *I talk about how it can be helpful in all sorts of different jobs and in life as well'.*

Mr Gray expressed his concern that students often see maths as separate from everyday life and so one of the things he tries to include in his lessons often is showing relevance and practicality.

Mr Gray: *Most of the time what's actually practical is teachers need to be showing how and what they're learning is relevant. I don't want it to be completely separate from everyday life.*

Mr Gray commented that at the start of every topic is a golden opportunity to show relevance and he tries to do this as much as possible. He has noticed that the idea of being able to use maths in everyday life motivates and engages students.

Authenticity of the teacher

Trying to show the relevance and practicality of maths is sometimes difficult and Mr Gray has experienced this in his teaching.

Mr Gray: *It's really hard sometimes to show relevance and I'll be honest about it with them (the students)*

This demonstrates how important authenticity is to Mr Gray and how he believes it can motivate and engage students. During the interview Mr Gray discussed how students can 'see right through you' and that although being authentic teachers may feel more vulnerable in the beginning, in the long term both the teacher and student

benefit. Throughout his years as a teacher he's noticed that students, particularly Gen Y students, need authentic people in their lives and that it's hard for students to respect the teacher (and hence the learning) if the teacher isn't living with integrity and is someone different when they're not at school.

Achievement

Achievement was one aspect that Mr Gray strongly emphasised to influence student motivation and engagement. The table below shows his responses to do with achievement.

Table 4.1: Mr Gray's comments during the interview regarding achievement

Achievement	•I do give them achievement certificates but it is not as part of their motivation •A big part of it is success •I make sure that I'm not giving work to them that is unachievable or that they should be up to according to the maths syllabus
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His comments make it clear that Mr Gray doesn't want students' motivation in maths to come from achievement certificates and rewards, as he believes they can be a barrier to deep learning. He is also concerned about the idea of students feeling the work is unachievable. He wants them to be constantly experiencing success in the mathematics classroom and would rather give students work that is below what the student should officially be up to (according to the syllabus) and have them experience success than the student fail because they weren't ready for the level of learning.

Mr Gray: *Even if it's a year nine class achieving to year six maths standards, at least they're achieving, they aren't constantly failing*

Mr Gray has noticed that repeated successes contribute to an increase in student motivation and engagement and repeated failures contribute to a significant decrease in student motivation and engagement. During the interviews Mr Gray related that he wants students to feel confident and challenged. He believes that there's a certain point where students feel challenged and then become defeated.

Mr Gray: *With the advanced classes, I think it's good to challenge but not to the point where they just feel defeated.*

Clearly Mr Gray sees that in the grand scheme of things, the level of achievement is irrelevant as long as students feel they're experiencing success. It appears that Mr Gray's ultimate goal is enable students to leave school with a positive attitude towards learning and mathematics.

Intrinsic Learning

During initial discussions on motivation and engagement Mr Gray was quick to distinguish between intrinsic and extrinsic motivation and the impact he's seen the two types to have on student motivation and engagement. He commented that he favours intrinsic motivation.

Table 4.2: Mr Gray's responses on intrinsic learning

Intrinsic Learning	• It's a different sort of learning I think when it's for yourself and you remember it more • You need to be allowing the motivation to sort of take hold within the student and be giving the students opportunities • I guess the ultimate is the aim to create motivation within the students
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The idea that learning becomes more meaningful and hence more memorable with intrinsic motivation was one Mr Gray identified with. He clearly wants students to

create their own motivation and he recognises that the ideal is for students to be responsible for their own motivation and engagement, and while this is perhaps a little unrealistic he still believes the aim shouldn't be abandoned.

Environment

Mr Gray did not make a large mention of the classroom environment however he did feel it was significant enough to comment on.

Mr Gray: *I feel if I cut out the social element in the classroom too fast then the classroom will become really stagnant and boring*

Mr Gray did not want his classroom to be silent, unexciting and uninspiring. He believes in being lenient with classroom management (up to a point), so that the classroom remains lively. Mr Gray wants it to remain lively because in his experience the mood of the classroom contributes to student engagement and motivation. He aims to consistently remain positive and encouraging to frame the mood of the classroom.

Mr Gray: *Constantly being positive and uplifting is a huge part of the classroom atmosphere. It sort of frames the mood of the classroom*

Relationships

At the centre of quality teaching is the idea of relationships according to Mr Gray.

Mr Gray: *I guess relationships are pretty key to quality teaching*

He has noticed that students respond differently in classrooms where they know the teacher has an interest in and genuinely cares about them and their learning.

Table 4.3: Mr Gray's responses on relationships

Relationships	•Knowing your kids is really important •Relationships and positive words over the kids is a huge thing
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Not only is Mr Gray aware of the important AITSL teaching standard element 'knowing your students', but he constantly implements that in his teaching because he is authentic and wants to maximise student motivation and engagement.

How content is taught

Central to student motivation and engagement in mathematics is how content is taught according to Mr Gray. Mr Gray values variety in teaching maths for many different reasons.

Mr Gray: *They learn it really thoroughly when using multiple methods, not just one method that works for the teacher's way of doing it*

The learning that Mr Gray is describing is holistic and inviting for students. He doesn't want to lecture up the front of the classroom and measure student success by how well they've mastered the 'proper' way of solving a particular problem. He notes that 'if you did everything straight from the textbook it could be pretty stale and boring'. He then related how in his classroom one in three topics were not textbook based. There are several reasons why he chooses to do this; for variety, deep learning and wanting students to link knowledge to the real world.

Mr Gray: *Constantly changing what's happening is really important*

The last thing Mr Gray had to say on how the content is taught was again emphasising variation in the learning. He believes that variation can enhance student motivation and engagement in mathematics, particularly because mathematics can be considered by some as a ‘heavy’ subject.

The amount of information given in a lesson

Closely linked with variety in lessons, is the amount of information given in a lesson. Mr Gray monitors the classroom environment and is able to sense when students are struggling and feeling overwhelmed.

Mr Gray: *I can see people struggling and not feeling motivated and I think what we need to do is have a quick break like watch a youtube clip, stretch our arms and get back into it*

Mr Gray aims to avoid overloading students with information because he wants them to retain as much of the learning as possible. He states that generally most of his classes are divided up into fifteen to twenty minute blocks because he’s found that to be optimum for student motivation and engagement at the moment.

The teacher as a facilitator

Lastly, Mr Gray mentioned the influence of the role of the teacher on student motivation and engagement in mathematics. Mathematics has often been taught with the teacher-as-instructor model in secondary schools but Mr Gray believes the teacher should be a facilitator and he made several comments in this area.

Table 4.4: Mr Gray's comments on the notion of the teacher as a facilitator

Teacher as facilitator	• They have this thing in their mind where they're not learning everything if they do it on their own • They sort of feel like they need to be spoon fed by the teacher. I'm trying to teach them to teach themselves • I actually think they learn more when they're teaching themselves. The ultimate would be them on their own just working through it
------------------------	--

Mr Gray aims to push students beyond being spoon fed to just using the teacher as one of many resources. He believes that students are limited by their perceived reliance on teachers and doesn't want to encourage that in his classroom. Mr Gray views the teacher-as-facilitator role as the most conducive role for learning and student motivation and engagement in the mathematics classroom.

A Student Perspective

The student perspective emerged through the focus group and interviews with four students; Sally, Mark, Claire and Ethan. During the focus group and interviews the students shared their perspective on how and why they are motivated and engaged in the mathematics classroom. Their thoughts will be presented under seven headings;

- 1. The vision of the teacher and student**
- 2. The applicability of the learning**
- 3. Achievement**
- 4. Co-operative learning**
- 5. Relationship between the teacher and student**
- 6. Parental influence**
- 7. How content is taught**

Vision

When students were initially asked about their experiences in maths and what motivates them, one of the first things each of them said related to vision:

Table 4.5: Student responses relating to vision

Sally	•I'm not motivated at all when I just think of maths
Mark	•I'm motivated to do maths because my goal is to be a pilot
Ethan	•I half like maths, but half don't

Mark commented that his goal to become a pilot was a big part of his motivation to engage in maths and succeed. It is this vision that contributes to his motivation. Sally didn't appear to have a particular vision and this was reflected in her statement. Although Ethan also didn't seem to have a vision or goal, his statement reflected a different perspective. He described being motivated and engaged in some lessons but not in others and isn't sure whether he enjoys maths on the whole. Instead of having a fixed mindset he's decided to do his best and leave his options for the future open.

The applicability of the learning

When students were asked if they felt the learning was relevant and how that impacted their motivation, most responses indicated that the students thought the maths was relevant if it was going to be overtly used in everyday life.

Claire said that it depended on what it is and what they were doing but some of it she didn't think they'd ever need to use it again. Claire also commented that some things probably get used a lot. Sally said that she hasn't used what she's learned in class

apart from adding and subtracting money but that maths can sometimes be relevant depending on what someone wants to do. The notion of future relevance was also evident in Mark's response.

Mark: *It's not really relevant to just day to day life but if you just want to be a I don't know, pretty much anything unless you really need a high level of maths this is just fairly pointless I guess. Just because simultaneous equations is what we're doing right now and I mean there's just not any day to day situation where that would just come in handy but it's relevant to me because I want to be a pilot and you need to be able to do all that stuff, so I think to me it's relevant but for people that just want to have a normal day to day life it's not really relevant.*

Ethan also thought that it the relevance of the mathematics they were learning depended on what you wanted to do later on. It was interesting that from these comments an underlying theme of mathematics as a science is relevant but mathematics as an art wasn't even mentioned.

Achievement

In regards to achievement the students who felt more competent in maths had the most to say. The following table shows student responses regarding achievement in mathematics.

Table 4.6: Student responses regarding achievement

Claire	• I like maths because I get most of it • If there's a test I'll motivate myself to do it as much as I can • If it's about something we've done heaps about I just get kind of bored and so I think I don't need to do it anymore
Mark	• My most memorable time in maths was when I got the next year ups textbook but then my grades went down so I had to give it back but I was allowed to go back to it once my grades came back up so that was really good • I think it was just more like realising that it was so cool knowing you're ahead of the class and I really wanted to power on and try and study more

The ability and the opportunity to achieve was a significant motivator for Mark and Claire. It appears that repeated success for Mark has encouraged him to engage in mathematics.

In contrast, Ethan had little to say on achievement and felt he was motivated more by curiosity rather than achievement.

Ethan: *I just do it because I have to but sometimes I just find it kind of interesting and it's like some kind of curiosity on how they figured it out like 'oh to get this I have to find that'*

Co-operative learning

Another factor students identified as a significant motivator was co-operative learning. Claire, Sally and Ethan were very enthusiastic about the co-operative learning saying they find it motivating and helpful for learning.

Claire: *There's four of us in our class, well four of us girls that are all together and in my group and we all do it together so we all help each other to work it out so it's more fun. That way because we're all doing something together, so we're all understanding it together*

When asked whether this was a technique just for maths Claire replied that they did it in a lot of classes, whether it was maths or not. Expanding, Claire commented:

“It's better that way, because you're actually doing something that could be boring, with friends so it's more interesting”. Sally and Ethan's responses reflected the same thought.

Table 4.7: Student responses on co-operative learning

Sally	• I just find that if I'm doing it by myself then because I'm not really that interested in maths nothing gets done like I'll find other ways to distract myself but with the girls they get their work done and they don't hate maths like I do so I find that I'm actually doing the work
Ethan	• It's really good motivation but even with two people you can also get sidetracked but you're also more focused. • It's better to work with someone because then if you get one answer and they get the other you can ask them how they got that and that can improve your way of doing it

The ability to get side tracked, which Ethan mentioned, was something that Mark identified with. He preferred to work by himself in order to fully engage in the learning.

Mark: *I get more work done if I work individually otherwise I just talk and hang out*

The variety of methods students preferred showed the need for differentiation.

Relationship between the teacher and student

When asked how their teacher Mr Gray influences their motivation, the students all agreed that their relationship with him positively impacted their motivation in his maths classes. Sally described what she thought would happen if she had a different teacher,

Sally: *If we didn't have Mr Gray I probably wouldn't try as hard. The teacher would just ignore you and I can't even think about it, no I wouldn't want to go to the class because I'd probably just want to fall asleep*

Despite Sally's strong dislike of maths, she recognised that her relationship with Mr Gray significantly impacted the way she viewed maths classes and her engagement.

Mark also commented on what a difference Mr Gray made to maths classes.

Mark: *Mr Smith who was my year 7/8 teacher, he was really, really good at maths and was passionate if you got ahead of the class like I did in year 8. Whereas Mr Gray he's been teaching me for two year now, this is the second year and he's just like really, really passionate even if its just algebra or something he's just like 'it's so cool how they all work together' and it really gets you into it. Mr Gray is a really good teacher, he's really gotten like a lot more people into it, especially some of the people that weren't actually interested at all, now with Mr Gray are like 'this is pretty cool'*

When discussing the notion of relationships the students were most at ease and particularly wanted the researcher, to understand how much Mr Gray had changed their thoughts on maths.

Parental Influence

Students were asked how their parents influenced their motivation and engagement in the mathematics classroom and the responses varied. Claire related that she liked to try and get good grades for her parents while Sally felt her parents were supportive but sometimes unable to help.

Sally: *My dad's good at maths but in the half yearly we had a practice test that we could take home and get help and my dad, well my mum she never really like maths either she finished school in year ten and went to tafe so she didn't really like maths but dad's really good at it but the stuff that I brought home he didn't even know how to do. So yeah they don't help much.*

Sally didn't feel as though her parents influenced her motivation and engagement in mathematics. Mark and Ethan both commented that their parents positively impacted their motivation in mathematics. Mark said that his parents are really supportive while Ethan appreciates that his mother sets aside time in which he has to do homework.

Ethan: *My mum sets aside time for me to do my homework and so I guess I do my maths homework because I've got nothing better to do in that time*

Three out of the four students interviewed found their parents to be a positive influence on their motivation and engagement with mathematics.

How content is taught

The final factor that emerged from the student perspective data is how content is taught. Students were asked if the method or lesson structure in mathematics had an impact on their motivation and engagement. Their responses are found in the table below.

Table 4.8: Student responses on how content is taught

Claire	•I like doing example questions, when we do new topics and when we go through something hard Mr Gray goes through it slowly using every single step on the board so I can write it down so when we do tests I can look back at it and see how we did it
Ethan	•He comes around and just like, even if we've got it he still comes around and says 'are you alright with it' and yeah he still just checks, it's good
Sally	•Mr Gray normally if we're doing something new he puts it up on the board and if we have any questions he'll come and help us while the rest of us do exercises

Students related that how the content was taught did impact their motivation and engagement in the mathematics classroom. Once again the need for differentiation in a classroom is evident from the responses. Each student felt the way Mr Gray presented the content reflected his belief in them and they felt capable of achieving the outcomes for the lessons. Mr Gray's effective facilitation had a positive impact on his students' motivation and engagement.

Having considered the perspectives of both the teacher and the students the next chapter will consider the themes that emerged from the data as it synthesises the results presented with the literature presented in Chapter 2.

Chapter Five

Introduction

Having explored the literature, and the results from the data collection process, this chapter aims to synthesise the data to explore factors associated with motivating students in the mathematics classroom. This will be created with a blend of the literature discussed in chapter two and the results shared in chapter four.

The Key Role of Relationships

In reflecting on data obtained in this research project, it appears that core to the process of engaging students in the mathematics classroom is the notion of relationships. The data points us to the importance of the relationship between the student and the teacher that is central to the motivation and engagement of students. This result aligns with current research, which says the nature and quality of students' relationships with their teachers is critical in motivating and engaging students to learn (Wentzel, 2002; Martin & Dowson, 2009; Roorda, Koomen, Spilt & Oort, 2011). These relationships are founded on qualities such as honesty, acceptance, knowing, believing, understanding and caring.

A model for student engagement was developed from the themes that emerged from the data. Surrounding the core of relationships, four elements emerged from the data; Authenticity, Believing, Empowering and Learning (see diagram 5.1). The role of these elements in creating an environment that is stimulating and facilitates the engagement of students will now be considered in more detail.

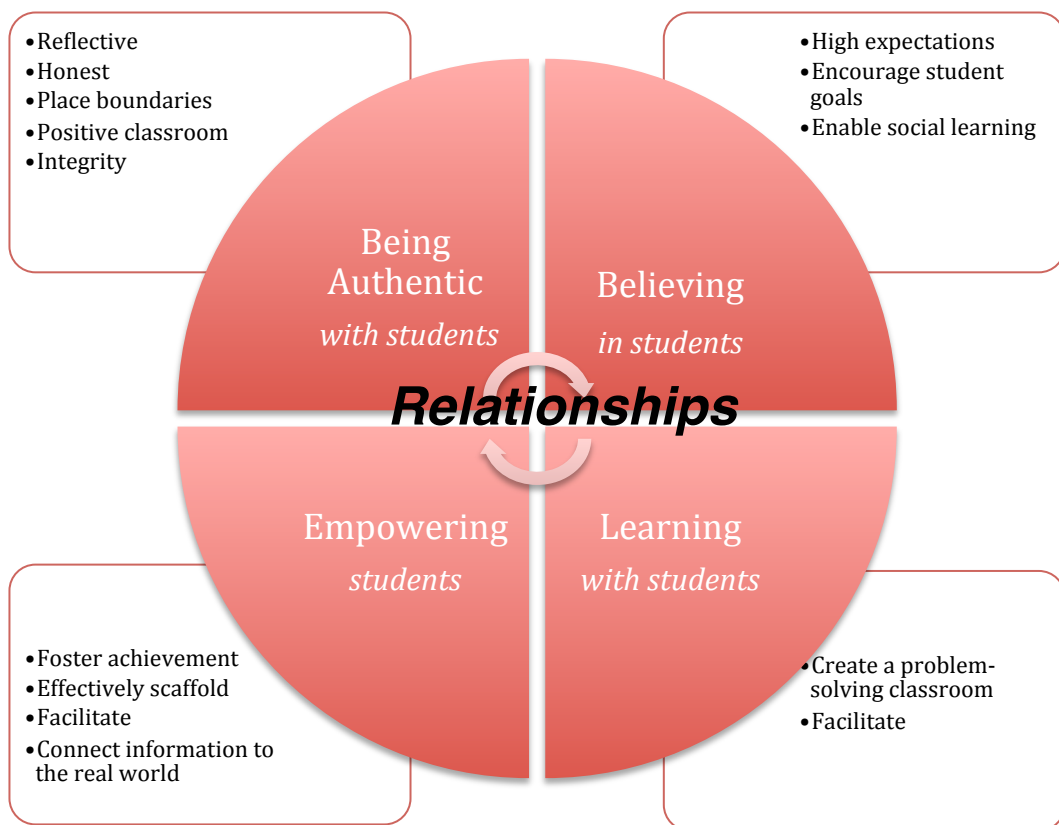


Diagram 5.1: Relationships Model of Engagement



Authenticity

One key element surrounding the core of relationships is the notion of authenticity. It appears that teachers who are reflective, honest, place boundaries, create a positive classroom and have integrity, develop meaningful relationships with students that encourage student motivation and engagement.

The ability to be reflective is seen as an essential characteristic of being an authentic teacher (Cranton & Carusetta, 2004). Mr Gray's ability to reflect ensured lessons are of high intellectual quality and suited to the needs of that particular class. Reflecting over what was done in the classroom, why it was done, and if it worked, resulted in the identification and exploration of beliefs and practices. It is through this process of self-observation and self-evaluation that changes and improvements may be made. Cranton & Carusetta (2004) state that perspectives on teaching are an expression of personal beliefs and values related to teaching that are often formed through careful reflection. Reflection is central in the process of trying to motivate and engage students. Reflection ensures that lesson content is relevant, achievable and conveyed effectively. Mr Gray's drive to reflect is found in statements like;

Mr Gray: *"I can see people struggling and not feeling motivated I think what we need to do is have a quick break or something different", "I don't want it (mathematics) to be completely separate from everyday life" and "I tried doing that for a little while and two thirds of the class just felt it was unachievable so I stopped doing that".*

As Mr Gray reflects, the learning becomes increasingly relevant and connections are

made in student minds. To improve teaching practice Dewey (1933) advocates moving from routine action to reflective action. This transition is characterised by ongoing self-appraisal and development. Mr Gray's students did not mention the success of his reflection on their motivation and engagement. It may be that from a student perspective, teacher reflection is an element that is unnoticed unless it is not occurring.

Honest and integrity are characteristics that are essential to quality relationships (Drummond, 2012). Students are very good at seeing something for what it is and are not fooled for long if a teacher is not honest. Students need to see that a teacher is honest in relationships with them, the feedback that they are given, through the authentic nature of the teacher's worldview, in their teaching. This honesty tells students that the teacher cares and respects them enough to live with the one set of values and morals, to let them know when their learning and behaviour is not their best and that they genuinely care about them as a person. This open and honest approach encourages student motivation and engagement.

As Sally expressed, if they didn't have Mr Gray she probably wouldn't try as hard and other teachers would just ignore her. Sometimes relevance is hard to show and Mr Gray says he's honest about it with them. This upfront approach shows the value he places on the teacher-student relationship.

Table 5.1: Teacher responses regarding integrity and authenticity

Integrity/ Authenticity	• It's really hard sometimes (showing relevance) • And I'll be honest about it with them • I think they are actually learning more when they are teaching themselves
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Honesty and integrity is important for the relationship between the student and teacher, and for motivating and engaging students, but it also encourages students to adopt these qualities for themselves.

Being an honest, authentic teacher assists in creating a positive learning environment. From the data, the importance creating a positive classroom environment to maintaining a healthy teacher-student relationship and fostering engagement was evident.

Table 5.2: Responses regarding classroom environment displayed by the teacher

Classroom Environment	•I feel if I cut out the social element in the classroom too fast then the classroom will become stagnant and boring •Constantly being positive and uplifting is a huge part of the classroom atmosphere. It sort of frames the mood of the classroom
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Mr Gray related how significant the classroom environment was to student engagement and motivation saying, “It sort of frames the mood of the classroom”. A student is unlikely to be engaged in effective learning in an environment where the teacher is being negative, sarcastic, intimidating. Mr Gray’s classroom was what he wanted it to be; positive and uplifting as observed during my time at the school.

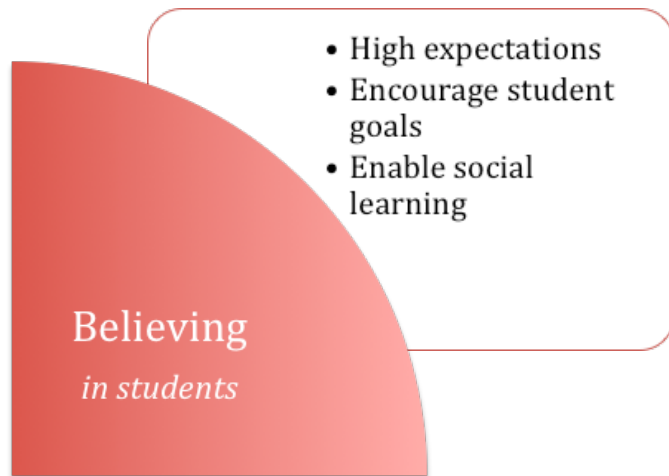
Part of maintaining a positive and uplifting environment was fair, known boundaries.

Mr Gray: *You have to draw the line and you just have to respond in a way that will allow the rest of the class to learn and do it in the most loving way so that you’re not trampling over some kid’s feelings. It’s a challenge. It’s definitely a challenge*

The students were able to contribute to classroom discussions and take part in social learning due to the positive classroom environment and knowledge of boundaries that existed to keep them safe and to promote learning. Bluestein (2008) states that skilled educators know that effective boundaries can help them avoid the frustrations likely in more coercive win-lose approaches. Referring back to the underpinning notion of relationships, students who feel safe are able to fully engage in learning

and they can know that the teacher values the relationship.

Being an authentic teacher through reflection, honesty, integrity, boundaries and creating positive classroom environments means that students are more likely to be motivated and engaged.



Believing in Students

A second element contributing to student engagement through strengthening the student teacher relationship is belief. Belief is exhibited when the teacher has high expectations, encourages student goals and enables social learning. It appears when teachers believe in students, the students are more inclined to view the learning as achievable and relevant. Believing in students significantly impacts the development of meaningful relationships with students and it is these relationships that encourage and foster student motivation and engagement in the mathematics classroom.

When the topic of high expectations came up in the interviews all the students responded positively to Mr Gray's expectations of them. One student excitedly related that he was given advanced work in the next year's textbook but had to give it back when his grades went down. When his grades came back up he was allowed to go back to the advanced work. The student was motivated and engaged when Mr Gray had high expectations for him and gave him the advanced work. The student was also still motivated when the advanced learning was put on hold because he wanted to return to the new textbook. The boundaries and high expectations of Mr Gray enabled this student to feel safe and motivated at all times in the experience and engaged the student in quality learning. Brophy (2010) describes this event well as he informs when teachers have high expectations for students and provide tasks that are engaging and of high interest, students build self-esteem, increase confidence and improve academic performance.

Table 5.3: Responses regarding high expectations displayed by the students

Mark	•I got the next year ups textbook but then my grades went down so I had to give it back but I was allowed to go back to it once my grades came back up so that was really good
Ethan	•I just do it because I have to
Claire	•Sometimes I complete the work because I dont' want to get in trouble from the teacher

These comments demonstrate that there is a teacher who believes in these students and has high expectations. Ethan's remark "I just do it because I have to" alludes to a mathematics teacher who follows through if his high expectations aren't met. These expectations can be different for each student because fostering success (another contributor to student motivation and engagement) for each student dictates they should be. Ethan might not enjoy mathematics at the moment but because of his teacher's insistence that learning must be done his self-esteem, confidence and performance will increase and he will more than likely find himself enjoying the learning. Mr Gray's high expectations convey his belief in each student.

Mr Gray states that he is trying to teach the students to teach themselves.

Mr Gray: *I actually think they learn more when they're teaching themselves. The ultimate would be them on their own just working through it.*

He aims to push students beyond just receiving and accepting information from himself. Students are limited by their perceived reliance on teachers and Mr Gray appears to see belief in students as an important avenue to reducing the perceived reliance. It is well established that teacher expectations can influence student

performance (Brophy, 2010) and this notion was evident in the study.

Social and co-operative learning experiences are an important way for students to learn and appear to be most effective when there are high levels of teacher trust (Rimm-Kaufman, 2011). Bandura (1977) highlights the need for social and co-operative learning saying, “learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do.”

When teachers *know* their students they are able to facilitate effective social and co-operative learning situations in which the teacher can trust the students to learn. In this study, Mr Gray did not specifically mention using social and co-operative learning strategies in the classroom. However, within the student data social and co-operative learning was a repeated theme. Every student interviewed mentioned that Mr Gray trusts him or her to work in groups while learning and all of them valued this opportunity.

Being able to work in a group was very important to the students who recognised the benefits for their own unique learning styles and also the drawback of getting sidetracked. Sally related early in the data collection process that she strongly dislikes mathematics and typically one would anticipate that she would avoid engaging in the learning and let her attitude towards mathematics dictate the amount and extent of mathematics learning. However, knowing that Mr Gray believes in her, and that he has high expectations and trusts her to learn in a group, Sally is more motivated to engage in the learning. One student preferred to work individually as he commented that he’d ‘just talk and hang out’.

Table 5.4: Responses regarding co-operative learning displayed by the students

Claire	•There's four of us in our class and we all do it together so we all help each other to work it our, so we're all understanding it together
Ethan	•It's really good motivation, you're also more focused and it's better to work with someone because then if you get one answer and they get the other one you can ask them how they got that and can improve your way of doing it
Sally	•I just find that if I'm doing it by myself then because I'm not really that interested in maths nothing gets done but with the girls they get their work done and they don't hate maths like I do so I find that I'm actually doing the work

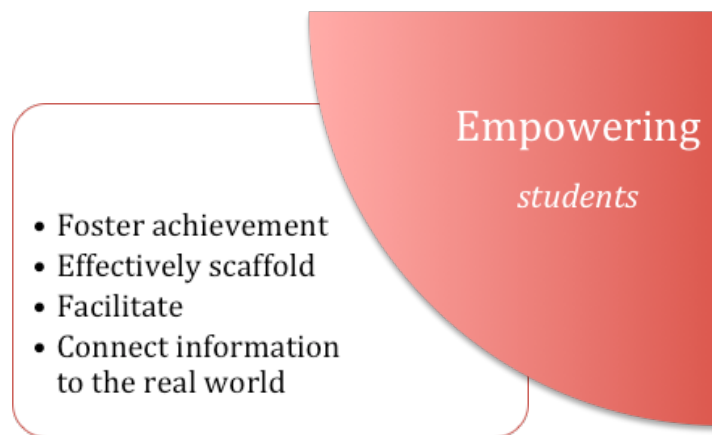
It appears that Mr Gray's belief in his students and his high level of trust has enabled the students to motivated students to work and learn in the mathematics classroom. Once again, this belief is generated because of the valued teacher-student relationship.

Curwin (2012) emphasizes that believing in students is more than just telling them you believe in them, belief must be demonstrated. He advises five ways to express belief;

- » Stop using rewards
- » Encourage effort more than achievement
- » Give second, third and fourth chances
- » Don't say "You failed" - say "You haven't done it yet"
- » Increase opportunities to learn

Interestingly, from the data Mr Gray plainly expresses his belief in students using three of these five suggestions already. Mr Gray has chosen not to use rewards, to

encourage effort more than achievement and gives second, third and fourth chances. Through these ways of demonstrating his belief, students are more motivated and engaged in the mathematics classroom.



Empowering Students

A third element that emerged from the data that contributed to student motivation and engagement through the creation of relationships was the empowerment of students. This idea of empowerment appears critical to authentic relationships (Curwin, 2010). Empowering students can be achieved through fostering achievement, effectively scaffolding, effective facilitation, and connecting information to the real world. Empowering students in this way promotes engagement and motivation in the mathematics classroom.

In this study, Mr Gray strongly emphasised the importance of achievement in his classroom. Although he does give students achievement certificates, he believes rewards can be a barrier to deep learning. Mr Gray makes sure “...they are constantly having success in the classroom” and that he’s “...not giving work to them that is unachievable or that they should be up to according to the standard mathematics syllabus”.

Deci & Ryan (1985) pronounce the use of rewards as “control through seduction” and Kohn (1999) comments that ultimately this frays relationships with students as they become less inclined to think creatively, explore ideas and take chances. Mr Gray wants creative thinking, exploring ideas and taking chances to be an everyday occurrence in his mathematics classroom and so does not use a reward system.

The students in Mr Gray's class also demonstrated the importance of achievement for continued motivation and engagement. One student commented that she likes mathematics because she 'gets it'. It is known that increased competence typically leads to higher levels of motivation to further engagement (Irvin, Meltzer & Dukes, 2007). This generates a cycle of engagement and developing competence, which supports improved student achievement (Irvin, Meltzer & Dukes, 2007). Claire also highlighted the need for differentiation saying she switches off if she knows she has already mastered a particular skill.

Claire: *If it's something we've done heaps about I just get kind of bored and so I just think 'Oh I don't need to do this anymore, I know what I'm doing'*

Without effective scaffolding perhaps this student would not have felt as confident about mathematics and would have been much less likely to be motivated and engaged in that class. Scaffolding and differentiating content *enables* each student to feel positive about learning even though each student is at a different stage in mathematics. Mr Gray identified the existence of a particular point where students feel too challenged and the task appears unachievable.

Mr Gray: *With the advanced classes, I think it's good to challenge but not to the point where they just feel defeated.*

Mr Gray's approach in the mathematics classroom appears in harmony with current research findings that have found that teaching and learning in a constructivist-learning paradigm is highly effective in fostering motivation and engagement. The point just before students feel defeated could be identified as the lower end of Vygotsky's "zone of proximal development" (Vygotsky, 1978). In successfully completing tasks that are slightly above their current level of development, learners gain confidence and are motivated to attempt more challenging tasks.

As Mr Gray embraces the constructivist-learning paradigm, it would be expected that he would often take on a facilitation role. During class, Mr Gray was often observed walking around the classroom and he spent little time lecturing at the front. In the interviews, one student related that Mr Gray often moves around the classroom

questioning and observing.

Ethan: *He comes around and even if we've got it, he still comes around and says are you alright with it and still just checks, it's good.*

According to Attard, Di Ioio, Geven & Santa (2010) greater involvement with students by the teacher is central to student motivation and as part of student centered learning, teachers spend more time around the classroom than in front of it,

“...signifying a shift of power for the teacher to a shared teacher-student relationship...”

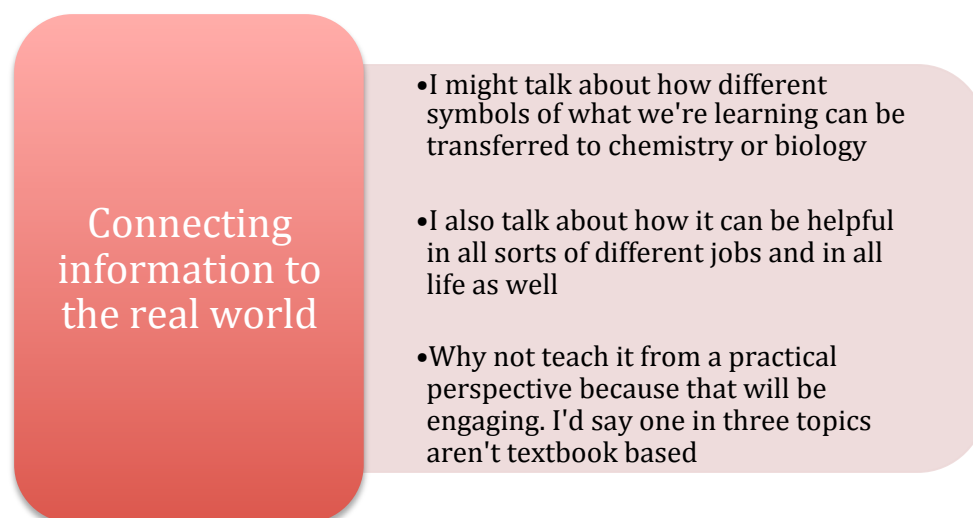
To effectively facilitate a student-centered classroom the teacher must develop an awareness of the diverse student backgrounds. Once again this demonstrates the importance of knowing students and how central the teacher-student relationship is to motivation and engagement.

Lastly, it appears that a teacher who connects information to the real world empowers their students. Mr Gray recognises the difficulty of directly connecting every topic in mathematics to the real world but still believes it's important.

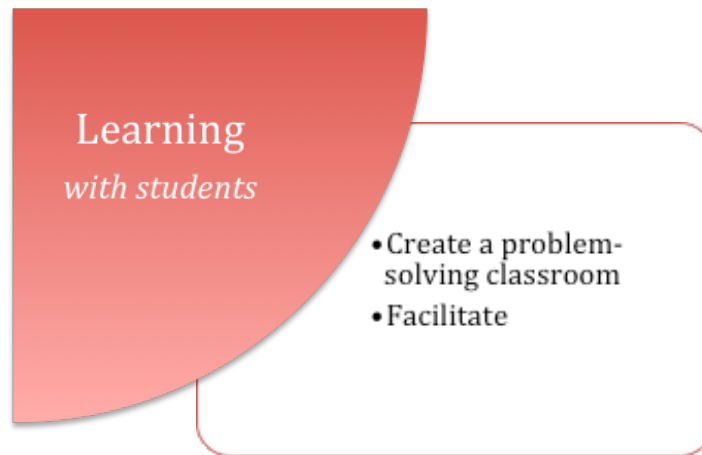
Mr Gray: *Most of the time what's actually practical is teacher's need to be showing how and what the students are learning is relevant*

To motivate and engage students by helping them connect information to the real world, Mr Gray uses several strategies that he implements often (see Table 5.5).

Table 5.5: Responses regarding connecting information to the real world displayed by the teacher



Through helping students make connections, facilitating, scaffolding and fostering achievement teachers are able to empower students to learn and improve the student teacher relationship, which in turn motivates and engages. Emerging from the notion of empowering students is the idea of learning *with* students. This is the last element from the initial diagram to be discussed.



Learning With Students

When educators learn with students, it appears that student motivation and engagement are positively affected in several ways. Learning with students is exhibited when teachers create and take part in a problem-solving environment.

During observations of Mr Gray's classroom, his constructivist approach suggested that problem solving would be central in students' learning (O'Shea, 2010). Initially the problem-solving element was not obvious however in considering the data as a whole the underlying theme began to emerge.

Mr Gray made the comment that multiple methods mean students can learn concepts thoroughly.

Mr Gray: *They learn it really thoroughly when using multiple methods, not just one method that works for the teacher's way of doing it.*

It is evident that Mr Gray values problem solving and recognises that mathematics is not helping students master the 'teacher's way' of solving a problem. Mr Gray saw the need for a problem-solving environment.

As previously discussed, one of the keys to creating such an environment is effective facilitation and in seeking to create this environment Mr Gray relates that students sometimes believe they aren't learning properly if the learning is done on their own and he would like to change this.

Mr Gray: *They have this thing in their mind where they're not learning everything if they do it on their own*

Eng (2001) states that problem based learning aims to design and deliver a total learning environment, one that is holistic to student-centred learning and student empowerment. It appears that although problem-based learning is still developing in Mr Gray's classroom and but he believes that the creation of problem-based learning environments is paramount to student engagement and motivation.

Conclusion

In reflecting on this developing motivational and engagement framework, we revisit the research question:

What do teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom?

It appears that the quality of the teacher-student relationship expressed through the teacher's authenticity, belief in the student, and the teacher's ability to empower and learn with the student, significantly impact student motivation and engagement. So what then, are the implications for other educators and mathematics classrooms? The next chapter will discuss the implications of this framework.

Chapter Six

Introduction

This research project aimed to look at teachers' and students' perceptions of key factors that drive student motivation and engagement in the mathematics classroom.

The role of this chapter is to bring together the results and examine the implications of the study. The study's applicability to other contexts will also be discussed along with its limitations and some possible areas for further research.

Response to the Research Questions

The following question guided the research;

What do teachers and students perceive as the key factors that drive student motivation and student engagement in the mathematics classroom?

The data revealed that the central key factor that drives student motivation and student engagement is the learning environment of the classroom and particularly the positive relationship between the student and the teacher. The students and teacher interviewed felt this relationship was expressed in four main themes;

- Being authentic with students,
- Believing in students,
- Empowering students,
- Learning with students.

Being authentic with students asks the teacher to be reflective, honest, live a life of integrity, enforce appropriate boundaries, and to create a positive classroom environment.

Believing in students means that a teacher has high expectation of the students, encourages student goals, and enables social and co-operative learning.

Empowering students invites the teacher to foster student achievement, effectively scaffold learning, take the role of a facilitator, and help students connect information to the real world.

Finally, learning with students means that a teacher creates and facilitates a problem-based learning environment in which both the teacher and the student are learning.

The developing framework in chapter five (see Diagram 5.1) was created to structure and present these findings.

Implications of the Findings

As numerous researchers argue, there are considerable concerns about mathematics education and solutions need to be found to enable students to leave school with a holistic, comprehensive education and contribute to wider communities (STEM skills, 2012; Sullivan, Mousley & Zevenbergen, 2005; Productivity Commission, 2012).

Some researchers (Whitebread, 1995; Pound, 1999; Westwood, 2012) suggest that the cause of students' turning away from mathematics lies in the way that mathematics is taught. While these suggestions were made more than a decade ago, there are still considerable disparities in mathematics education evident in the concerns held by the Productivity Commission (2012) and STEM skills (2012). Taylor and Parsons (2011) indicate that students have changed over the last twenty years and have different needs, goals and learning preferences. They attribute this change partially to a technology rich upbringing. Turkle (2011) notes that technological devices are so psychologically powerful that they don't only change what a person does but who they are. The use of technology and social networking services can bring feelings of loneliness despite the person being so widely connected. Turkle (2011) relates that people now use technology to define

themselves by sharing thoughts and feelings. When they don't have connection they don't feel like themselves so they connect more and more, but in the process they are setting themselves up for isolation if they don't cultivate the capacity for solitude. Relationships Australia conducted a Relationships Indicators Survey in 2011 and the report contained an additional section on loneliness. They stated that an interesting link between the use of social networking technology and loneliness became apparent.

The proportion of respondents indicating they felt lonely increased as the number of methods of technology used increased.

(Relationships Australia, 2011)

In 2013, ninety seven percent of young people aged 14-15 years and ninety nine percent of young people aged 16-17 years used social networking services (ACMA, 2013). Given this background, it is not surprising that the current study's findings reflect a student's desire for authentic relationships. This study reminds us of the importance of these relationships in the mathematics classroom. But, authentic relationships may also be a key factor in driving student motivation and student engagement in all classrooms, not just mathematics classrooms. The NSW Quality Teaching Model (2003) has for a decade highlighted the importance of a quality learning environment to quality teaching and learning. This study reinforces this dimension and demonstrates that if the desired outcome is improved student motivation and engagement, then the establishing of a quality learning environment is central. If classroom pedagogy focuses on providing a quality learning environment where positive relationships between teachers and students are prioritised, then student motivation and engagement is improved. Such an improvement would lead to better outcomes for students in the mathematics classroom and more students would leave school with a comprehensive mathematical education and be in a position to make a contribution to wider communities (Anthony & Walshaw, 2009).

Limitations

While the study has highlighted a very importance aspect of student engagement, it is not without limitations. The most significant limitation was the small sample used in the study; one teacher and four students from one classroom in one school. While the study revealed some important and interesting results, it is recognised that generalizing these results to all mathematics classrooms should be treated with caution.

Further Research

Possible areas for further study identified from the findings of this study and gaps in the literature include;

1. Research to explore whether the findings could be translated into other mathematics classrooms and indeed into all classrooms, not just mathematics classrooms.
2. Studies on how teachers have adapted their motivational and engagement strategies to maximise the learning of a technological generation.

Conclusion

This study shows that the learning environment established in the classroom is key to student motivation and engagement. Relationships play an important role in establishing a quality learning environment where students are motivated and engaged. Learning is a life-long pursuit and if we as teachers want to motivate and engage our students in this pursuit, then positive relationships with them is the key.

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Appendices

Appendix A: Student consent form



STUDENT CONSENT FORM

‘Understanding Student Motivation’

I have been given information about the research into my ‘motivation’ and have been provided with the opportunity to discuss this project with Lauren Findlay.

I understand that if I consent to participate in this project:

1. I can withdraw at any time without penalty during the duration of this project.
2. that my participation in this research is voluntary and I am free to refuse to participate and I am free to withdraw from the research at any time.
3. My refusal to participate or withdrawal of consent will not affect my relationship with Avondale College of Higher Education.
4. Refusal to participate or withdrawal of consent from the project will not affect any grade associated with my class.

I have been advised of the potential time elements associated with this research and have had an opportunity to ask any questions I may have about the research and my participation.

If I have any concerns or complaints regarding the way the research is or has been conducted I am aware I can contact Mrs Lauren Findlay and Dr Phil Fitzsimmons in the first instance, and if unresolved the Avondale’s HREC secretary as detailed below.

This research project has been approved by the Avondale College Human Research Ethics Committee (HREC). Avondale College requires that all participants are informed that 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 the College’s HREC Secretary, Avondale College, PO Box19, Cooranbong, NSW, 2265 or phone (02) 4980 2121 or fax (02) 4980 2117 or email: research.ethics@avondale.edu.au.

Student’s Name:

Student’s Signature:

Date:

Appendix B: Principal consent form



HEAD OF SCHOOL CONSENT FORM

‘Understanding Student Motivation’

I understand that 30 secondary school students will be asked to participate in a research project undertaken by the Avondale College of Higher Education. I have been given information about the research into ‘motivation’ and have been provided with the opportunity to discuss this project with the researcher. I understand that if I have any more questions I can contact Lauren Findlay and Phil Fitzsimmons.

Lauren Findlay
Avondale College of Higher Education
Email: ducky_quack@hotmail.com
Phone: 0439962971

Assoc. Prof. Phil Fitzsimmons
Faculty of Education
Avondale College of Higher Education
Avondale College, POBox19,
Cooranbong, NSW, 2265
Australia
Email: phil.fitzsimmons@avondale.edu.au
Phone: +612 49802183

I understand that if these students consent to participate in this project:

5. they can withdraw at any time without penalty during project.
6. the child’s participation in this research is voluntary and they are free to refuse to participate and are free to withdraw from the research at any time.
7. refusal to participate or withdrawal of consent will not affect the child’s relationship with Avondale College of Higher Education.
8. refusal to participate or withdrawal of consent from the project will not affect any grade associated with their class.

I have been advised of the potential time elements associated with this research and have had an opportunity to ask any questions I may have about the research and my participation.

If I have any concerns or complaints regarding the way the research is or has been conducted I am aware I can contact Dr Phil Fitzsimmons in the first instance, and if unresolved the Avondale’s HREC secretary as detailed below.

This research project has been approved by the Avondale College Human Research Ethics Committee (HREC). Avondale College requires that all participants are informed that 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 the College’s HREC Secretary, Avondale College, PO Box19, Cooranbong, NSW, 2265 or phone (02) 4980 2121 or fax (02) 4980 2117 or email: research.ethics@avondale.edu.au.

Head of School’s Name:

Signature:

Date:

Appendix C: Notes recorded during student focus group

Don't know what intrinsic motivation is, or engagement.

1. ~~_____~~ & ~~_____~~ & ~~_____~~ do complete ~~_____~~ doesn't
 ↓ ↓ ↓
 Feels like she'll get in trouble if she doesn't wants to be a pilot Mum sets ½ hr - 1 hr hw time & he has nothing better to do Not interested
2. ~~_____~~
3. Muck around, don't do the work (from all)
4. Yes, yes, ~~_____~~ - most of it some you don't use' ~~_____~~ - depends what you want to do.
 ↓
 For ~~_____~~
5. ~~_____~~ → Fun scavenger hunt with rewards, solving maths clues ~~_____~~ → Yr 8 trig boring teacher's voice but remembered for some reason
6. Facilitates bludge lessons "mathematics is for 12 yr olds" - "~~_____~~"
 ↓
 Recognises that teacher can't monitor their screen don't use textbooks or computer ~~_____~~ likes practice tests on computer.
7. 5/5, 5/5, 4/5, lucky if 2/5
8. ~~_____~~ & ~~_____~~ like helping others
~~_____~~ & ~~_____~~ haven't motivated others
9. ~~_____~~ mum cares and makes him do hw
~~_____~~ dad is a math whiz
~~_____~~ mum is a maths teacher.
~~_____~~ dad is ok but didn't know half of answers to help with a test
~~_____~~ perceives it makes it diff to her
10. ~~_____~~ → Mr Westlake is passionate → inspires him, ~~_____~~
 ↓
 Has a brother who was dx, ~~_____~~
 (100%)
 • Like working in groups, can compare, more enjoyable
 • ~~_____~~ doesn't like it when teacher answers whole question instead of the part he asked. Doesn't think any teacher at his school caters to learning style.

Appendix D: Use of probes during interviews

Ok there we go cool. Ok so um my first two questions are on the understanding of motivation and engagement so I just wondered what you understand intrinsic motivation to be like your personal definition of it?

Motivation for me or just motivation for the...

Um just...

How to motivate the students or...

Yeah both...

I mean motivation I feel like would come um from either something that you just love, you enjoy um but also if there's some sort of goal that you're trying to reach. Some sort of um you've got a vision for to achieve something and that can happen – cause motivation because you want to get somewhere as well so they're probably the two either ones.

Goals
Vision

Yeah. Do you find it more powerful in the classroom rather than having to say, use your rewards system or um a punishment system or...

I don't use a rewards system or a punishment system

Really!

Yeah

Cool. So what do you do?

Um I try and make it relevant, so at the start of every topic I try and um show where what we're learning is relevant to life as much as is possible. It's really hard in some times. And I'll be honest about it with them I'll say look like this topic is difficult to relate to real life just as a topic, I mean and then I might talk about how different symbols of what we're learning can be transferred to chemistry or into biology or other parts of maths but also just how problem-solving in itself is um something that can be helpful in all sorts of different jobs and in life as well. Um yeah so

Difficult to show
relevance.

Honest
Integrity-
Authenticity
in maths

Linking to
other subjects

"real life" applications

Appendix E: Broad ideas and themes recorded during an observation

~~XXXXXXXXXX~~ Observation 2

12.00 * Computer room lesson (USE OF TECHNOLOGY - IS IT NEEDED?)
 * Revision for pre-university test ↓

* students ask "are we writing this down?" (ENVIRONMENT)
 maybe they don't really care about the learning goal
 writing things down and expecting them to know later

* Yr 10 advanced class, fill in table of values, still incomplete at 12.10 (PACING) / (EXPECTATIONS)

12.12 * students need accountability & a guide, not the answers
 "Maths is like Shakespeare - stupid", "where did maths come from" said by girl swivelling around in chair at the front. Teacher ignores.

* Writes questions up on board, students copy down
 - maybe a sheet would've been more time efficient

* About 1/3 of class appears to be engaged

(ACCOUNTABILITY)
 (TEACHER AS FRIEND?) * Students distracting each other, those working by themselves are quiet & on task.

* MUST enforce what you say → "Silence now please"
 Trying to use presence but perhaps not familiar with code.

* Students are not at all fazed I'm here, really seems they're acting completely the same.

(NEED FOR CURIOSITY & INTEREST TO ELIMINATE BEHAVIOUR CAUSED BY BOREDOM)

12.30 * Students still completing a quiz on a sheet.

12.35 * "It's planned to do more, but they didn't seem interested" → free teacher.

(VARIETY OF ACTIVITIES?)

Appendix F: Field notes for initial data analysis

Student Interview Questions

Understanding of motivation/engagement

What do you understand intrinsic motivation to be?

Motivation in and out of the maths class

- 1 If and why do you complete the maths work set? → Mum sets aside time for homework (Extrinsic)
- 2 What percent of the time do you engage in maths learning? Why?
- 3 What happens when you don't feel motivated? → Recognises feeling unmotivated, mucks around
What happens when you do feel engaged?
- 4 Would you say the maths you do is relevant? What would make it relevant?
What limits you from engaging in maths? ↓ Depends on what you want to do, believes it's relevant if it's used in everyday life
- 5 Tell me about a memorable maths lesson?
Tell me about a lesson when you weren't engaged?
- 6 How has the use of technology in the classroom impacted your motivation/engagement?
- 7 How many times would you not complete work/homework in a week? Why? ↓ Mathematics

Who is responsible for/contributes to my engagement in maths?

- What prevents you from self motivating? → Having to work alone
- 8 Have you motivated others? Why?
 - 9 How and to what extent have your parents influenced your motivation in maths?
 - 10 How and to what extent has your teacher influenced your motivation in maths?
- } Significantly

Appendix G: Precise transcription of words, phrases and sounds

Yeah!

increase motivation by
stimulation through
variety.

Um so constantly changing, constantly changing um what's happening in the classroom is really important. Um fifteen minute blocks of, even if it's as simple as using a worksheet and now we're using the textbook. Even if they have the same type of questions, it's amazing how different that can be for them and it's just something different you know. Um another really influential thing I've found is going from class to class to class to class, if every single class is exactly, exactly the same so they come in, I mean routines are good, but if it's just routine non stop, I find that they get bored. So every now and then something needs to be a bit different like you start the class with something fun or um yeah like we do mathematics in the computer lab as you've seen a few times and I try to do that you know two maybe, two times a week one or two oh a fortnight I mean, two or three times a fortnight. Um and I don't tell them which period that's gonna be in like they'll get to class and I'll go 'right guys mathematics' and they'll be like 'yes!' Um so yeah that can be good as well cause you know it just breaks it up, it's not like monotonous for them like yeah.

Even if, even some classes like really random things like I remember from year seven we watched this really dorky video on the 'Golden Ratio' and I still remember it even though it was probably the worst video ever made but like but yeah just something different um like watching funny maths videos and um it's probably not very um relevant or helpful to the class but sometimes at the beginning of my um and prac lessons I like to put up funny maths comics um and they enjoy them some of the time. Some of them are a bit nerdy and they're like 'oh you love maths so much' but yeah.

That's awesome, that's awesome!

Cause there's some funny you know with all the new internet like memes I mean there's so much now.

That's great yeah I'm fully into that with my two unit class last year? Yeah it was last year, at the start of our three unit class at the start of every single um time we'd watch something funny on YouTube but I'd let them like research it was well so like and we'd come in and I'd be like 'ok

Appendix H: Example of memoing

Um ok so who is responsible for the students motivation and engagement. Or who do you want to be responsible?

APPLICABLE

Idea for students to be responsible for own engagement maybe unrealistic but shouldn't abandon idea!

Um I mean well I mean you would want the students to be responsible to, you would want them to walk into a classroom that is absolutely completely boring and the teacher is just, doesn't make anything applicable to anything and just the worst thing ever, and you'd want them to be fully engaged and like really wanting to learn. I mean that's the aim, that's the goal. But of course that is...

That would never happen!

PRACTICAL

Freedom from textbook

It almost yeah almost never happen unless like I think family life and parents can intrinsic, like parents can teach students to be motivated even if they're teachers aren't motivating them. But I'd say most of the time what's actually practical is teachers need to be um showing how and what they're learning is relevant and um and allowing the motivation to sort of take hold within the student and giving the students opportunities to see why they should be self motivating themselves and things like that, and engaging, yeah. Oh and like um like for example the statistics topic that we do, if you did it straight from the text book it could be pretty um stale and boring whereas it's such a good opportunity to do something like that's just, I feel like statistics is an obvious one where you can you know there is so many opportunities like measure each others height, and then do you're statistics based on that. Or you know count the number of different um Toyota's and Holden's in the car park or something, you know there's the Bureau of Statistics websites that the census is it called that does like...

Oh yes

Idea that superannuation and real life stuff will motivate and engage students

You know things like that, there's so many things like Superannuation and there's so many practical things that statistics are used in. Why not, teach it from that perspective, cause that will be engaging and you'll be motivating cause you want to learn about life you know, so um that, that onus is on the teacher but I guess the ultimate answer is, the aim to create motivation within the students I would think.

Appendix I: Axial Codes

<u>Teacher Coding</u>	
Goals Vision	Honesty Integrity Authenticity Accountability
	Affirmation Rewards Approval
Linking to other subjects Relevance Applicability Practical Meaningful	Success Confident Achievement Self-belief
	Challenge Opportunity ~~Freedom from textbook~~
Syllabus Methods Steps Freedom from textbook Variety	Distractions Atmosphere / Environment Information Overload
	Practise Implementation
Relationships How teacher makes student feel	
7min A4	

Appendix J: Diagram created to clarify connections in themes

