

Their Stories:
Students' Perceptions of Engagement with Middle Years Mathematics

by
Gwen Birse

A Thesis submitted to the Faculty of Graduate Studies of
The University of Manitoba
In partial fulfilment of the requirements of the degree of

MASTER OF EDUCATION

Dr, Ralph Mason (Advisor)
Dr. Gary Babiuk
Anne Reimer

Department of Curriculum, Teaching and Learning
University of Manitoba
Winnipeg

Copyright © 2008 by Gwen Birse

THE UNIVERSITY OF MANITOBA
FACULTY OF GRADUATE STUDIES

COPYRIGHT PERMISSION

Their Stories: Students' Perceptions of Engagement with Middle Years Mathematics

BY

Gwen Birse

**A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of
Manitoba in partial fulfillment of the requirement of the degree**

Of

Master of Education

Gwen Birse @ 2008

Permission has been granted to the University of Manitoba Libraries to lend a copy of this thesis/practicum, to Library and Archives Canada (LAC) to lend a copy of this thesis/practicum, and to LAC's agent (UMI/ProQuest) to microfilm, sell copies and to publish an abstract of this thesis/practicum.

This reproduction or copy of this thesis has been made available by authority of the copyright owner solely for the purpose of private study and research, and may only be reproduced and copied as permitted by copyright laws or with express written authorization from the copyright owner.

My thesis is dedicated to my children

Scott and Brooke

for sharing the wonder of learning with me.

Abstract

This phenomenographic study is an opportunity to view student engagement through the eyes of middle years mathematics students. Their perspectives were shared as stories which provide a collection of experiences for educators to utilize in reflective professional development opportunities. The categories of descriptions which are identified provide potential implications for teaching practices.

Twenty-four grade 8 students from the same mathematics class participated in the study. This study used interactive writing, transitional interviews, reflective narrative interviews and narrative texts as data sources. Interpretation included immersion in the data as a whole, as individuals and within the individual data sources and question used in the interviews and writing prompts.

The categories of descriptions which emerged are: student engagement as an internal quality of learning, an external indicator of learning, and connected to understandings; and the range of dependence, independence and interdependence. These categories of description depict a range of student experiences which identify the complex nature of learning mathematics. The implications for teaching practices include: teaching by building on prior understandings, building meaningful understandings, assessment to enhance engagement, fostering movement towards independence, and support for students in transitioning to high school mathematics. Students identified these areas as important to their success in mathematics.

However, it is the collection of student stories which is the heart of this study. The challenge to teachers is to allow these students' stories to paint a picture of student engagement for them to consider.

Table of Contents

Abstract	page ii
Table of Contents	page iv
List of Tables	page vii
Chapter One	
Introduction	page 1
My Story	page 2
Their Stories	page 6
Chapter Two	
The Storyteller and Engagement with Mathematics	page 8
The Storyteller	page 8
The History of Middle Years	page 9
Middle Years Mathematics	page 10
Student Engagement	page 13
The Two Sides of Engagement	page 15
A Working Definition of Engagement	page 17
Engagement and Middle Years	page 18
Engagement and Mathematics	page 19
Engagement and Disengagement	page 20
Engagement and Voice	page 22
Chapter Three	
Building a Structure for Their Stories	page 24
Phenomenographic Research	
Introduction	page 24
History	page 26
Data Collection and Interpretation	page 26
Building Relationships	
Interactive Writing	page 28
Transitional Interviews	page 30
Their Stories	
Narrative Texts	page 31
Focus Groups	page 32
Data Analysis	page 33
The Beginning	
Recruitment	page 34

Sequence of Events	page 34
Chapter Four	
Storytelling and Layers of Learning	page 37
The Storytellers	page 38
Data Collection: Building Their Stories	page 40
Step One: Interactive Writing	page 40
Adapting writing prompts to the experience.	page 42
Intentions of the researcher's responses.	page 46
Step Two: Transitional Interviews	page 50
Step Three: Narrative Texts	page 53
Chapter Five	
Listening to Their Stories	page 56
The Interpretive Process	page 56
Multidimensional Data Spaces in Phenomenography	page 56
Narrative Inquiry: A Layer in Phenomenography	page 58
Categories of Description	
Student Engagement	page 61
An Internal Quality of Learning	page 62
An External Indicator of Learning	page 64
Tied to Understandings	page 65
Dependence, Independence, and Interdependence	page 70
Dependence	page 72
Independence	page 75
Interdependence	page 78
Individual Insights and Themes	page 80
Conclusion	page 82
Chapter Six	
The Potential in Their Stories	page 83
Implications for Teaching Practices	page 83
Teaching by Building on Prior Understandings	page 84
Building Meaningful Understandings	page 85
Student Engagement and Assessment	page 86
Fostering Movement towards Independence	page 87
Transition to High School	page 88
My Story – The Next Chapter	page 88
Potential for Professional Learning	page 91

The Last Words

page 93

References

page 98

Appendices

Appendix 1

page 102

Appendix 2

page 103

Appendix 3

page 108

Appendix 4

page 110

Appendix 5

page 112

Appendix 6

page 113

List of Tables

Table 1
Table 2
Table 3
Table 4

page 43
page 52
page 95
page 96

Chapter One

Introduction

The truth about stories is that that's all that we are. The Nigerian storyteller Ben Okri says that... "we live by stories, we also live in them. One way or another we are living the stories planted in us early or along the way, or we are also living the stories we planted – knowingly or unknowingly – in ourselves." (Thomas King, 2003, p. 153)

The essence of people's lives is their stories. Thomas King brings this to life in his book, *The Truth About Stories*. King explores native peoples' use of story to record and share their history and teachings about life and living. It is the sacredness of their stories that creates a culture of respect and learning. He shares that native storytellers honour and pass down through their teachings the appropriate times and places to tell a story. There also is tradition in who can tell a specific story and for what purpose. However, it is King's elaboration on the public and private notion of stories which brings the true power of story to light. As people, we all learn from stories: whether we tell them or write them, whether we hear them or read them, whether they are private or public. Stories capture the essence of an experience and the spirit of the storyteller.

Gadanidis and Hoogland's (2003) work brings the power of stories into the realm of mathematics educational research in their work with elementary school teachers. In creating the context for the exploration of aesthetics in mathematics as story, they created a culture which validates an individual's mathematical stories.

Human cognition is story based. We think in terms of stories, we understand the world in terms of stories that we have already understood,

we learn by living and accommodating new stories and we define ourselves through the stories we tell ourselves. (p. 488)

Their findings reveal that mathematics educators need to have good mathematical stories about learning mathematics to build good stories for their students. By using the term “mathematical story” the aesthetic component of mathematics is incorporated, directionality is added to the experience, and the complexity of the experience of learning mathematics is captured. These stories can have an impact on curriculum reform as the power of stories enhances the learning experience of educators through dialogue and reflection. In their research, Gadanidis and Hoogland not only developed individual stories, but they also looked for common ground on which to build future research questions for mathematics educators.

My Story

As a mathematics educator, I have good mathematical stories to share and have aspired to create these experiences for my students. As a student studying mathematics there was a time when I did not have good experiences or stories to tell at all. When I moved from Manitoba to Quebec in Grade 11, I found myself in a situation where the learning of mathematics all of a sudden seemed unobtainable. In complete frustration I was ready to drop out of mathematics and just give up. Thanks to my teacher’s persistence, I managed to struggle through the remainder of the year. It was not until my second year of university that studying mathematics became enjoyable again. All of a sudden math was not just a group of things to

memorize but an interwoven group of concepts that created a framework to solve problems.

It is this experience that has been the basis for my work as an educator. I wanted to make it possible for all children to learn math and to have the strength to continue even when it did not make sense. In his book, *Thinking Mathematically*, John Mason (1985) gives a clear message about the process of learning mathematics. It is one where everyone needs to have the opportunity to get started and to build strategies and skills to become users of mathematics in their lives. It is not just a body of knowledge but a way of interacting with its core concepts. In my opinion, the most powerful part of Mason's work is that he gives students permission to be "STUCK" when working with mathematical concepts. This is a valid part of the mathematical thinking process. "Everyone gets stuck. It cannot be avoided and it cannot be hidden. It is an honourable and positive state." (p.49) This is a strong message for educators to share with their students as it provides approval for thinking mathematically in classroom situations.

Brian was a student in my mathematics class whose simple words left a lasting dilemma in my work as a math educator. That year I decided to begin the school year in a different way. It was a time in my career when I felt that I had the experience and knowledge to break away from the traditional teaching methods I had become uncomfortable using. I decided to start the year with the "Toothpick Bridge Building Project." This meant that students would work in groups to build the strongest bridge they could with toothpicks and glue. Each group had a lump sum budget to buy supplies, information on design and strength, and a corporate

structure to organize the group work. My colleagues expressed concern that I was beginning the year this way, without first establishing classroom expectations and identifying individual student skill levels. These were areas which I felt would be addressed as a natural part of the learning environment because I was asking my students to “think mathematically”. The classroom expectations had been set: students needed to think in math class and to learn with their peers. I developed a relationship with each student as a math learner through my observations and interactions during this creative process. I was thrilled with the atmosphere and the complexity of the learning which I observed.

The project ended with the ceremonial breaking of the bridges to see which one would hold the most weight. It was Brian’s group, which had a unique triangular design, which held three times the weight of the other bridges. I can still hear the students’ cheers as we crowded around and added the weights on one by one until each bridge broke. I can still hear my colleagues’ excitement as they rushed into our room to see what was going on.

However, when all the excitement, relationship building, and interaction with mathematical concepts created by the project were over, it was Brian’s words that have stayed with me over the years. “*Mrs. Birse, when are we going to learn real math?*” They were such simple words and to me asked such a simple question. In the excitement of the classroom, it seemed to be simply answered, “This is real math, Brian” and off I went to the next activity. It was a question I felt confident to answer with me students and my colleagues. My students were communicating mathematically, making connections, using mental math, reasoning, problem

solving, and participating in an activity which grabbed their interest. This was “**real math.**”

In Manitoba Education and Training document (1997), *Grades 5 to 8 Mathematics: A Foundation for Implementation*, it states that the goals for mathematics learning is that students will:

- Use mathematics confidently to solve problems
- Exhibit a positive attitude toward mathematics
- Communicate mathematically
- Appreciate and value mathematics and its contributions to civilization
- Reason mathematically
- Commit themselves to lifelong learning
- Become mathematically literate adults, using mathematics to contribute to society

(MET, 1997, p. A-2)

This toothpick bridge building activity brought the essence of mathematical learning to life for my class. It allowed me as a teacher to be able to work with students and mathematics as a vibrant and dynamic subject. It reflected the goals which the foundations document identified and created an opportunity for my students to enjoy learning mathematics.

Over the years I have reflected on Brian’s initial question, not as a simple question, but as a complex statement about himself as a learner of mathematics. This has raised many more questions throughout the years with many more students. What did Brian’s question really mean about himself as a learner of mathematics? How could this person’s previous experiences not allow him to see what real mathematics was? Why did he feel that he wasn’t learning mathematics? What was Brian’s story? These are all questions which I continually reflect on and wonder what Brian’s “mathematical story” was. As an educator, it was a lost

opportunity to gain insight into this student's experiences with learning mathematics. It was Brian's voice which had the power to create meaning and context about the complex act of learning mathematics.

Their Stories

This research will look at the complexities of being a learner of mathematics through the lens of the student. It will give voice to learners through the power of their stories. Every person's story is different and unique and, as a collection, they create a body of knowledge for mathematics educators to use as they work towards engaging students in learning mathematics. This research supports the sharing of deep and reflective student stories. It enabled students to explore their experiences with learning mathematics and to tell their stories to educators.

This is a phenomenographic study which is "an area of research which focuses on identifying and describing the qualitatively different ways in which people understand phenomena in the world around them" (Franz, Ferreira & Thambiratam, 1997, p. 21). By using this method a range of student perceptions will be explored which allows the individual spirit of the experience to develop. Principles of narrative inquiry will be used to co-author the narrative texts which will tell the students' stories that are the heart of this phenomenographic study.

Franz, Ferreira and Thambiratam (1997), state that in order to enhance teaching it is essential to gain a better understanding of how students learn. It is also critical to understand how students interact with the learning process. This is the essence of student engagement, and understanding student perceptions of it can help educators

inform their practice. By creating a place for students to tell their stories, another dimension is added to understanding the complex layers of learning mathematics.

This research will use student engagement as a cornerstone for students to tell their stories. Student engagement will provide a structure for students to weave their stories, and it will create a framework for interpretation. This study is an opportunity to view engagement with mathematics through the students' eyes and to gain insight into how students define their successes as learners of mathematics. These are critical issues for educators to understand as they pursue rich mathematical learning opportunities for their students.

Chapter 2

The Storyteller and Engagement with Mathematics

The Storyteller

The middle years student has unique learning needs that are related to the developmental stage of adolescence. Middle years learners need a safe environment that allows them to explore their gifts and talents and to have new experiences that expand their world (Wormeli, 2001). The middle years learning environment needs to include a curriculum which is hands on, active and relevant to the world of the adolescent. It must include opportunities for social and emotional growth as well as cognitive development.

The middle years learner in the twenty-first century lives in a world which is influenced by a wide range of societal issues. The bombardment of media messages, global warming and social justice issues all affect the curricular aspects of middle years education, including mathematics. “Learning mathematics within context and making connections relevant to learners can validate past experiences, and increase student willingness to participate and be actively engaged” (Manitoba Education, Citizenship and Training, 2007, p.10). Middle years students’ experiences also include a multitude of images and information which is accessed through technology. This allows students to be more globally aware, but they need support in understanding and dealing with the complexities of these issues. In mathematics, “we must distinguish between using things in the world around us to do math, and using math to understand the world around us” (Stocker, 2006, p. 11).

The History of Middle Years

The identification of adolescence as a unique stage in development has had an impact on education since Hall's work in the early 1900's. He not only identifies the physical changes attributed to the stage but also the spiritual and emotional changes which require a schooling experience that not only supports the academic learning of the child but also allows for the creation of opportunities to develop positive self esteem. This manifested itself into the creation of the concept of junior high school.

The National Middle School Association (NMSA) provides leadership and professional development opportunities to support professional dialogue around middle years education. It was not until the 1960's that the middle school concept was introduced and it did not gain momentum until the 1980's. In Manitoba, faculties of education now have a specific specialization for middle years teacher candidates. This has had a huge impact in validating the middle years concept in the Manitoba educational context.

The NMSA publication in 1995 of, *This We Believe*, provides six characteristics of a responsive middle school: a curriculum which is challenging, integrative and exploratory; varied teaching and learning approaches; assessment and evaluation that promotes learning; flexible organizational structures; programs and policies that foster health, wellness, and safety; and, comprehensive guidance and support services (p. 11). These characteristics can be supported in schools through many organizational and pedagogical structures such as: block timetabling (to support curricular integration), teacher advisors, inquiry learning, student voice

groups, self-awareness, and exploratory opportunities. However, the cornerstone of the middle years approach is the creation of strong relationships between the teacher and the student, which is the basis for a successful learning environment.

Middle Years Mathematics

NCTM's *Principles and Standards for School Mathematics* (2000), provides a framework for educators which includes the themes of equity, curriculum, teaching, learning, assessment and technology. At the middle years level, teachers must have a strong understanding of the intellectual, emotional and physical needs of young adolescents and the ability to use research-based practices which are appropriate for this age level (NMSA, 2006, p. 14). "Teaching mathematics well involves creating, enriching, maintaining, and adapting instruction to move towards mathematical goals, capture and sustain interest, and engage students in building mathematical understanding" (NCTM, 2000, p. 18). This requires that teachers know their students as individuals so that their unique experiences can be interwoven into rich mathematical experiences which support learning for understanding.

Creating a mathematics learning environment which supports the middle years learner is important to the teaching and learning process. The Editorial Panel of *Mathematics Teaching in the Middle School* suggest that as well as knowing each student, it is important that teachers establish a community of learners where risk taking in learning is modeled and encouraged. Middle years students are active learners and they need to have variety in their tasks, activities, investigations, and connections between the mathematical strands. The energy which middle school

students bring with them to class creates an opportunity for mathematics to be explored in a “fun” environment where humour is essential. “Positive passion is contagious in the classroom”, and it helps to capture the enthusiasm of the middle years learner (Editorial Panel, 2006, p. 419).

In Manitoba, middle years mathematics education is currently being revised in collaboration with the Western and Northern Canadian Protocol to provide consistent outcomes for students not only throughout Manitoba but also with the Western Canadian Provinces. The revised Manitoba framework is available for voluntary implementation in the 2007-2008 school year with mandatory implementation occurring in 2008-2009. The document, *Manitoba Framework for K-9 Mathematics* (Manitoba Education, Citizenship and Youth (MECY), 2007) is in draft form, but will be used in this study to provide a vision for the direction of mathematics education in Manitoba.

This document is centered on the beliefs that all students are individuals and bring differing experiences and backgrounds to the learning environment. The learning environment must be respectful of this, include a variety of materials and pedagogy, support risk taking and stimulate meaningful student discussions about mathematics. Students need to move from “simple to complex”, from “concrete to abstract”, and “explore problem solving situations to become mathematically literate. The ‘curious active’ nature of the middle years student is reflected in these beliefs about learning mathematics” (MECY, 2007, p. 2).

As learners of mathematics, middle years students must have an approach that allows them to explore math in an interactive manner. Mathematics learning is not

done in isolation but as part of an interactive process that engages both teacher and learners. In any mathematics classroom, the teacher and the learners work together to build a rich learning environment. Steffe (1990) states that “mathematics is a human activity that is carried out in the social context of the classroom” (p. 45). He suggests that the interactive nature of mathematics supports the learning of all students. Davis (2001) brings forth the belief that the teacher is not the only teacher in the classroom. The interaction between children in the classroom also supports the learning of each individual student of mathematics. This is reflected in the introduction of the framework document.

In the *Manitoba Framework for K-9 Mathematics*, (MECY, 2007) the Goals for Students are:

The main goals of mathematics education are to prepare students to

- *Use mathematics confidently to solve problems*
- *Communicate and reason mathematically*
- *Appreciate and value mathematics*
- *Make connections between mathematics and its applications*
- *Commit themselves to lifelong learning*
- *Become mathematically literate adults, using mathematics to contribute to society*

Students who have met these goals will

- *Gain understanding and appreciation of the contributions of mathematics as a science, philosophy, and art*
- *Exhibit a positive attitude toward mathematics*
- *Engage and persevere in mathematical tasks and projects*
- *Contribute to mathematical discussions*
- *Take risks in performing mathematical tasks*
- *Exhibit curiosity*

(MECY, 2007, p. 4)

These goals include cognitive (understanding, make connections, reason mathematically), behavioural (exhibit, persevere, commit, risk taking) and affective

(appreciate and value, confidence) aspects of learning. They provide a multidimensional context on which to view the learning of middle years mathematics.

In this Manitoba Framework, the specific outcomes, with achievement indicators, are identified for each grade level. The specific outcomes for Grade 8 are all linked to mathematical content. None of the affective attributes of learning mathematics which are identified in the goals for students are included in the specific outcomes. Mathematics educators will only gain insight into the affective attributes of learning mathematics from the introduction component of the document. It is critical that educators are aware of the multifaceted approach to the curriculum during implementation to ensure the essence of the curriculum is shared. “Teachers, students and parents need to recognize the relationship between the affective and cognitive domains, and attempt to nurture those aspects of the affective domain that contribute to positive attitudes” (MECY, 2007, p. 3). They must include these affective aspects of learning mathematics in the specific outcomes for each grade level to ensure that it is part of the mathematical experience students participate in.

Student Engagement

Student engagement is a term which has moved to the forefront of educational discourse in Manitoba since its inclusion in the Manitoba Provincial Assessment Policy.

The primary purpose of the policy is to enhance student learning and engagement through classroom-based assessment processes that build student awareness and confidence in learning. Research shows that both the quality and level of academic achievement and student engagement can be increased through formative assessment (assessment for and as learning).(MECY, 2007, p. 3)

Manitoba Education, Citizenship and Youth developed a process where students can be involved in the assessment of engagement so that it would be part of the learning process. “The active engagement of students is an essential element of assessment that makes a positive difference in student learning” (MECY, 2007, p. 7). To accomplish this, teachers are encouraged to use materials that are appropriate to their specific learning environment. It recommends that teachers begin the discussion about student engagement assessment in September so that students will be able to reflect and discuss their engagement throughout the year. Reporting to parents, students and the community takes place at the end of January, providing a mid-year snapshot of student engagement to all stakeholders.

Irvin’s (no date) research on teacher conceptions of how to increase student engagement found that teachers hold diverse understandings about the facilitation of student engagement and do not share similar understandings about the constructs of engagement. It is therefore important that engagement is well defined and explicitly stated in each piece of education research. This is echoed in the MECY document, “Currently there is no universally accepted definition of the term ‘student engagement’. This lack of consensus requires that a working definition of ‘student engagement’ be stated so educators of Grade 7 students in Manitoba have a

common frame of reference when they are using this document” (MEYC, 2007, p. 14).

The Two Sides of Engagement

There are diverse meanings of engagement within the field of education. At one end of the spectrum, MECY has developed the following definition of engagement which frames it as a measurable and quantifiable data source for provincial analysis.

Student engagement is a multifaceted concept that reflects student **actions** related to engagement, their **feelings** about school, and their **understandings** about their own learning. (MECY, 2007 p.14)

The process requires teachers to report on Student Engagement in Grade 7. The indicators to be reported on are:

- **Demonstrating an interest in his/her learning** (discussion work with peers or teacher, pursuing learning goals, showing an interest in independent research or learning, “going beyond” the assignment/extending his/her learning, working with enthusiasm, etc.)
- **Engaging in self-assessment** (comparing work to assignment criteria or an exemplar to see if it can be improved; proofreading, revising, comparing current work with past work, using a portfolio process for this purpose, etc.)
- **Being aware of learning goals** of a unit of study and/or personal learning goals (participating in discussions/activities, identifying goals, using self reports/ journal entries/portfolios, student led conference(s), student teacher conversations, etc.).
- **Participating in lessons** (listening, questioning, sharing with peers, engaging with activities related to the lesson, etc.)
- **Accepting responsibility for assignments** (handing in assignments on time, completing work in class when assigned, meeting assignment criteria, etc).

Teachers report on the level of performance for each indicator as: **Emerging**, **Developing**, **Established** or **Inconsistent**. There is also an area for **teacher comment** (optional) and for **student reflection** and **goal setting** (optional) on the reporting template.

This reporting process requires teachers to look at the whole student across all subject areas. However, within the guidelines there is an opportunity for students to complete the engagement profile for different subjects if they feel there are differing levels of engagement. The assessment process has sparked professional dialogue regarding the term “student engagement” as teachers wrestle with the demands of completing this provincial assessment requirement. As these indicators are reported to students and their parents, the term will be widely used and discussed.

At the other end of the spectrum, Tomlinson (1999) uses the term student engagement in the context of supporting children’s learning within a differentiated classroom.

Engagement happens when a lesson captures students’ imagination, snares their curiosity, ignites their opinions, or taps their souls. (Tomlinson, 1999, p. 38)

This definition captures the passion and aesthetics of learning. It creates a framework for educators to think of engagement in a non-structured creative, responsive environment on which to build. As mathematics educators, it creates opportunities to allow students to capture their imagination and ignite their curiosity in the learning of mathematics.

These two orientations illustrate the dichotomy between the two essences of engagement and therefore create different opportunities for research. The provincial assessment of student engagement has defined criteria for teachers to measure their students' engagement. Tomlinson's definition creates a context for educators to view engagement as an interactive passionate entity of education. In this study, the aesthetics of story allows students to explore their deep feelings and understandings of engagement. The use of story in this research will allow the context of Tomlinson's definition to be explored. It creates an opportunity to deepen the understanding of how students perceive themselves as being engaged in learning.

A Working Definition of Engagement

The terms school engagement and student engagement are both used in research, depending on the breadth of focus of the study. School engagement can include such indicators as participation in extra curricular activities and provides a wide snapshot of activities throughout the school experience. Student engagement focuses on the teacher student relationship and indicators which occur within the classroom context.

For the purposes of this research, I will be using the definition of student engagement that was developed by Fredericks, Blumerfeld and Paris (2004), which delineates three facets. **Behavioural engagement** relates to on-task behaviour and student conduct; **affective engagement** relates to student attitudes, values, and interests; and **cognitive engagement** relates to motivation and self regulated

learning. Many studies have been done on these individual facets of engagement, but more recently the focus is on defining student engagement as a multifaceted entity unto itself. “The fusion of behaviour, emotion and cognition under the idea of engagement is valuable because it may provide a richer characterization of children than is possible in research on single components” (Fredericks, Blumerfeld & Paris, 2003, p. 61). The phenomenographic research method which I will be using will allow the passion elicited in Tomlinson’s definition of engagement to be explored through the use of story.

Engagement and Middle Years

Engagement is associated with positive school outcomes and is an important goal for educators. Students who are engaged in school are more likely to learn, like school, graduate and pursue higher education. “Engagement is an important facet of students’ school experience because of its logical relationship to achievement and to optimal human development” (Marks, 2000, p. 155). In her study, Marks surveyed students about their attitudes, behaviours and experiences in mathematics and social studies. She found that subject matter did not seem to influence engagement in middle years students, but it did in high school and elementary students.

Marks also found that peer alienation detracts from engagement to the greatest extent in middle school students. The social emotional development of middle years students is intertwined with their learning and it was clearly evident in her study. Students were more worried about their peers at middle years than they were at any

other level. Similarly, Bishop and Pflaum (2005) found that middle school students strongly perceive that social conditions of the classroom influence their academic engagement both negatively and positively. I feel that these studies illustrate the uniqueness of the middle years learner and accentuate the need to conduct research specifically for this educational group.

Engagement and Mathematics

Conducting research exclusively in the context of the middle years mathematics classroom is imperative as educators continue to implement new curriculum, pedagogy and strategies. Martin and Marsh (no date) found that there is merit in conducting research that is specific to a given school subject. Their study of middle years math, science and English demonstrated that the largest variance in motivation and engagement is found at the student level. However, only in mathematics was there a class level variance in engagement. This has an impact on educators when looking at interventions for student engagement and deciding if they should be school wide, classroom based or directed at the individual learner. This study suggests that classroom interventions could be successful in mathematics.

Research that is exclusively in mathematics classes allows mathematics educators to reflect on the interactive nature of mathematics as part of the learning environment. Boaler's (2002) study in England, measured the academic achievement of two groups of students taught differently over three years and created a unique base of information for the field of mathematics education. She

found that math classes, which have a ritual of procedural reproduction actually caused students to leave the field of mathematics because they want to “express their own ideas, engage in social interaction and exercise their freedom of thought” (p. 44). Students who were allowed to engage in mathematical discussions as part of their learning process were more likely to continue to include mathematics as part of their education.

Student engagement within education is complex because it has associated behavioural, affective, and cognitive dimensions. Within the mathematics classroom, engagement is demonstrated through students’ actions, their feelings towards mathematics and their understandings about their learning. It is the combination of all three areas that provides the concept of engagement with a rich definition. It is not just about students enjoying math, or that they work hard in class; it must also include their understandings of mathematics that are developed in the classroom.

Engagement and Disengagement

Some of the current focus on engagement is motivated by research that identifies the consequences of disengagement. Fredericks, Blumerfeld and Paris (2004) identified low levels of academic achievement, high levels of student boredom and disaffection, and high urban drop out rates as underlying factors of what has ignited the interest in school engagement. Carroll (2003) identified that, “much research into mathematics education in recent years has been driven by concerns about student achievement in mathematics” and has caused research to be

focused on the teacher and their pedagogy and strategies used within the classroom (p. 208).

As educators struggle with the disengagement of students in mathematics classrooms, they are looking at their practice as a way to support engagement in the classroom. It is important that student voice is part of this reflective process. Sullivan, Tobias and McDonough (2006) explored the lack of engagement of middle years students in mathematics with respect to the decision making of students. They found that there was a deliberate decision by students to not be engaged within the classroom and this was largely peer influenced. They completed interviews with 50 students largely from low socioeconomic areas. Their research is important in the middle school context, as the students' decision to be disengaged was not reflective of the pedagogy of their classroom but it was affected by their peer relationships.

Greeno and MMAP (1997) identify the "covert engagement" middle school students can experience. Students sometimes are reluctant to participate in whole class interactions or to show that they are truly interested in mathematics (p. 107). He tells the story of Hector who never handed in his work. In the MMAP classroom he participated in the learning activities, acted as a peer tutor and successfully completed the graph that was required. However, at the end of the activity, Hector still did not hand in his work which was a major component of the assessment. This illustrates the need to include student voice in the study of engagement, as it is a personal decision with many layers and facets as to how and why engagement occurs or does not occur for each individual.

Engagement and Voice

Teacher perceptions of student behaviour leave room for misinterpretation of engagement as observed in the classroom. Using student voice to explore the notion of engagement is important to allow the true essence of the experience to be understood. The need for students to describe their experiences and tell their stories is a critical part of educational research and one which I feel will add to professional dialogue about student engagement. There is a need to hear from the students who are experiencing the phenomena and to amplify their voice to support the professional development of mathematics teachers. “Students themselves rarely have been consulted as ‘knowers’ in this process, as valuable informants of when they are truly engaged, and of what they deem as conditions influencing their engagement” (Bishop & Pflaum, 2005, p. 1).

For this study to give voice to middle years learners, it is vital that there is a framework to provide a context for their stories. The framework for the data flow will focus students’ reflections and responses around the three facets of engagement: cognitive engagement, affective engagement, and behavioural engagement. This will provide a scaffold for students to build their stories of engagement with mathematics in their middle years classroom. Their stories will enable me to identify perspectives of the middle years learner. “Research that takes a qualitative approach to understanding phenomenology of engagement is needed. Qualitative methods can illustrate the process whereby students construct meaning and purpose of education in a highly complex and sometimes contradictory school environment” (Fredericks, Blumerfeld & Paris, 2004, p. 86). It is the goal of this

study to provide research that will add to this body of knowledge through the lens of the middle years student.

The stories of students are theirs to be said and theirs to be amplified – it is their becoming. ...Listening to learners is vital to their becoming in the mathematics classroom. I hope that others are not only encouraged to engage in inquiry into the success of learners in mathematics classrooms, but that they are also encouraged to listen to the learners that they interact with daily. If we want to understand how to teach exceptionally, to understand how to design curriculum effectively, and to understand what it means to learn excellently, we will have to listen to the voices of the students in our classrooms. (McFeeters, 2006, p. 173)

Chapter 3

Building a Structure for Their Stories

This chapter will identify the methods that were proposed for data gathering and the interpretive framework for data analysis. As students give voice to mathematical stories, it is imperative that there was a research methodology to ensure that their voices remain true to their experience. I attempted to design this study to support student voice as they told their mathematics stories. A story elicits the heart and soul of a person's voice. This study was designed to focus the students' stories of engagement within the mathematics classroom and provided for insight into their meaning. Phenomenography was used to build meaning from the texts as a collection, using the interpretive framework of student engagement as defined in Chapter 2.

Phenomenographic Research

Phenomenography is the empirical study of the differing ways people experience, perceive, apprehend, understand, conceptualise various phenomena in and aspects of the world around us. (Marton, 1994, p. 4)

Introduction

Each person's story is unique and influenced by many factors within his/her lived experiences (King, 2000). Phenomenography allows the researcher to view the range of experiences with a phenomenon. The phenomena of engagement with mathematics as experienced by middle years students must be viewed through their eyes and their words. Phenomenography does not make any assumptions about the

nature of reality or the way in which the phenomena is experienced. The researcher must “bracket” or leave behind his/her assumptions and notions in order to allow the true meanings of the participants’ experiences to be developed (McMillan, 2004, p. 274). This open-ended thought process allows researchers to explore the phenomena without any boundaries of expectations. I feel that this is crucial to my research as it allows the student voice to shine through without any preconceptions. The students tell their stories, whether they are supportive of their mathematics education or not. In this way it allows educators to explore the notion of engagement through a different lens and to view it in a deep way through the eyes of the students.

Orgill (2007) identified two benefits to phenomenographic research. One is that the information about how a student experiences a phenomenon is useful to teachers in planning rich mathematical learning experiences. Teachers must be aware of how the learner is experiencing mathematics in order to make informed decisions. Secondly, students learn about themselves and how they experience a phenomenon and become more open to alternate ideas as they reflect on their perceptions and understandings. There can be strong learning opportunities for students by participating in this research. I feel that a strength of the design of this study is that not only will educators be able to learn from the stories about engagement with mathematics, but participants had the opportunity to learn about themselves through the process.

History of Phenomenography

Phenomenography originated as an educational research method through the work done by Ference Marton and his colleagues at the University of Göteborg in Sweden during the 1970's. It began as this research group wrestled with the questions: "What does it mean, that some people are better at learning than others? and Why some people are better at learning than others?" (Marton, 1994, p. 4424). Their research required students to read a text and described how they had learned that text in an individual interview. This methodology was adopted and used by other researchers in education as well as business and has become a distinct research specialization (Pang, 2003).

As Pang (2003) discusses, although phenomenography began with identifying the different ways in which people experience a phenomena, the methodology has grown to allow for a deeper interpretation of the data. It is not only telling the story, but it is looking for the interaction of the storyteller with the critical elements of the context. The researcher is looking for meaning in the experiences of the participants.

The new phenomenography studies both the variation among different ways of experiencing something as seen by the researcher, and the variation among the critical aspects of the phenomenon itself as experienced by the learner.(Pang, 2003, p. 152)

Data Collection and Interpretation

Phenomenography aims to capture perceptions of personal experiences. To achieve this, data processes must support deep interactions between the researcher and the participant. I proposed to use narrative texts which were created using the

data sources of interactive writing and interviews in this study. Focus groups could be conducted, if necessary, at the completion of the interviews to support the interpretive process.

There are two reasons for choosing this data collection method. The first is to allow students different ways to reflect on their engagement with mathematics and also to express themselves to the researcher. This supports the diversity of the students by using both written and oral expression and, if necessary, group and individual interview methods. The second reason is to allow the relationship between the researcher and the students to develop. By including multiple data sources over a longer period of time, the opportunity for the student to feel comfortable with the researcher is increased. "The aim of the interview is to have the participant reflect on his or her experiences and then relate those experiences to the interviewer in such a way that the two come to a mutual understanding about the meanings of the experiences or of the account of the experience" (Orgill, 2007, p. 2). The participant must feel comfortable to be able to share the true "essence" of the experience of the phenomena and therefore must have a relationship with the researcher.

To provide an opportunity to interpret the data collected through the telling of stories, the researcher must be immersed in the data. My intention was that the interviews and focus group conversations would be recorded electronically. The narrative texts and interactive writing samples would also be included in the interpretation. Marton (1994) identified that through this process categories of descriptions would emerge. These categories of description are retested against the

data and adjusted and retested again until a stable outcome space has been defined. “Once a stable outcome space has been defined, the researcher attempts to develop as deep an understanding as possible of what has been said, or rather what is meant”(Marton, 1994, p. 4428). Here the word “meant” points towards understanding of the student intentions and beliefs that are inside of their words. Phenomenography as a research method allowed me to deeply reflect on the students’ words and to build meaning using the interpretive framework of engagement.

Building Relationships

Creating relationships between the researcher and each participant enriches the data collection processes of this study. To support this process, interactive writing opportunities were planned for use over a two-week time frame.

Interactive Writing

The use of interactive writing to develop the relationship between the researcher and the participants provides a context on which to build the interview questions. According to Mason and McFeeters (2002), the interactive writing process begins with prompts which invite student’s written responses. The teacher reads the student response and replies in written form the next day. This allows not only the researcher to gain insight into the student’s thoughts, but it also allows the student to view the researcher as an interested participant. Mason and McFeeters identify that “the teacher’s response can provide students with a sense of audience for their writing and recognize the student as a particular person with something

significant to say” (p. 536). In this research, there was a focus to ensure that the students know their voice is important and their words create the richness of the data for interpretation.

In addition to providing a process for the researcher and the students to get to know one another, interactive writing also allows students to express themselves through written text. One of the goals of this research was for students to explore their experiences, feelings, and understandings of being learners of mathematics. By having students communicate about mathematics in written form, it “allows insight into how students are developing concepts, skills, attitudes, and processes” (Dougherty, 1996, p. 556). The written form can prompt students to explore their experiences and understandings in a reflective manner. It can also bring mathematics into more human terms and allow students to take greater risks in their responses. I provided an opportunity to incorporate personal aspects from the students’ interactive writing in the development of interview questions to allow for deeper exploration of their understandings of learning mathematics.

The interactive writing component of this study was to occur for nine days. The writing prompts were based on the three aspects of student engagement: behavioural, cognitive and affective (See Appendix 1). The researcher’s responses were intended to prompt students to think more deeply about their engagement in the mathematics classroom and support the development of a relationship. The students wrote their entries in their actual mathematics classroom to support the depth of data collected (Marks, 2000). The interactive writing responses stimulate discussion throughout the data collection process.

Transitional Interviews

Transitional interviews are a vital data source for this study. During the interviews, the goal of the researcher was to have the student feel relaxed and open to talking about the topics in meaningful ways (Bogdan, 2004). The data that was obtained during the interactive writing exercises supported this process. The transitional interviews allowed for in-depth discussion about each student's experiences and understandings. This process provided the framework on which to tell their stories.

The transitional interviews were planned to be approximately fifteen minutes in length. This was to allow time for a rapport to be established and for students to reflect on their past interactions in math class. The interviews provided an opportunity for students to describe their experiences, feelings, and understandings about themselves as learners of mathematics. They also supported the conversation about learning mathematics within the interpretive framework of behavioural engagement, affective engagement, and cognitive engagement. These terms were only be used by myself as a listener. I would not be using the specific terms of behavioural, affective, and cognitive engagement in the interview process with students. Students were invited to talk in their own words.

Their Stories

The data collected from the interactive writing activities and transitional interviews were used by the researcher to compose the narrative texts. These narrative texts were shared with each individual student in a follow-up interview to

gain insight into the meaning of the texts and to ensure that they were true to their story. During the data collection, the participants had time to reflect on their words and to look deeper into their experiences with mathematics within their middle years classroom.

Narrative Texts

Narrative text allows researchers to layer the data gathered through the process of the researcher and the participant exploring the text. “Written narrative accounts have the capacity to illuminate the often complex and deeply problematic nature of people’s lived experience. ...Often the mere act of ‘telling their own story’...may reveal hidden positive dimensions of experience and enable them to see their worlds in a more positive light or become aware of new possibilities” (Stringer, 2004, p. 130). The narrative text can not only provide educators with information to reflect on, it may enable the students to gain insights into their experiences, which is part of the assessment component of learning mathematics. “Therefore, difficult as it may be to tell a story, the more difficult but important task is the retelling of stories that allow for growth and change” (Clandinin & Connelly, 2000, p. 71).

I planned to compose the narrative text based on the interactive writing and transitional interview responses of each student. The student and I would review the text during the reflective narrative interview and together edit the text so the student felt that it told his/her story. Clandinin and Connelly (2000) identify that the collaboration of the researcher and the student through the narrative inquiry process builds understanding of the experience being explored (p. 20). This is at the core of

a phenomenographic study and supports the two methodologies working together to ensure that the integrity of the student voice is preserved and deep meaning can be explored through the interpretive process. The researcher gains insight into the words which she has written through the reflective narrative interview process. Within themselves the narrative texts can be powerful for mathematics educators to read, reflect on, and to stimulate discourse.

Focus Groups

Focus groups allow for the creation of conversation in a familiar environment. Qualitative researchers use focus groups to hear the range of views of the participants and to support those who may not be able to talk as thoughtfully in an individual interview (Bogdan, 2003). In this study, the purpose of the focus groups would be to build familiarity and a relationship with the researcher and to allow the students to interact with each other about engagement and being learners of mathematics. Stringer (2004) feels that the data becomes more effective when individuals are able to explore their experiences and beliefs interactively. Through this process they could be exposed to a range of views. The conversation with their peers provides the opportunity for another layer to their stories.

Focus groups would be conducted at the completion of the interviews, if they were deemed necessary by the researcher. The decision was to depend upon the richness of the other processes which the students had participated in. As the stories are composed, opportunities for further questions may present themselves. As a

researcher, it was important to me that the opportunity for group reflection would be available at that time.

Data Analysis

Phenomenographic research requires that the data is approached in a holistic form. It aims to reveal the variety of ways of experiencing a phenomenon. For each participant, interactive writing responses and transitional interview recordings are used to compose the narrative texts which are prepared by the researcher and the participant. The narrative texts (stories) and focus group transcripts (if necessary) would be included as data for the phenomenographic study. “The data is pooled, temporarily losing the individual context in which it was gathered and gaining a collective context of the voices of the other individuals who have contributed to the data” (Asghari, 2004, p. 2-65). Asghari suggests that I must immerse myself in the data in order to allow the categories of description to emerge.

The categories of description would be interpreted using the framework of the three facets of student engagement: affective engagement, behavioural engagement and cognitive engagement that have been defined in this study. These categories of description would be analysed in a hierarchical order to create the outcome space. It was through this process that the theoretical meaning would be interpreted and the deeper understandings of student perceptions of their engagement with mathematics would be developed. The use of the multifaceted framework of student engagement ensures that the behavioural, cognitive, and affective aspects of learning mathematics are explored. This was the component of the study which would give purpose and power to the voice of the students.

The narrative texts, developed in collaboration between the researcher and the students, would provide the stories that create a unique collection for teachers to study. Within themselves, the stories would create a body of knowledge to ignite and stimulate professional dialogue about student engagement within the middle years mathematics classroom.

The Beginning

Recruitment

This study used a convenience sample from two Grade 8 homerooms in a middle class suburban middle year school. Initially, the teacher of one of the homerooms and I reviewed the methodology of the study including the writing prompts and interview questions. During the initial meeting with the students, I shared “My Story” from Chapter 1 to create a context of story for them. Students had the opportunity to ask questions and gain insight into the research. They were provided with a letter of consent for their parents (See Appendix 2) and assent for themselves. A further parent and child meeting allows parents the opportunity for clarification about the research methodology. The teacher of mathematics would be included in these information sessions to ensure that all participants are informed about the goals, process and intentions of the research.

Sequence of Events

Once participants were identified, following Research Ethics Board approval, the data collection activities were to proceed as follows:

Cycle one

- Day 1: Interactive writing prompt (behavioural engagement) completed during the last 10 minutes of math class. Researcher response shared next day.
- Day 2: Interactive writing prompt (behavioural engagement) Researcher response shared next day.
- Day 3: Interactive writing prompt (behavioural engagement) Researcher response shared the next day.

Cycle two

- Repeat cycle one using the context of cognitive engagement.

Cycle three

- Repeat cycle one using the context of affective engagement.

Narrative text generation

- Day 10 – 13: Transitional interviews
- Day 14 – 20: Researcher will compose narrative text for each participant
- Day 20 – 23: Reflective narrative interviews
- Day 24 – 30: Researcher revises final narrative texts

This is an intensive process with participants meeting with the researcher twice and participating in the interactive writing process nine times. The data generated through the interactive writing process would be used throughout the remainder of the data gathering process to provide a context for the researcher. The oral data is reviewed electronically during the narrative text construction including the recording of quotable elements.

The interpretation of the data was to use the framework of the three aspects of engagement: cognitive engagement, affective engagement and behavioural

engagement. The final narrative texts would provide the basis for interpretation with other data supporting theme synthesis, creating meaning for re-telling of **“their stories.”**

Chapter 4

Storytelling and Layers of Learning

This chapter will summarize the data collection and interpretive processes which evolved during this research project. It will also identify the opportunities and challenges which arose during the data collection process and how they effected the interpretation. I developed this approach for creating layers of interpretation by blending the principals of narrative inquiry with phenomenography. This process allowed me to use different lenses to view the experiences which students shared as their stories evolved. It also provided students with multiple layers of learning about themselves as their stories took shape and their voices created understandings.

The research methods and constructs of this research study evolved throughout the Research Ethics Board approval process and the data collection process. Interactive writing, interviews, and narrative texts in the student interactive component created a rich relational framework which allowed the complexities of the teaching and learning process to be portrayed by the data and its interpretation. My relationship with the students developed quickly and this enabled me to weave a teaching orientation into my research stance. As classroom considerations warranted, I amended the research process outlined in the original proposal to enrich the research and to support the participants' storytelling and learning.

The Storytellers

All participants in this research project were from two Grade 8 homerooms in a suburban middle school in the province of Manitoba. The two classrooms were team taught by Mrs. Z and Mrs. Y who brought both classes together to create flexible learning communities to support diverse student learning. The students were grouped in a variety of ways dependent upon the subject and activity which was being studied. In mathematics, the two homerooms were divided into two groups which allowed students who were having difficulty in math to work in a smaller teacher-student ratio setting. This group had 12 students working with Mrs. Z and the rest of the 32 students worked with Mrs. Y. The 32 students who worked with Mrs. Y formed the convenience population for this study. The fact that these two groups were structured by ability in mathematics must be taken into account during the interpretation process. The students who identified themselves as needing additional support were not included in this research study due to the classroom groupings.

I initially met with the 32 students during their scheduled math class with Mrs. Y. This was intentional to help the students see that this research would be part of their regular math class. The students were quiet and respectful as I was talking to them, almost too quiet. I shared with them that I was interested in what they had to say about their learning of mathematics and that it is important for teachers to hear their perceptions and understandings of being learners of mathematics. As I handed out the letters of consent and assent to the students, I knew that I needed to immediately begin making connections, so I took time to speak to each student as I

went around the classroom. This began the process of building our relationships and also helped the students realize that each person has perceptions and insights which are important to share.

Two days later, an evening information meeting was held in the students' classroom for parents and students to attend. The letters of assent and consent were extremely informative, but I felt that the formality and complexities of the letters would create a certain amount of parental concern regarding their children's participation in the study. As a researcher, I was surprised that not one person attended this meeting. The letters of assent and consent were returned quickly and 25 students had permission to participate in the study. The students were eager and willing to participate in this research project. Of the 25 eligible participants, one student did not complete the interview process due to illness and subsequently a narrative text was not composed for her. Therefore, 24 students, 10 boys and 14 girls completed all of the data collection activities which resulted in the co-authoring by myself and the student of the final narrative texts.

The large number of students who participated in this research study created a challenge during the data collection process. The quantity of data generated through the interactive writing process and two interviews for each participant was large. The multifaceted definition of student engagement which includes behavioural engagement, cognitive engagement, and affective engagement (Fredericks, Blumerfeld & Paris, 2004) was used to develop the interactive writing prompts and interview questions. It also allowed the data to be organized in three interwoven yet distinctive categories throughout the data collection process. The three distinct

aspects of student engagement allowed the interpretative framework to enhance the data collection process by creating a framework for students' stories to be told through the narrative texts.

The data was collected over a four- week period from the middle of May to the middle of June. This is a distinctive time of the year in any school as students begin to look towards their summer holidays and certain school and classroom rituals take place. It was especially significant with this group of students as they were leaving their school after three years and moving to high school next year. The lateness in the school year created a challenge for me as a researcher as there were tightly defined timelines which I needed to adhere to. However, this also created an opportunity to allow students to reflect on their Grade 8 year near its completion and also to extend their thoughts about learning mathematics in high school.

Data Collection: Building Their Stories

Step One: Interactive Writing

The interactive writing process was completed by all 32 students in the classroom, including the students who were not participants in the study. In consultation with the teacher, the educational value of all students completing this process was supported. This allowed each student to reflect on his/her practices and to allow myself the opportunity to interact with each one through the writing process. Students were aware that this was not part of their mathematics assessment; rather it was an opportunity to reflect on themselves as learners of mathematics.

Each student was provided with a folder which contained a piece of paper with the interactive writing prompt for the day. The folders were handed out in the last ten minutes of math class by the teacher and the students were asked to respond to the question. I collected the folders at the end of the day and wrote my responses in the evening and delivered them to the school the next morning with the next writing prompt added to each folder. I could hardly wait to pick up the folders on my way home each day and read what each student had written.

Seven interactive writing pieces were completed during a two-week period. Adjustments had to be made to accommodate school activities which affected the math classroom time. I did not visit the students' math class during the interactive writing process and allowed the relationships to develop through the written word. This was an intentional decision to allow myself as the researcher the experience of interactive writing as the sole relationship building activity prior to the individual interviews. I was so appreciative of the effort the students were putting into their responses that I sent a letter for Mrs. Y to read to them after the fourth writing prompt to thank the students for their rich responses and their participation in the study.

On one of the days, the classroom went on a field trip and returned to school thirty minutes before dismissal. The class always writes a reflection on the field trip when they return to class, but Mrs. Y decided not to do it this time as the students seemed so tired. She suggested to them that they could do their writings for Mrs. Birse, expecting the students to say no, that they just wanted to relax. However, the students were eager to get their folders and to begin writing their next responses.

Mrs. Y felt that the students reacted this way because they were eager to read what had been written to them. This illustrates the relational nature of the interactive writing process. As I read the students' responses to each day's prompt, I felt confident that their relationships with me were well on their way to being established enough to support the interview process.

Adapting writing prompts to the experience. The power of the interactive writing experience required me to change the order and wording of the original prompts which I had written in my proposal. As I reflected on the writings the students were sharing each day, it became increasingly apparent that the writing prompts which I was giving them needed to build on the responses they were providing. My writings responded to the students personally and many times I asked an additional question to push their thinking. However, I needed to use my experience, knowledge and skills as a teacher to adapt the prompts to ensure that they elicited responses which could enhance the data which was being written in the responses. Table 1 summarizes the changes in the prompts which were made. [All student names in this document are pseudonyms]

Table 1: Original and Revised Interactive Writing Prompts

Original Interactive Writing Prompts	<i>Revised Interactive Writing Prompts</i>
1. Explain one task you were asked to do in math class today. Describe what you did. (B)	<i>1. Explain one task you were asked to do in math class today. Describe to me what you actually did during this task. (B)</i>
2. Tell me about a time in class today when you understood the math you were doing. Explain why. (B + C)	<i>2. Tell me about a time in class today when you understood the math you were doing. (B+C)</i>
3. If I was watching you in math class today, what would I see you do? (B)	<i>3. If I was watching you at your best moment in math class today, what would I see you do? (B)</i>
4. What did you learn in class today? Explain it to me. (C)	<i>4. Tell me the steps you would do to multiply 45 by 20 in your head. Why would you do it this way? (C)</i>
5. How do you multiply 45 by 20 in your head? Why do you do it this way? (C)	<i>5. Describe a time when math made sense to you. How did you know that you understood it. (C)</i>
6. How do you know when you understand the math you are doing in class? (C)	<i>6. a. Do you enjoy working with mathematics? (A) b. Do you feel that you are a good math student? (A) c. What does a “good” student mean to you? (A) d. Do you think that you will be successful in mathematics in high school? (A)</i>
7. What do you do when you get frustrated with math? When does this happen? (A)	<i>7. If you were completing your self assessment on engagement within your math class, what would you write for this term? (A+B+C)</i>
8. As a mathematician, I _____ (A)	
9. Tell me about a time in math class when you went; NOW I GET IT. How did you feel? (A)	[moved into interview questions]

(A)Affective Engagement /(B) Behavioural Engagement /(C) Cognitive Engagement

The number of prompts was reduced from nine to seven due to class outings and changes in the classroom schedule. Revised Prompt 6 is divided into four parts specifically to delineate the student responses to a more direct question. I hoped that the smaller specific questions would help focus the student responses which could be expanded on during the transitional interview. Revised Prompt 7 was created because it used the language which these specific students were familiar with. At this time of year students at this school are completing self assessments for all subjects. By revising the prompt it allowed the interactive writing process to work in combination with classroom and school practice. In one interview a student was on her way to complete her self assessment for the third term and this was reflected in her narrative text.

The original Prompt 4 was eliminated during the process because it was similar to the previous prompts. Revised Prompts 1, 2, and 3 asked students to reflect about their math class during that specific day. This tied the student responses to the actual activities and learning situations which were occurring in the classroom on that day. For example, on the day Prompt 3 was written, students were working on their math scrapbooks, trying to finish them before the quickly approaching due date. This provided unique data to explore in the interviews, but it identified to me as a researcher, that I needed the students to look at their math learning through a broader perspective than just one specific math class. Revised Prompt 5 allowed the students to reflect back on all their experiences with mathematics. The following is an example.

Revised Prompt 5: Describe a time when math made sense to you. How did you know that you understood it.

Wendy: Math made sense to me in the third grade when we were learning multiplication and my mom showed me how to multiply with little beans. She showed me how to use beans in groups. It really helped me because it was visual. I knew I understood because I was getting the right answers in class.

I also wrote follow-up questions in my writings to specific students. These questions served two purposes: one was to guide the student to explore their response in a deeper context: and the second was to include questions which reflected the student as an individual. This is demonstrated in the first writing exchange between Belinda and me.

Prompt 1: Explain one task you were asked to do in math class today. Describe to me what you actually did during this task.

Belinda: From yesterday's class, I have learned some handy tips and integer rules from Mrs. Y. Although, I knew some of those already from the previous years but those tips such as "subtracting them together when you have to add two different integers and then take the sign of the larger integer" helped me a lot.

After, Mrs. Y gave us a couple of sheets to answer, that's pretty much what we did yesterday.

Response: Hi Belinda. I am interested in the fact that you did remember some integer rules from last year. You used the new "handy tips" from Mrs. Y to build your learning. Why do you think you remembered from last year? Mrs. Birse

Belinda: I think the reason why I remembered the things that I did last year is that I understood the topics well and I was able to store it in my long term memory.

When I originally wrote the interactive writing prompts, they were in the context of a researcher anticipating how to elicit powerful pieces of data. However,

even after reading the students' first response it was clear that as an educational activity the two roles of researcher and teacher would need to be interwoven and honoured. Both were critical to the process and I quickly knew that the words I would choose would be important to the students and their validation as learners of mathematics. Each student had opened themselves up to a total stranger and I knew immediately that this would create a powerful dimension to my research.

Intentions of the researcher's responses. To illustrate the complexity of the interactive writing process which developed; I would like to introduce you to Omar and Veronica. When I read Omar's initial response to the first writing prompt it had few words and there was doodling all over the page. I presumed from this that he was not interested in completing this task. I knew that the words I used to respond to him had to be carefully chosen if the interactive writing process was to be positive and that he could learn about himself and be open to participate fully in the transitional interview. The following is our interactive writing responses to each other.

1. Writing Prompt: Explain one task you were asked to do in math class today. Describe to me what you actually did during this task.

Omar: We had to work on a sheet in class.

Response: Hi Omar.

From your page it looks like you enjoy drawing. I had fun making these pages and picking a picture to insert. What type of sheet did you work on in class? Mrs. Birse

2. Tell me about a time in class today when you understood the math you were doing.

Omar: We worked on an adding integers sheet. I did a pretty good job on it. I did a good job on it because I understand it. I didn't understand fractions, decimals and percent

Response: Good Morning Omar!

How do you like the guy with the light bulb? I think it was you yesterday while you were working on the adding integers worksheet. Do you know why you understand integers and not fractions decimals and percent? Mrs. Birse

3. If I was watching you at your best moment in math class today, what would I see you do?

Omar: I think I understand integers more than fractions, percents and decimals because I like it more because it's interesting. In math class today We worked on math scrapbook And I got a couple of articles for it.

Response: Hi Omar. I like the pink pen. My sister in-law only writes with a green pen. What type of articles did you choose? I am sure that they reflect your interests (soccer, etc.). Mrs. B.

4. Tell me the steps you would do to multiply 45 by 20 in your head. Why would you do it this way?

Omar: that's too hard. My article was about motorcycles and dirt bikes and about ratios. And I like hockey.

Response: Hi Omar. I have the hockey game on in the background. My team is not winning. There would be a lot of math in Hockey. I wonder how much water is used to make the ice. I look forward to seeing your scrapbook. Mrs. B

5. Describe a time when math made sense to you. How did you know that you understood it.

Omar: I probably would say during a game of Monopoly because you need to play smart so you don't go broke. I'm guessing your team is Detroit.

Response: Hi Omar. You are right, Detroit is my team. I really like your example of Monopoly. There is so much math in it and you need to make decisions using math. It shows that you understand rent, budgeting, mortgages, etc. Thank you for this. Mrs. B.

6. Absent

7. If you were completing your self assessment on engagement within your math class, what would you write for this term?

Omar: I'm not really involved because its not interesting to me.

In my responses I chose not to focus strictly on mathematics but to make my responses more personal and show an interest in Omar as a person. He in turn was willing to write about mathematics during the process and this provided data which could be explored during the interview process.

Veronica's first response was neatly written on a separate sheet of loose-leaf and stapled to the interactive writing sheet. Her responses were immediately about herself as a learner of mathematics. I focused my responses on reframing her words and to help build clarity into her ideas and perceptions. Here is Veronica's first interactive writing response.

1. Explain one task you were asked to do in math class today. Describe to me what you actually did during this task.

Veronica: Today in math class one task I accomplished was doing an integers speed test. There was about 30 questions on the page. During this class I tried to answer the questions all correctly and as fast as I could. For some of the questions that had bigger numbers, that I had to subtract I did use a calculator. Firstly, I went through all the questions and determined whether the answer was negative or positive and wrote down the symbol. Secondly I did all the easy questions and the ones with alike integers. The last thing I did was answer the harder questions with the time I had left.

*Response: Hi! You have a very detailed plan about how to successfully write a speed math test. I am very interested in how you used your calculator as a tool only when you needed it. It is a very good strategy to save the questions that are harder until the end.
Do you do the same thing on tests in other subjects? Mrs. Birse*

Veronica: (response to question written the next day)

I do this on most tests. I find I might as well get all the easy questions right, then do the hard ones which take more time and get less than half the amount done. Veronica

As I wrote my responses to the students, I focused on three things: firstly, to validate their responses and ask a question about what they had written if it was appropriate; secondly, to show an interest in each student as a person; and finally, to encourage each student as a learner of mathematics. The power of the interactive writing process is not just the words which are shared by the students, but the impact the process has with the participants as they explore themselves. It is not a one way sharing of information and the responses which are made by the researcher must contribute to the development of the learner who is the participant. As an educator, the following words which were written in the responses demonstrated to me that these students gained insight and appreciated the personal interaction which was enacted through this process. Helen wrote in her fourth response:

The time when math made sense to me is when Mrs. Y would help me understand some concept and I actually understood it. I know that I understood it when I did the work and I actually got it right!

Response: Good morning Helen. Did you have a good weekend? I had my dance recital on Saturday and I was very nervous. You knew you understand something when you check your work with an answer key. This is a good strategy to have. There is no point doing the whole assignment and finding out it is incorrect. Even if you don't have an answer key, ask the teacher or your classmates. Mrs. B

Helen: My weekend was fine. I also did a lot of dancing and I also have a recital coming up too. Also that is a good strategy for myself to make sure I know what I'm doing.

The students appreciated the personal responses to their writings and that they were being asked about how they learn mathematics. Elaine wrote in her third response: “I would times 45 and 20 and you will get your answer. And thanks I appreciate what you are doing.” Students were aware that the words they were writing were being heard and that I valued their unique insights into the experience of learning mathematics.

Step Two: The Transitional Interviews

On the first day the transitional interviews were held, I visited the classroom before classes started in the morning. Although I had seen the students during our initial visit, I had not met with them face-to-face since. I walked around as the students chatted and they told me their names. I was intrigued that when I heard their names, I could picture their handwriting in my mind. I was putting a face to a writing style and a person whom I had met entirely through the written word. This demonstrates the depth to which the process of interactive writing can provide a structure for relationships to develop.

The transitional interviews were conducted in a private office located in the school and were digitally recorded. As each student came in to begin the interview, I took some time to allow him/her to become familiar with the recording device and to realize that I did remember the thoughts which had been shared through the writing responses. I specifically had in mind a personal interest each student had shared in the interactive writing responses and chatted with them about it during this time.

The use of student engagement as a structure for students to tell their stories is a key component in the development of this research study. From each student's interactive writing responses, I chose one response from each facet of engagement: cognitive, affective, and behavioural to share with the student during the transitional interview. These were the first three questions of the interview so the student would see that the writings were important and had been heard. It also allowed me an opportunity to gain insight into their responses. The interactive writing folder was available to me throughout the transitional interview with Post-it notes marking each prompt I might refer to. Table 2 provides examples of the interactive writing responses which I selected for three students in the areas of cognitive, behavioural, and affective engagement. These writing responses served as the basis for the first three interview questions. (See Appendix 3)

The transitional interview questions were used as a guide and the open-ended interview process allowed the students and myself the flexibility to explore their learning through their interactive writing. The interactive writing folder supported students' answers and allowed students to view what they had written in another way. The transitional interviews were completed over a three-day time period.

Table 2: Writing Responses Selected for Interview

Cognitive Engagement

Student	Response Selected
Fred	5. When math made sense to me is when we started learning integers. I understood this because I learned how to do the signs in grade 7 and 6 so that helped a lot.
Sally	2. In math today I had 2 tests. The first one I was very confident and sure I'm going to get a good mark but for my second test I learned to add the integers even though it tells me to subtract. It is hard to explain but I kinda understand it but I need to look at it a little more. Sally Jones
Elaine	1. I did have a fun math class. I understand it so well that I learned it in grade 6 and 7 and now it is easy for me. E.B.

Behavioural Engagement

Student	Response Selected
Fred	3. If you were watching me at my best moment you would see me working on my work, staying on task and not getting distracted.
Sally	5. When we were doing rates I understood it so well. I know that I understood them because I was helping other people with it, and it all started to make sense for them too. Sally
Elaine	6. d. I'm probably gonna improve and get better study habits. I am for sure gonna ask a lot more questions.

Affective Engagement

Student	Response Selected
Fred	6. a. I enjoy working with math because it is a challenge for me.
Sally	6. a. I don't really enjoy working with math unless I truly understand it.
Elaine	7. For this term I would assess myself for being a good listener in what we need to do for homework. But I need to ask more questions when I don't get math, I just am scared that I'm wrong. I would say that I need to pay attention more.

Step Three: The Narrative Texts

The narrative texts were written in collaboration with each student. The first draft of the narrative text was written by me using the data generated by the interactive writing prompts and the transitional interview. This draft was reviewed with the student during the reflective narrative interview, to make changes if necessary, and gain further insight into the words which were written. Finally, using the data from the reflective narrative interview, I revised the narrative texts to reflect the student responses. (See Appendix 4)

To create the first draft of a narrative text, I reviewed the interactive writing responses of each student and composed a three-paragraph text which reflected the three areas of student engagement as defined in this research study. I then listened to the recorded transitional interview and made notes of the student's statements. I then revised the narrative text to include this information. This allowed me to blend the two methods of data collection while creating the text using the behavioural, cognitive, and affective facets of student engagement. This process provided support for the development of narrative texts which used each student's words and allowed for the layering of the interpretive process with the data. This allowed a relatively efficient interweaving of the interactive writings and the interviews generated by 24 participants.

When I returned to the school to conduct the reflective narrative interviews, I felt as if I was a part of the students' learning. When I saw the students in the hallway, they would say, "Hi" and stop to talk with me. I was amazed at how many of the names I did remember and how comfortable it felt to be a part of their

learning environment. The words I had written for the narrative texts are critical to this research and mathematics educators, but these words are more crucial to the reflective process they would provide to each student.

The reflective narrative interview began with me reading the narrative text I had written for the student (See Appendix 5). The length of the written text required that after the initial reading of the full text, each paragraph was reviewed separately. This allowed us to collaboratively revise and edit the narrative text to ensure that it told “their story”. These interviews were relaxed, and the students were especially appreciative of the words which I had written. The interview questions challenged the students to bridge their learning to their future as learners of mathematics in high school. My experience as a senior years math teacher was vital to this process as we talked about their impressions of learning mathematics at high school.

I used a similar process to interpret the recorded reflective narrative interviews as I had used after the first interviews. I completed the edits on the narrative text which collaboratively had been agreed upon during the interview. I then listened to the digital recording of the second interview and made notes of the student responses to use in the interpretation of the data to complete the phenomenographic component of the research.

Focus groups were not completed as part of the data collection process due to the richness and amount of data which was collected. Adapting the principles of narrative inquiry within the data collection component allowed me as a researcher to make decisions regarding the appropriateness of the data as it was being collected. I was confident that the narrative texts which had been co-authored would

provide a sound basis to complete the phenomenographic research. This process also allowed the interpretive component to focus the data for the phenomenographic study. The interweaving of the two research methods created the layers of interpretation which will be explored in Chapter 5.

Chapter 5

Listening To Their Stories

The Interpretive Process

The interpretive process of a phenomenographic study requires the researcher to be immersed in the data to allow categories of description to appear and define the outcome space. The intertwining of phenomenography and the coauthoring of narrative texts in the methodology of this study created a unique multilayered dimensional data space to support the interpretive process. The layers of data generated in this research study allowed me to immerse myself in the data at different intervals and in different ways throughout the data gathering and interpretive process. This created a multidimensional space to build the layers of interpretation. This chapter will illuminate the outcome space which emerged through out this process. It will include the categories of description as a whole and some unique aspects which provide educators with insight into the perceptions of students and their learning of mathematics.

Multidimensional Data Spaces in Phenomenography

Initially, the interactive writing responses and the transitional interviews created the data upon which the narrative texts were written. The interpretation of these two sets of data was an integral component of writing the narrative texts. The data was viewed in this process as 24 individual data spaces which included each student's interactive writing responses and transitional interview. Once the 24

individual narrative texts were composed, the reflective narrative interview created another layer of data for each individual data space. This component of the study required that the data was interpreted in 24 individual data spaces. This allowed me to begin the interpretive process through the creation of each individual narrative text and to be immersed in each of the 24 student's experiences of learning mathematics in the data gathering component.

The next layer of interpretation involved viewing the 24 individual experiences as a whole to allow the categories of description to emerge. I began this process by reading and reviewing the narrative texts as a group. To move beyond the words of the narrative texts, I then reviewed each transitional interview within the context of the individual narrative text. This allowed for a deepening of understanding of the words which the student and I had written together. This process was repeated again using the reflective narrative text interviews to provide another layer of interpretation. At this point categories of description began to appear and allowed individual narrative texts to be identified to illustrate the ranges of experiences which students described.

The uniqueness of the multidimensional data spaces which were created during this research study allowed me to return to the data and to view each individual component of the data as another data space. This included defining and interpreting the responses of an individual's interactive writing prompts as a specific data space. It also allowed me to look at the responses of specific interview question as a defined data space. The three facets of engagement; (cognitive engagement, affective engagement, behavioural engagement) each created its own

data space upon which to view the components of interactive writing, both interviews, and the narrative texts. This multi-layering of individual and group data spaces throughout the interpretive process created a rich dynamic upon which to build the interpretation process throughout this study.

Narrative Inquiry: A Layer in Phenomenography

The narrative texts (See Appendix 6) were written by me in the form of a letter from the researcher to the student, summarizing the data which was gained from the interactive writing responses and the two interviews. Each of the 24 students participated in the reflective narrative interview and each paragraph of the text was reviewed for clarification and change. The interview allowed the narrative text to be reviewed and edited in a collaborative process between the student and myself. Of the 24 completed narrative texts, only five students made modifications and changes to their narrative texts which were composed by myself. During this interview, questions were also included to extend the students' thoughts and reflections to their future learning in mathematics. A potential goal for the narrative texts in this study is to promote learning as the students reflect on how they learn mathematics; however it also provides educators with an opportunity to enlighten their practice.

I used the principles of narrative inquiry to position myself as an active listener with each of the students. I was not simply recording their stories; each student and I were the co-authors of their perspectives of engagement. I developed a statement of each student's perspective on engagement from the interactive writing and

transitional interview. In the reflective narrative interview I shared a first draft which I referred to as a narrative text. Each student confirmed, elaborated and refined details in the narrative text.

Throughout the writing process of the narrative texts, I concentrated on being true to the individual student's words but also to include the educators' context. Thomas recognized this and shared during our reflective interview, "I feel like you took whatever I said and wrote and put it in your own way." I found this comment troubling at first until I balanced it with the fact that Thomas did make changes to his narrative text and was specific about the wording which we used. For example, he wanted the wording "you complete your assignments" changed to "you complete most of your assignments." He was very careful that the words in the narrative text were an accurate reflection of his learning, even though "I put it in my own way."

The students who did not request changes to be made to their text shared that they felt the narrative text did indeed reflect them as learners of mathematics. Veronica stated, "It is pretty straight forward. That is me. I felt like you know me." Roberta shared that she felt "a little weird" when she read the text because, "It does portray me." Patty stated that, "I felt, (pause) I was surprised because you listened to everything." John stated that he felt "good because you understood what I was saying and you listened." These comments identify that it is important for each student to know that he/she has been heard and that the narrative text reflects that person as a unique learner. The text needs to allow the student to see themselves in the words which are written in this collaborative process.

Helen brought a broader context to this process and extended her perceptions to include her classmates. She states, "I feel like I am starting to understand a student's point of view in math class and how there are certain people who feel different." It is important to clarify that all of the interview questions and writing prompts which were asked of Helen were about her as an individual student. Her comment reflects the depth of her response and how this process enhanced her perceptions within math class.

Two students, Mona and Carol, revealed an evaluative component to this process from their perspective. Mona felt good because it was a "good reflection." Although her words were few, during the reflective narrative interview it was clear that Mona felt as if she was being evaluated. She was relieved that I viewed her as a "good student". Carol stated, "I learned that I am OK and that I am a good listener. I didn't know I was a good learner. Next year I will not be afraid to make mistakes in math class and to take a risk in math class." I feel that Carol accepted the words of the narrative text because a teacher (myself) wrote them, but she did not show confidence as a learner to make these statements about herself. This provides teachers with insight into the self assessment process. Students' perceptions about themselves can be influenced by their perceptions of understandings and may not provide a true picture of their engagement within the learning process.

The creation of the narrative texts through this collaborative process brought the two languages of student and teacher together. The collation of these texts is the primary data for the phenomenographic interpretation; however, the interactive writing prompts and both sets of interview responses are woven into the narrative

texts and will be referred to throughout this chapter. The layers of interpretation and multidimensional data spaces created by the intertwining of process adapted from narrative inquiry and phenomenography created a unique context to define the outcome space for this study.

Categories of Description

Student Engagement

You know that you are engaged with mathematics because you are thinking mathematically individually and with your teacher during the lessons.
(Excerpt from Veronica's narrative text)

Phenomenography research supports the interpretation of data to determine the range in which people experience a phenomenon. This research began with the intention of exploring student perceptions of engagement in middle years mathematics class. Fredericks, Blumerfeld and Paris' (2004) multifaceted description of student engagement provided a scaffold for students to build their stories of engagement and a framework for interpretation of the data generated. The inclusion of this component in the structure of the research study situated student engagement as an overlying category of description to be examined throughout the interpretive process. However, it was not the only category of description which emerged as students wrote and talked about being learners of mathematics.

The themes within student engagement which emerged from the narrative texts include student engagement as an internal quality of learning, student engagement as an external indicator of learning, and student engagement and its connections to understandings. I will explore each of these themes individually using all of the data which was generated throughout this research study.

Student Engagement: An Internal Quality of Learning

One of the focuses of the narrative texts was to include the student's perceptions of engagement. Using the data which was generated by the interactive writings and both interviews, created a beginning to explore this with each individual student. The words which they shared, clearly illustrated that engagement has uniqueness in the way it is experienced within the mathematics classroom. The notion of engagement as a process of learning which resonates within oneself began to appear through the words of some students. Carol views her engagement as an internal quality which she controls and defines the parameters. It is the internal thinking and learning of mathematics which define her engagement.

*You stated that to be good at math you need to take responsibility to learn, try different skills and enjoy math. I am very interested that you see engagement with mathematics as you being inside the process. You are not an outside observer of learning mathematics but inside the thinking and learning of mathematics. (Excerpt from **Carol's** narrative text)*

Carol views engagement as what is happening during the learning process inside of her. She identified that she learns differently in mathematics than in other subjects because she needs to break things down into steps. The interesting piece of Carol's perception of engagement is that she is the person who controls her learning, and by being involved within the process she feels she will do better in math. Elaine and Veronica also perceive engagement as an internal quality, but it occurs in conjunction with their teacher in math class. Although the process is internal, the classroom expectations of the teacher can support their learning or, at times, interfere with the process itself.

*You engage with mathematics by listening and thinking through the question with the teacher. You have clearly told me that you need to be an active part of the process of learning mathematics. However, the teacher needs to match their pace with you. You will continue working on something until you understand it and you need the teacher to wait for you. (Excerpt from **Elaine's** narrative text)*

*You know that you are engaged with mathematics because you are thinking mathematically individually and with your teacher during the lessons. (Excerpt from **Veronica's** narrative text)*

Neil's development of his perceptions of engagement throughout the data gathering process illustrates how the methods within the study supported and allow students to develop their perceptions. Neil also perceives engagement as an internal quality and he made an individual decision to be engaged in math class. Neil's interactive writing responses portray engagement as "getting your work done, paying attention and bringing your supplies." It was during the transitional interview that he deepened his reflection of engagement to include "how you are in the process." He extended his view of engagement to include his determination to learn the concepts being studied and not just the tasks he needed to complete to do so.

*Engagement is how you are in the process. For example: paying attention, asking questions and completing your work. You identify that being engaged is being in the middle of the learning process. (Excerpt from **Neil's** narrative text)*

Each of these students perceives student engagement with mathematics as an internal quality of learning mathematics, but each of them has a differing perception of this internal quality. It is these differing perceptions which provide rich insight into the complex questions of why students are engaged in mathematics class and how a teacher can influence the process of learning mathematics.

Student Engagement: An External Indicator of Learning

The inclusion of student engagement in the Manitoba Provincial Assessment Policy creates a context upon which to view engagement as a measurable outcome which has identifiable features. The Manitoba government identifies these features as: demonstrating an interest in his/her learning, engaging in self-assessment, being aware of learning goals, participation in lessons and accepting responsibility of assignments (MECY, 2007). These indicators are part of the assessment process the students in this research study partake in.

Mona identified student engagement as a behaviour which is seen by the teacher. This is supported by her observation that some students are not engaged in math class because of their behaviour which is seen by others. Mona does what the teacher expects from her and she shared that, “I learn what the teacher teaches.” The essence of student engagement for Mona is the observable behaviours and acts which are viewed within the mathematics classroom. Xena also defined student engagement as an outward behaviour which can be viewed by others.

You are engaged in math class because you listen carefully and complete all of the work. You have discovered that to understand the math you must listen very carefully to the teacher. This helps you learn mathematics. You see other students not engaged in math class because they are fooling around and not listening. (Excerpt from **Mona's** narrative text)

You have related engagement in math to how many questions you answer orally. I find this interesting because this would be something that your teacher would notice. (Excerpt from **Xena's** narrative text)

Xena does not see herself engaged in math class, she wrote in her response, “I would say that I answer questions when asked in class, but I don't really willingly

raise my hand. Most of the time I listen and take in the information.” To Xena this is not being engaged because the teacher does not see her ask questions or interacting outwardly with mathematics. Leonard also tied his engagement to the outward interactions which are shown in class and she creates a connection to his understanding of the math concepts.

You are engaged in math class because you answer allot of questions and you understand the work being studied. You complete your math homework on time and take it home when you need to. (Excerpt from **Leonard's** narrative text)

There are multiple examples of student quotes which connect student engagement to completing their work, listening in class, and studying for tests. These items are connected to the tasks the teacher requires them to do and the expected behavioural norms of schooling in general. In this theme, the students' perceptions reflect that student engagement is something that they can demonstrate to the teacher so that the teacher knows they are trying to learn mathematics.

Student Engagement: Tied to Understandings

The three facets of student engagement; cognitive engagement, behavioural engagement, and affective engagement are intertwined in the responses students provided both orally, written and in the narrative texts. However, through the interpretive process it is important to build meaning from the student responses to his/her perceptions of engagement. In this process it became clear that there was a unique distinction regarding the cognitive engagement component of the responses and the student's perceptions of engagement.

You shared with me that you are a very conscientious student. You always complete your homework and hand in all assignments. You are engaged in the lessons in class and make decisions about what notes to make to refer to later. Engagement to you is how focused you are and that the material is understood. You see engagement as a process where you are learning mathematics. If a person is not successful in mathematics he/she is not engaged. (Excerpt from **John's** narrative text)

John finds math easy and he ensures that he completes all of the math work which is assigned by the teacher. In the transitional interview John elaborated that, to him, engagement is, “you know what you are doing and you understand it.” The understanding of mathematics is fundamental to John’s perception of engagement. He views others as not engaged if they do not achieve good grades on tests. John also included in his description components of behavioural engagement such as: completes assignments, writes notes, and studies for tests. These behaviours support his learning of mathematics but he reflects that engagement is demonstrated by good grades on tests. His perception of “engagement equalling success” in mathematics provides a context upon which to view the other narrative texts which identify understandings as a qualifier of engagement.

Quinton shared in his interactive writings “I am very engaged with my math class because you could just see my math tests. I understood rate and ratio because I got 99% on the test.” He clearly ties his assessment grades to engagement. For the students who are cognitively able to learn mathematics in their mathematics classroom, their engagement is proven by the grade on their test. They see a correlation between doing the work and understanding the concepts being studied which is demonstrated by the grades they receive.

However, Kristen and Sally provided another lens to view the relationship between understandings and student engagement.

Kristen, you shared with me that engagement is participating in math class by answering questions correctly because you understand the mathematics. You do not feel that you are engaged because you sit quietly in class and listen to the teacher and usually do not understand the lesson. ... You feel that you are a weak math student because of the test marks you receive. It seems to you that everyone else just gets it and you do not. This makes you feel sad about yourself. You do not understand why you cannot learn the math because you try hard. Continually listening to the teacher does not help you understand the mathematics. Someone making it simpler does help you understand mathematics. Working with someone helps you enjoy mathematics because you do not understand it on your own.
(Excerpt from **Kristen's** narrative text)

You do not enjoy math class. The concepts are difficult for you to understand and have been in all grades. You are a great student in all of your subjects but there is something about math that does not make sense to you. You find it frustrating when you do not understand a concept and continuing to listen to the lesson does not help you. You are engaged in math when you understand it. You have discovered that when you help other people understand the problem you also improve your understanding. You have a plan to have a tutor to help you in high school.
(Excerpt from **Sally's** narrative text)

Sally's narrative text states this theme very simply, "You are engaged in mathematics when you understand it." The connection between understandings and engagement is at the core of her perception of student engagement. If you understand the work being done then you can independently complete the work, participate in class and do well on the tests. To Sally, you learn the mathematics first and then you do the work. She does not see that you learn mathematics when completing classroom work. This is an interesting observation to incite professional

discourse amongst educators. How do classroom practices support learning and understandings of mathematical concepts?

Sally and Kristen both find mathematics difficult and do not understand the math concepts being studied and therefore do not see themselves as being engaged. As an educator, it is difficult to read these two excerpts because the hopelessness and underlying emotions of the two students show through our words in the narrative texts. The unique aspect of Sally and Kristen is that they identify what behaviours support their learning and which ones do not. They can articulate things which help them learn mathematics, yet they do not see themselves as learners of mathematics. Both students identify that listening to the teacher in whole class discussions does not help them understand. Both of them identify the interactive connections of working on math together with a classmate as helpful to their understanding. Sally has already made arrangements to have a tutor in high school and is hopeful that, “after working with my tutor I will understand it more.”

This raises questions for educators about the impact of academic success as defined by the assessment practices on student engagement. Can we really expect students to be engaged with mathematics when they are not successful on classroom assessment tasks? As educators, if students do not understand a concept we want them to “try harder” and to be more engaged so that they will learn the material. However, if the student is not doing anything different, how will this happen? How do we keep students engaged when they are telling us that they do not understand? This dilemma takes me back to Omar, who I introduced to you in Chapter 4.

In math class you are not engaged and have given up. You shared with me, Omar that you are not interested in the math which is being learned. You

do not interact with your classmates in math class but you will ask your teacher for help if you think you can understand it. Sometimes when you understand a concept like integers, you are more interested in doing the work. (Excerpt from **Omar's** narrative text)

Omar has “given up”. He does not see himself engaged with math because he feels that he cannot learn it. His frustration has culminated in his shutting down in math class. However, like Kristen and Sally, Omar can tell us what will help him learn math, “Don’t do questions on the board, doing questions together doesn’t help me. Making the questions simpler kind of helps me. Having things to move helps me.” He knows that his teacher would also say he was not engaged and he will not see himself as engaged until he can understand the work being studied. Clearly, these students identify their lack of understanding as an indicator of student engagement.

Veronica, a Grade 8 student, provides an educational response to these students’ perceptions in her interactive writing response to the question: What is a good math student?

It means someone who puts effort in their work and always tries their best. doesn't matter about your marks, but how willing you are to learn.

Her words are deep and reflective and display an understanding of the learning process and the impact of assessment on it. The dilemma that Omar has is how willing are you to learn, if you never understand or are successful on the assessment tasks. The hope of learning mathematics has evaporated for him. This is an area where educators can have a huge impact on through their practice and it will be discussed further in Chapter 6.

Dependence, Independence, and Interdependence

This category of description emerged through the data gathering activities which focused on behavioural engagement and the constructs upon which they were based. It became initially evident during the interactive writing process and continued to develop throughout the interpretive process. In the first interactive writing prompt, students were asked to describe a task which they performed in math class that day. Many of the students' responses focused on what the teacher had asked them to do and it did not include what they actually had done themselves. They defined their activities in math by what the teacher had directed them to do. This immediately was a concern for me because the focus of this research was to elicit the students' perceptions of engagement. As the data collection process continued I was very intentional in my prompts and questions to focus the discourse on the students' activities, feelings and understandings about learning mathematics and not what the teacher did within the classroom.

Teacher dependence, therefore, was a theme which immediately emerged and influenced the data collection process. It therefore was certainly something which I wanted to explore during the interpretation process of the study. However, it did not present itself uniquely as a category of description. As the data was reviewed again and again with respect to teacher dependence, it became clear that the notions of dependence could not just be tied to the student teacher relationship. Dependency has many variations within each student's perception. There was also evidence of independence in learning strategies and this was reflected in some students' narrative texts. As the data was reviewed again with the context of dependence and

independence within the learning process, it became clear that interdependence must also be included in this category of description to allow the range of student experiences to be described.

Chickering and Reisser's (1993) seven vectors of human development provide a context upon which to view the notions of dependence, independence and interdependence. "The vectors describe major highways for journeying toward individuation – the discovery and refinement of one's unique way of being – and also toward communion with other individuals and groups, including the larger national and global society (p. 35)." Although their research was based on college level students, the impact of this research to understandings of development is widespread within the educational community.

Their third vector, *moving through autonomy toward interdependence*, provides noteworthy insight into this category of description. This vector was modified from the original vector, *developing autonomy*, in Chickering's (1969) initial work to encompass the movement from dependence through independence toward interdependence. Chickering and Reisser identify three components in moving from autonomy towards interdependence: "(1) emotional independence – freedom from continual and pressing needs for reassurance, affection or approval from others; (2) instrumental independence – the ability to carry on activities and solve problems in a self-directed manner, and the freedom and confidence to be mobile in order to pursue opportunity or adventure; (3) interdependence – an awareness of one's place in and commitment to the welfare of the larger community"(p. 117). Although this category of description identifies dependence, independence and interdependence as

separate entities, Chickering and Reisser provide a context upon which to view them as a natural progression in human development.

Dependence

The theme of dependence in learning mathematics reflects a student's reliance on other individuals to support their learning. This may include student/teacher, student/student, and student/family. Dependence in the learning process can be viewed as a positive attribute if the student is making intentional decisions to gain understandings which cannot be done on their own. It may include asking the teacher or friends for help, accessing a tutor, or enrolling in a remedial class. In this scenario the student is an active participant in his/her learning, but the mathematical skills needed to become an independent learner of mathematics have not yet been acquired which creates the parameters for dependency.

Dependence may also be viewed as a negative aspect of learning mathematics. This may be demonstrated by a student who is paralysed in the learning process unless there is immediate direction or support from another person. In this case, learning ceases until the student is in a situation where he/she can access support. The student does not take ownership of his/her learning and hands the responsibility of their learning to someone else, normally the teacher. The following student excerpts will develop differing scenarios of the reality of dependence in the middle years mathematics classroom.

In the transitional interview, one of the questions I asked each student was: What do you do when you "get stuck"? A common response from students was that

they would ask their teacher or a friend. I tried to explore this further during the reflective narrative interview and described a scenario where the student was by themselves at home to allow the student to share strategies which they could use themselves. Even with these parameters, some students shared that they would ask their parents or “their uncle who was really good at math” to help them. It was very difficult for students to articulate strategies they could use when they “got stuck”. Some of the strategies which were shared include: working backwards, re-reading the question, looking at the notes, breaking it into steps and making it simpler. However, most students still replied that they would wait until tomorrow to ask their teacher. These students are dependent on their teacher to learn mathematics and could not or did not take initiative to gain understandings on their own.

This identifies a dynamic in mathematics classrooms which is difficult for teachers to change. Teachers guide students to build understandings and to be academically successful within the classroom. However, this will not contribute to learning if the students cannot build on their understandings without direction from others. Harbaugh (2005) ties this to the notion of mathematical authority within the classroom. “Without learning habits of argumentation and proof to support their ideas, students may end up dependent of someone or something for mathematical validation (p. 4)” This creates a construct where the teacher is the mathematical authority in the classroom and does not allow independence in mathematical thinking to be established. Mason (1995) identifies that students need to have strategies so that they can think mathematically and move forward when they “get

stuck”. These thinking processes include: generalization, justification, and conjecture.

A transitional interview question which gave insight into this dynamic was, “Do you learn differently in math class than you do in English?” Xena explained, “Yah, because it involves numbers. Yah, because I’m trying to get the right answer but in English I am trying to understand it. I am more independent in English because I can do it on my own. In Math I need the teacher to explain.” As Xena continued her answer she looked deeper and deeper into the process of learning which she experienced in the two different classes. She identifies that numbers are used but also realizes that she is dependent upon the teacher to learn the mathematics being studied. In another response, Xena identified that when she gets stuck she reads the question over again, writes side notes for herself and will work backwards through the question. She has acquired some strategies, but she still defined her learning of mathematics as dependent upon the teacher.

Neil shared Xena’s reflection that he learns differently in mathematics than ELA. “Maybe I think differently in math. In ELA we do more written work. In math she explains it. In ELA we just read and do a reflection. In ELA you do it on your own and in math you work it out with the teacher.” Although, Neil identified different ways of working with the teacher in math class, he does not depict a dependency on the teacher during the learning process. He sees it as a different instructional strategy which the teacher uses in mathematics.

Kirsten shared in her interview that she was doing better in math before the student who sat beside her moved at spring break. Kirsten clearly tied her

understanding of math to the help she received from the student sitting beside her. Now that this person is not there, Kirsten is not understanding the work and is frustrated and losing her confidence. She was dependent on another student to work with her through the math assignments. Both Xena and Kirsten describe relationships upon which their learning of mathematics is dependent (reliant) upon the intervention of another person.

Another dynamic which emerged through the interpretation of the data was the dependence of students on the teacher for the tasks which facilitate learning. Generally students do what the teacher asks them to do. Only two students (Isabelle and John) shared that they would do more work than the teacher had assigned to strengthen their understandings of the material. Wendy stated the obvious during the interview: "No one will do anything if the teacher doesn't tell them to." Her words add an important context to this discussion: students are dependent upon the teacher to provide them with curriculum and experiences which will enhance their learning. This is accepted and practiced throughout our schools and schooling years. However, the dilemma which these students raise is when does dependence on teachers contribute to learning and when does it disable learning? This is an important issue for educators to grapple with as the instructional strategies they employ in the classroom are pivotal to the issue of dependence.

Independence

You enjoy math because it is a challenge. You are determined to learn the concepts and are very intentional in what you do to achieve this. You are an independent learner who always pays attention in class and completes the assignment. You are not upset if you do not understand something at

first; you will ask for help and try to look at the question in different ways.
(Third paragraph from **Wendy's** narrative text)

A phenomenographical study requires you to depict the range of experiences of a phenomenon. As this category of description evolved, the student notions of independence within the learning process became evident. The establishment of parameters which allow independence in the learning process was seen as a desired outcome. Independence implies mathematical authority by the student and reflects strategies and understanding which allow the student to be dependent upon themselves.

Unintentionally, I used the word independent within both Wendy's and Patty's narrative texts. When I used this term I considered it to be a positive attribute of their learning not realising that it would be part of a category of description. During the reflective narrative interviews, both students confirmed that they saw themselves as independent learners of mathematics. They were confident that they could learn mathematics independently, free from reliance on either their teacher or a friend. However, Wendy connected independence to the affective component of learning mathematics when I asked her which part of the narrative text was most important to her. Her response was, "The most important would be the third paragraph, because it (math) does give me a challenge. When there is a challenge you get more involved and you want to learn about things. You want to complete the challenge. Like a video game, you want to beat the level."

You are an independent learner of mathematics. You have many strategies to work through problems on your own. You know that you understand the math being studied if you can do the homework by yourself without any trouble. A high test mark will also tell you that you understand the math.

*You prepare by re-reading your homework and practicing a few questions. You want to know if you understand it before you write a test. (Excerpt from **Patty's** narrative text)*

Patty did not include in her responses that she is reliant on her teacher or her friends for success in learning mathematics. There is a persistence which is evident within this paragraph that she will continue working until she is comfortable that she has learned the concepts. She has a method and the confidence needed to be an independent learner of mathematics. She has a foundation upon which to build on. Quinton also displayed independence within the math classroom because he understands the mathematics which is being studied in class. Whereas, Patty has a way of working through things which allows her to be independent, Quinton just understands it right away.

*You write notes the teacher gives and add additional things to be sure they make sense to you. You work on your assignment on your own because you usually understand them very well. (Excerpt from **Quinton's** narrative text)*

A unique aspect of this theme is that some students who do not see themselves as independent learners of mathematics identify it as a goal for themselves. Belinda perceives her dependence on needing help from others as a barrier to her learning of mathematics. She shared when we were talking about learning mathematics next year in high school that, "It will be important for me to be independent and to work by myself next year." As we talked about this further, she felt that being able to work through problems on her own means that she understands it. Her use of the word independence illustrates the definition of independence as "freedom of dependence." She sees it as a step forward.

Paul perceived independence as a learned process. He stated in our interview that, "I will be independent when I get to university." He did not feel that he would be independent from the teacher during high school, but by the time he was in university he should know enough to be able to learn math independently. He felt the process of moving to independence as tied to content knowledge and understandings of mathematical concepts. As his knowledge of mathematical concepts increases, his independence in learning will improve. This is an interesting comment for educators to explore as they reflect on the K-12 journey of learning mathematics.

Interdependence

The recognition and acceptance of interdependency is the capstone of autonomy. It cannot be experienced until a measure of independence has been achieved and a sense of one/s place in the community and global society has been awakened. (Chickering and Reisser, 1993, p. 140)

In their research, Chickering and Reisser (1993) identify that interdependency has a global context as the person recognizes their impact on the larger community. The nature of the questions and reflections of the students who participated in this study did not elicit a global context of interdependence. In this research, interdependence is viewed within the mathematics classroom. This requires that the definition of interdependence is defined as a mutually beneficial relationship which supports the learning of mathematics.

Sally illustrated the notion of interdependence through the process of working together with her classmates. "When we were doing rates, I understood it so well. I

know that I understood them because I was helping other people with it and it all started to make sense for them too". Sally recognized that as she was helping other people, her understandings also deepened. This is different from a dependent relationship between two students. Sally shared that sometimes she is helping others and sometimes they are helping her. They are all benefiting from the process and increasing their understandings. Veronica also shared this experience: "Math is easier for me when I am with my friends. I can ask my friends if I have questions and if they need help I am there to help them." There is a collegial essence which comes from their words.

Unique in his story of engagement is Gerry. His experience throughout school has greatly impacted his view of what engagement should be. Most of his schooling occurred in Europe and he had recently moved to North America. He included the interrelationship between students and the collegial workings of a classroom to create a notion of engagement which supports the learning of ALL students. He brings the sense of community into the mathematics classroom which moves closer towards the notion of interdependence as defined by Chickering and Reisser. His was a very complex notion of engagement defined as a classroom dynamic which supports the learning of all through individual behaviours and attributes.

*You reflected that you are engaged in math class. Your teacher would know this because you answer the questions correctly and you help other people. You see the learning of mathematics in the classroom as everyone helping each other understand. The classroom works as a team to be sure that everyone is successful on the tests. (Excerpts from **Gerry's** narrative text)*

Gerry also shared in his interview that when he “gets stuck” on a question, “I actually go to them and solve it and we work as a team to solve it.” The inclusion of team work in Gerry’s notion of engagement is a way of his being within a classroom. He sees the classroom of students as one entity and that each person must learn the material. Learning is not an independent activity but one which is done together with respect for each other and students take on the responsibility of everyone’s learning. In his perception of learning mathematics, all students benefit and support each other.

Individual Insights and Themes

Math makes sense to me when I work with it, talk about it, and think about it.

- Gerry

I will be the best I can be. – Helen

I think Math is very wonderful - Mona

Learning math is like practicing your band instrument. - Derrick

Within the interpretive process, there were certain statements and thoughts which students shared which did not fall specifically within the categories of description which emerged. However, they are powerful in their insight and are worthy of being identified in the context of this study.

In the development of this research’s working definition of student engagement to include cognitive engagement, behavioural engagement, and affective engagement, it was apparent that these three areas are interconnected within the process of learning. Throughout the interpretation process, students gave examples of the interconnections and dependency between the three areas of student

engagement. I feel that it is important to share these findings as it provides another dimension for teachers to explore student engagement through the lenses of these Grade 8 students.

The interrelationship between affective engagement and cognitive engagement was shared by a number of students. This was identified through the responses to writing prompt 6a: Do you enjoy math? Many students tied their enjoyment of mathematics to their understandings. Some students enjoy math because they are challenged (Elaine, Gerry, Kirsten). Other students shared that their enjoyment of mathematics is reliant upon their understandings of the work. If they understand the work, they enjoy it; if they don't understand it, they do not enjoy it (Belinda, John, Sally). Leonard had a unique perspective and tied his enjoyment to his perception of how math will benefit him. He wrote, "Yes, because in the future everything will relate to math." This correlation of the affective and cognitive domains of engagement is critical for teachers to explore.

Students identified themselves as "good" math students mainly in terms of cognitive understandings. However, when the students explained what a good math student is, they defined it in terms of behaviours. The behaviours included completing homework, listening and being good at solving hard problems. This is an interesting concept to explore because of what the students did not say. They did not include in their reflection anything about perseverance in working through questions or thinking mathematically.

Conclusion

The categories of description which emerged from the interpretive process are: student engagement; as an internal quality of learning, external indicator of learning, and connection to understanding; and, the range of dependence, independence, and interdependence. These categories of description provide an outcome space to view the individual narrative texts which were written with each student. However, it is important to remember that each narrative text describes the essence of the phenomena for that student. This is what creates the richness in the data that was collected in this research project. There is interpretation of the whole from the phenomenographical component and the individual through the narrative component.

I hope that readers of this study will work with both interpretative components, using the categories of descriptions and their ranges of experiences to form questions which allow teachers to reflect on their practice at a classroom level. I also hope that readers will read each narrative text and reflect on the story that each student has shared. Each one is unique and reminds us as educators, we must be true to both contexts, the classroom and the individual.

Chapter 6

The Potential in Their Stories

The principles of narrative inquiry and phenomenography created two powerful perspectives which define this research. The categories of description and collection of narrative texts that have emerged from this study provide educators with differing lenses upon which to view student engagement and the teaching and learning of mathematics. In this chapter, I will discuss potential implications of this research on mathematical teaching practices. I will share how this experience has affected “My Story” and how it will impact my work as an administrator and educator. Finally, I will also explore some potential teacher learning opportunities which this study could generate.

Implications for Teaching Practices

The ideas of the students which were shared in this study identify to teachers that there is a wide range of perceptions and presumptions about engagement by students. Student engagement is a complex entity which exists in middle years mathematics classrooms and this reality creates implications for teaching practices. The following potential implications for teaching practices respond to the ideas and reflections of students which were shared throughout all data gathering methods in this study.

Teaching by Building on Prior Understandings

Students' interactive writing responses exhibited the realisation that there were connections between the mathematics the students were learning now and the math they had learned in previous years. The repetition of concepts from year to year was seen as positive as it created an opportunity for success in the tasks which the students were completing. Their familiarity with concepts allowed some students to use this as a building block in acquiring new knowledge. Remembering a concept which was taught last year helped build confidence in learners. All of these aspects illustrate a dynamic which students appreciated about learning of mathematics.

I found this intriguing because I had presumed that students would view this as a negative aspect to learning mathematics. As a mathematics teacher I specifically tried not to repeat concepts which students demonstrated understanding in with the intention of keeping the learning of mathematics new and interesting. The responses from these students have caused me to question my practice. The students provided numerous examples of how previous understandings supported their learning.

When students were asked, in the interactive writing, how they knew that they understood a concept in mathematics, many shared that they would check their answer with someone else. This action gave their mathematical authority to their teacher, their friend or their textbook. When students know that they understand a concept themselves, they begin to develop their own mathematical authority and confidence. Familiarity creates a context for students to recognise their potential as learners of mathematics. The building of student confidence through the process of

building understandings on prior learning has tremendous potential for teacher planning.

Building Meaningful Understandings

Students shared that they knew they understood the material when they could apply the concept to their real life. Their real lives included working at the family business, making good decisions as consumers, and recreational activities with their peers. The students understood that when math made a difference in their life right now, it created a purpose for learning. Students recognized that they knew they understood a concept when it was part of their long-term memory and they could apply it to their world.

As I interpreted the data in this phenomenographic study the range of student experiences and lives was apparent. When building relevance into mathematical learning opportunities, teachers cannot assume that all students are going to the mall, buying clothes, or have money sense and independence to make consumer decisions. These students shared that their lived experiences are unique and dependent on many social and family factors. Students demonstrated in their interactive writing that they could build personal relevance within the tasks which were required of them in class. This gives teachers permission to allow the perspective relevance of mathematics to emerge from assigned tasks and to provide opportunities for students to build meaning from their personal experiences. Teachers need to ensure that they facilitate the building of understandings through each student's lived experiences.

Student Engagement and Assessment

The differences and uniqueness of student responses in this study illustrate that engagement is a personal experience within a learning environment. The impact of the affective domain on the learning of mathematics was evident in this study. Therefore, it is imperative that assessment of student engagement does not interfere with students experiencing the wonder and power of mathematics.

Student engagement is at the core of learning and its definition and descriptions can affect assessment practices in the classroom. The reliability of formative assessment practices in mathematics is questioned by students who openly admitted that they never answer a question orally, unless they know that their answer is correct. Assessment practices can define and confine classroom experiences.

I feel that an essential question for teachers is: Can student engagement be measured? I have used the word “can” specifically because from these students’ stories there are many perceptions of student engagement which cannot be measured. Therefore the next logical question is: Should we measure student engagement? If student engagement is viewed through Tomlinson’s (1999) definition, engagement happens when a lesson captures students’ imagination, snares their curiosity, ignites their opinions, or taps their souls, then student engagement should not be measured. It should be noticed, nurtured, encouraged and assessed in interrelation ways which support student growth and confidence building.

It is imperative that educators do not accept government policies regarding assessing student engagement without exploring the complexities, potential, and

nuances of student engagement within their respective classrooms and educational contexts. Teachers must demand that they are part of the professional discourse regarding the assessment and measurement of student engagement within their classrooms and the broader provincial educational discourse.

Fostering Movement towards Independence

One aspect which is concerning to me is the prevalence of teacher dependence within the students' responses. If students can only learn when the teacher explains a concept to them, then mathematics has a narrow path to be followed. In data of all types in this study, students could describe few strategies for learning mathematics on their own and to build independence. It was apparent from these students' responses that working backwards and using the answers in the back of the book had been used in the classroom to support independent learning. Most students saw independence as a desirable quality in the learning of mathematics. This must be one of the educational goals which teachers include in their planning process.

Some critical questions for mathematics educators are: Do our current practices make students dependent on us? Do we break math it into such small pieces that the beauty of mathematical relationships cannot be experienced by students? How do we change the culture and climate of the classroom to empower students with mathematical thoughts and thinking? These are important aspect for teachers to include in their development of mathematical learning opportunities.

Transition to High School

In the interactive writing component, the students were also asked if they felt they would be successful in high school mathematics. Even though most of the students identified themselves as “good” math students, half of them showed some concern about being successful in math in high school. Helen wrote, “I am the best I can be at this point and I will hope for the best.” Some of the students had older siblings who had shared with them that math was difficult in high school. Overall the students’ level of confidence was not as high when they looked forward to high school as it was when they looked back on this school year.

The lack of confidence which students talked about is a crucial aspect for high school teachers to be aware of. What are the dynamics which create a fear of high school math in students who have been successful? What are the interventions that educators can implement to build confidence within students during their transition to the next level? Transition between schools and educational levels is something which these students have identified that math educators must address.

My Story – The Next Chapter

One of the underpinnings of this research study was to be true to the experience of engagement as the students told their stories. In the beginning, I wanted to know what Brian’s story was (See Page 4). I have had the opportunity to talk with twenty-four “Brians” and learn a little more about each one of them as learners of mathematics. This research has changed me as an educator. Biesta (2006) talks about the notion of “visiting” in his work, *Beyond Learning*. Visiting is putting

yourself in someone else's space, not to experience it through their eyes but so that the experience changes you. I feel that I have truly "visited" the eighth grade math students and that this experience has changed me as an educator. The innocent insight and genuine responses allowed me to hear and feel their experiences in a deep way.

My learning opportunities in this study are not just from the students' words and the interpretations but also from the actual research process. At the beginning of this study I was reluctant to participate in the interactive writing component. I remember sitting down to write my first response to a student and feeling totally overwhelmed by the thought of having to complete thirty-two of them. However, the natural process of education and human interaction cannot be overlooked in the research process. The fact that I felt a strong connection to the students and could visualize their handwriting when I met them has demonstrated to me that the interactive writing process was a powerful experience in itself, even before I was able to think of the students' writing as data for this research.

As an administrator, there are many times when I do not have a meaningful dialogue or relationship with some students. I feel that by using the interactive writing process with a classroom in a school, I can slowly build strong relationships with all students in my school. I plan to complete the interactive writing process with each sixth grade classroom. This will help me build relationships in the first year the students are at the school and will provide a strong basis to continue building them throughout their three years in middle school. I lived the power of

relationship-building through the process of intentional interactive writing and I plan to incorporate this into my life as a school administrator.

I now have twenty-four students who I have a connection to and wonder how their mathematical journey will progress. I am interested in continuing the research process and follow-up with these students at the completion of Grade 9. This would allow me to collect data which is reflective of their first year of studying math in high school. This would add another layer to the data which was collected in this study and another dimension to the transition process from middle school to high school with respect to learning mathematics.

This experience has also greatly affected my conceptions of student engagement. My beliefs as an educator and more specifically as a mathematics educator have been deeply affected by the stories of these students. As educators we make hundreds of decisions every day based on our beliefs and experiences as educators. I had the luxury of being able to share in the experiences of twenty-four individuals. The interpretative component of this study allowed me the opportunity to find added depth and insight into their words.

Therefore, it is imperative that this work is shared with educators so that they can have an opportunity for critical discourse into the notion of student engagement and learning of mathematics. I hope to be able to develop this research into professional development opportunities for teachers. I feel a strong sense of responsibility to share their words with the mathematics community and allow them to support teacher learning and professional development. I hope through extended professional development that I will be able to gain insight into what teachers will

learn from the collection of student narratives and how this will impact their practice.

Potential for Professional Learning

This research study began with the intention of building understandings of student perceptions of engagement within their middle years mathematics classroom. The opportunity to explore unique trends and perceptions students identified arose as the research process evolved. The perceptions which students have of their engagement with learning mathematics are important because teachers need to include this in their lesson goals, processes, and assessments. The perceptions reported here provide a framework that could be used to begin the discussion of what student engagement should look like, sound like and feel like. These are critical questions which can ignite dynamic professional discourse.

In this study student engagement was viewed through the lenses of cognitive engagement, behavioural engagement, and affective engagement. In this paper I have reviewed the connections and interrelationships between these facets of engagement. As educators, we must grapple with the notions of success, grades, and confidence. The students in this study identify these as three interconnected aspects that overlay the three facets of engagement. How is success defined in the classroom? How does the use of grades build and diminish confidence in learning mathematics? What behaviours do students demonstrate when they are successful or unsuccessful in the math class? These are all essential questions for educators to struggle with. There are not simple answers to these questions, but they need to be

asked if we are to view the words which have been written by these students as important.

The collection of narrative texts, which is the heart of this study, has huge potential for professional development. I hope that this collection of stories will be used by educators in a variety of ways. They can be used to create a context for teachers to discuss student engagement and the learning of mathematics. When teachers read each individual text, questions will arise. The professional dialogue initiated from the questions educators raise has potential for wide spread implications for math education.

The challenge to teachers is to allow these students' stories to paint a picture of student engagement for them to consider. This professional development opportunity could be a powerful application of this study, bringing the student lens of engagement into teachers' awareness. Does providing students with concept skills enhance their mathematical learning? How do students become learners of mathematics which is not teacher dependent? Many questions resonate from the words which the students shared and more will be raised as the narrative texts are used by educators.

I would recommend Humphreys and Boaler's (2005) work, *Connecting Mathematical Ideas, Middle School Video Cases to Support Teaching and Learning*, to add another dimension to this conversation. Cathy Humphrey's seventh grade math class was videotaped for an entire year. From this collection of videos, eight classes were selected to provide insight into student interaction in the development of thinking mathematically. The videos demonstrate strategies and

environments to allow students to engage in mathematical thinking and discussion. Also included in this work are student interviews about classroom practices which they view as supporting their understandings of mathematics. The students who were interviewed are in agreement that talking about math as a group helps them understand. Viewing and discussing these videos is a powerful professional development opportunity for educators. Although it does not involve the same students, it offers a similar opportunity for teachers to learn to value the perspective of students on how they engage with mathematics.

The Last Words

The students in this study took a chance and shared what they hoped teachers could learn from their stories. In the transitional and reflective narrative interviews, I included a question which asked students to reflect on what teachers could learn from them. This was a difficult question for many of the students to answer, and there were many pauses before they responded to the question. It was a different way of viewing what we had been talking about. Each of the questions I had asked the students was about themselves as learners and now I was asking them to think about a teacher's learning.

I decided to include each of the student responses in this thesis to honour the spirit of student voice in this study. I have given them the last word. Each one of the responses is unique and deserves to be shared with the potential of affecting teacher learning. The responses provide another window on the classroom environment and

may enable educators to reflect on the impact of their practice for learners in the mathematics classroom.

As educators read the individual student responses in the tables to the interview questions, they will each identify a statement, comment, or nuance which resonates with them. The inclusion of these responses allows them to be used for professional learning in an interactive way. Table 3 and 4 include all of the student responses which provide information which can inform teacher learning. Many students did not answer the question at all or shared that they did not know what to say. These have not been included in the table.

I felt that the students were genuinely surprised to have these questions asked of them. There are many different strands within these responses. Many of them relate to teacher behaviour and classroom expectation. I believe that these are critical questions for math teachers to ask their own students and taking the time to reflect on how their classroom practice supports different individuals in the learning of mathematics.

Xena's words especially resonate with me: "As kids, we are trying and working hard." She was not making an excuse for herself nor judgement of her teachers; she was genuinely sharing simple words packed with emotion. It is essential to remember that what a student states in words does not always represent the feelings and emotions which are tied to learning, especially when the student is experiencing difficulty.

Table 3: Student responses to Question 9 in transitional interview

9. What would you like to tell your next year's math teacher?

Student	Response
Elaine	"Math has always been hard for me. When I don't get it, I don't get it and I want to get it. I need the teacher to slow down until I get it and to break it into simpler steps."
Gerry	"I would tell the teacher that it is good to have fun with numbers, playing around with numbers." (Gerry gave an example of corners of the classrooms used for different math questions.)
Isabelle	"I would tell teachers to make sure you do things which are interesting. If the majority of students don't understand then go over it again. Try to make the lessons interesting. If teachers go too fast you don't understand and lose interest but if there is no challenge then you get bored and lose interest too."
John	"[I would tell the teacher that] kids should be asking questions and don't let them slack. The teacher should explain every step so that you don't get lost."
Kirsten	"Teachers need to make math not boring. It is boring when the teacher keeps talking and everyone still doesn't get it. Sometimes you just don't get it."
Leonard	"[I would tell teachers to] work with easy numbers first and then get harder. Start simpler so you can see the pattern. Show strategies, rules and handy tips."
Neil	"I don't know, maybe write problems on the board and go over it in more detail. Keep doing it until they get it."
Omar	"I would tell the teacher to help me. Don't do questions on the board; doing a question together doesn't help me. Having things to move around when I am doing math helps me."
Quinton	"[I would tell the teacher] doing rate and ratios is important. They need to take their time on something. I don't like it when they rush. I like it when you go step by step and don't rush."
Sally	"[I would tell the teacher] that I probably need extra help, more than everyone else because I do bad."
Ulysses	"[I would tell the teacher] to go step by step".
Veronica	"[I would tell the teacher] to write notes because it helps me learn."
Wendy	"I would tell the teacher, to make sure you explain things. Do it once quickly and add the detail after. It takes longer but it helps."

Table 4: Student responses to Question 3 in reflective narrative interview.

3. What do you hope that teachers will learn from your story?

Student	Response
Alice	"I'm not sure what teachers will learn."
Belinda	"Teachers will learn something about me."
Carol	"Teachers will learn about me? To be a good math student you need to take the responsibility to learn and try new skills."
Derrick	"Teachers will learn that students use some focused strategies."
Elaine	"[Teachers will learn that] I need more help in math and they should know that I am a weak and they need to make me understand it. Also that I am shy but I am more confident. I need more time to learn."
Fred	"[Teachers will learn] that math (pause) when the year goes on you get more into it and people get it. Like both things getting use to a new teacher and back into math. They are both important."
Gerry	"Teachers will learn that helping other people makes you understand."
Isabelle	"Teachers will learn what is important about lessons. It is the structure of their lessons."
John	"[Teachers will learn] that the teachers are really good here; they make sure that their students understand what they are doing."
Mona	"[Teachers will learn] how I learn and how I do the stuff."
Patty	"I don't know"
Quinton	"A teacher might do something differently like to break it in to smaller parts."
Roberta	"I don't talk during class and I listen and I know what I am supposed to do."
Thomas	"Teachers will learn that they might have to push me to work sometimes."
Veronica	"Teachers will learn that students are engaged in learning or they are not. There is no in between."
Xena	"Teachers will learn that math can be frustrating. It is hard but there are different ways to get involved, It relates to the world. As kids, we are trying and working hard. More real life helps because you use it to remember it."

Student engagement is a complicated, powerful educational term. It can depict an ideal situation where learning is powerful and passionate, or it can be used to describe situations where students have removed themselves from the learning

situation and are disengaged. The perspectives which students shared in all aspects of this data which was collected provides educators with opportunities to view their students' performance in mathematics through an alternate lens. This lens enables educators to visit their world. The stories which were created as narrative texts allow the ideas and perceptions of the students to become alive for educators. My hope is that "Their Stories" will not only provide a vehicle for teachers to engage in professional dialogue, but will also inspire teachers to discover their own students' stories.

References

- Asghari, A. (2004). Organizing with a focus on defining a phenomenographic approach. In *Proceedings of the 28th conference of the international group for the psychology of mathematics education, Vol. 2*, 63-70.
- Biesta, G. (2006). *Beyond learning: Democratic education for a human future*. Boulder, Co: Paradigm Publishers.
- Bishop, P. & Pflaum, S. (2005). Middle school students' perspectives of social dimensions as influencers of academic engagement. *Research in Middle Level Education*, 29(2), 1-14.
- Boaler, J. (2002). The development of disciplinary relationships: Knowledge, practice and identity in mathematics classrooms. *For the Learning of Mathematics*. 22(1), 42-47.
- Boaler, J. & Humphreys, C. (2005). *Connection mathematical ideas: Middle school video cases to support teaching and learning*. Portsmouth, NH: Heinemann.
- Bogdan, R. & Biklen, S. (2003). *Qualitative research for education: An introduction to theories and methods* (4th ed.). Upper Saddle River, NJ: Pearson Education.
- Carroll, J. (1998). Developing teachers of mathematics: Factors contributing to development in mathematics education for primary school teachers. In *Teaching mathematics in new times, Proceedings of the annual conference of the mathematics education research group of Australasia Inc., (Vol. 1)*, 200-208.
- Chickering, A.W. (1969). *Education and identity*. San Francisco: Jossey-Bass.
- Chickering, A.W. & Reisser, L. (1993). *Education and identity* (2nd ed.). San Francisco: Jossey-Bass.
- Clandinin, D.J. & Connelly, F. M. (2000). *Narrative inquiry: Experience and story in qualitative research*. San Francisco: Jossey-Bass.
- Davis, B. (2001). Why teach mathematics? *For the Learning of Mathematics*, 21(1), 17-24.
- Dougherty, B. J. (1996). The write way: A look at journal writing in first-year algebra. *The Mathematics Teacher*, 89(7), 556-560.

- Editorial Panel (2006). On our mind: 10 things to remember when teaching middle school mathematics. *Mathematics Teaching in the Middle School*, 11(9) 419.
- Franz, J., Ferreira, L. & Thambiratam, D.P. (1997). Using phenomenography to understand learning in civil engineering. *International Journal of Engineering Education*, 13(1), 21-29.
- Fredericks, J., Blumerfeld, P. & Paris, A. (2004). Student engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59-109.
- Gadanidis, G. & Hoogland, C. (2003). The aesthetic in mathematics as story. *Canadian Journal of Science, Mathematics and Technology Education*, 3(4), 487-499.
- Greeno, J. (1997). Theories and practices of thinking and learning to think. *American Journal of Education*, 106, 85-126.
- Hall, G. S. (1905). *Adolescence Volume II*. New York: D. Appleton.
- Harbaugh, A. (2005). *Creating a culture of (in)dependence*. Retrieved September 28, 2008 from [http://www.thefreelibrary.com/Creating+a+culture+of+\(in\)dependence.-a0142636430](http://www.thefreelibrary.com/Creating+a+culture+of+(in)dependence.-a0142636430).
- Irvin, L. (n.d.). *Teacher conceptions of how to facilitate student engagement*. Retrieved November 4, 2007 from <http://www.aare.edu.au/06pap/irv06614.pdf>.
- King, T. (2003). *The truth about stories*. Toronto: House of Anansi Press.
- Manitoba Education and Training. (1997). *Grades 5 to 8 Mathematics. A foundation for implementation*. Winnipeg, Mb: Author.
- Manitoba Education, Citizenship and Youth (2007). *Middle years assessment Grade 7 student engagement: Support document for teachers*. Winnipeg, Mb: Author.
- Manitoba Education, Citizenship and Youth (2007). *Manitoba framework for K-9 mathematics – draft*. Winnipeg, Mb: Author.
- Marks, H. (2000). Student engagement in instructional activity: Patterns in the elementary, middle and high school years. *American Educational Research Journal*, 37(1), 153-184.

- Martin, A. & Marsh, H. (n.d.). Student motivation and engagement in mathematics, science, and English: multilevel modeling. Retrieved November 4, 2007 from <http://www.aare.edu.au/05pap/mar0502.pdf>.
- Marton, F. (1994). Phenomenography. In *The International Encyclopedia of Education, Second Edition, Volume 8*, 4424-4429.
- Mason, J., Burton, L. & Stacey, K. (1985). *Thinking mathematically*. Essex, England: Pearson Education.
- Mason, R. & McFeeters, P. J. (2002). Interactive writing in mathematics class: getting started. *Mathematics Teacher*, 95(7), 532-536.
- McFeeters, P. J. (2006). Giving voice to success in mathematics class. In Van Zoest (Ed), *Teachers Engaged in research: Inquiry into mathematics classrooms, Grade 9-12*. Greenwich: Information Age Publishing.
- McMillan, J. (2004). *Educational research: Fundamentals for the consumer*. (4th ed.) USA: Pearson Education, Inc.
- National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA: Author.
- National Middle School Association. (2006). *Success in the middle: A policymaker's guide to achieving quality middle level education*. Columbus, Ohio: Author.
- National Middle School Association. (1995). *This we believe*. Columbus, Ohio: Author.
- Orgill, M. (2007). Phenomenography. In G. Bodner & M. Orgill (Eds.), *Theoretical frameworks for research in chemistry/science education*. Upper Saddle River, NJ: Pearson Education.
- Pang, M. F. (2003). The faces of variation: on continuity in the phenomenographic movement. *Scandinavian Journal of Educational Research*, 47(2), 145-156.
- Steffe, L. (1990) Adaptive mathematics teaching. In T. Clooney & C. Hirsch (Eds.), *Teaching and learning mathematics in the 1990's*. Reston, VA: National Council of Teachers of Mathematics.
- Stringer, E. (2004). *Action research in education*. Upper Saddle River, NJ: Pearson Education.
- Stocker, D. (2007). *Maththatmatters*. Canada: CCPA Education Project.

Sullivan, P., Tobias, S. & McDonough, A. (2006). Perhaps the decision of some students not to engage in learning mathematics in school is deliberate. *Educational Studies in Mathematics*, 62, 81-99.

Tomlinson, C.A. (1999). *The differentiated classroom: Responding to the needs of all learners*. Alexandria, VA: Association for Supervision and Curriculum Development.

Wormeli, R. (2001). *Meet me in the middle*. Portland, MA: Stenhouse Publishers.

Appendix 1 Interactive Writing Prompts

Cycle one

1. Explain one task you were asked to do in math class today. Describe what **you** did.
2. Tell me about a time in class today when you understood the math you were doing. Explain why?
3. If I was watching you in math class today, what would I see you do?

Cycle two

1. What did you learn in class today? Explain it to me?
2. How do you multiply 45 by 20 in your head? Why do you do it this way?
3. How do you know when you understand the math you are doing in class?

Cycle three

1. What do you do when you get frustrated with math? When does this happen?
2. As a mathematician, I _____
3. Tell me about a time in math class when you went; **NOW I GET IT**. How did you feel?

Appendix 2
Letter of Consent and Consent Form

(date)

Dear Parent/Guardian

This letter is to inform you of a special instructional activity that will be taking place in your child's mathematics classes over the next few weeks. As well, it describes a research project which is related to that instructional process, and it will invite you to consent to your child participating as a data source in that research.

My name is Gwen Birse. I am currently completing my Master of Education degree at the University of Manitoba. The thesis for my degree involves the development and enactment of a research project. It is in regard to that project that I am writing this letter. The title of the project is *Their Stories: Students' Perceptions of Engagement with Middle Years Mathematics*.

Purpose of the Research:

The teaching and learning of mathematics has been a passionate interest of mine throughout my career as an educator. I would like to become better equipped to help teachers build the excitement of middle years students as a part of a dynamic classroom environment in mathematics. At the core of my research is a belief that listening to students' voices and building meaning from their words can help teachers (including myself) to develop their practices. At the same time, it is clear that students can benefit from reflecting on themselves as learners of mathematics, with a teacher's assistance. As students leave middle years and enter senior years, it is to their advantage if they can understand their relationship with mathematics better, and identify the elements of that relationship that they can build on or change.

Mrs. _____ has invited me to provide instruction for her students that will lead them to explore their approach to learning mathematics as their time in middle years comes to a close. All students will participate in this instruction, and it is my hope that your child will be one of the students who agrees, with your permission, to become a data source for my study. This letter will provide some details about the instruction and the research, including details about the protection of data sources' rights at all times.

Instructional Procedures:

Along with all students in the class, your child will explore their notions of engagement through interactive writing. Here is how interactive writing will work. Three times a week, in the last ten minutes of math class, your child will complete a written response to a question about their engagement in mathematics during that

period. Mrs. _____ will collect the responses and I will write back to each student for the next class. My purpose in writing will be to help each student understand her/his engagement with mathematics and success in the subject. Over a three-week period this process will enable students to develop their understandings of what they can do in future opportunities to learn, as they reflect on how they have related to mathematics this year.

Along with the interactive writing, each student will meet with me to talk about how they are reflecting on their mathematical experiences. To help them to draw conclusions from their reflections, I will compose an interpretation of each student's writing. I will share that interpretation with the student to begin a 15 minute private conversation in which we will talk about their engagement with mathematics.

All students will participate in the educational processes described above. To prepare for the possibility that you and your child might agree to be a data source for my research, copies of their interactive writing will be made, and the conversation described above will be audio-recorded. I will be the only person with access to this material. If your child becomes a data source, I will use the material as data, as outlined below. Otherwise, I will destroy the material. Whether or not any student becomes a data source will not affect the students' opportunity to learn, or the student's marks in any way.

So that you will be fully informed, I will now describe the research procedures.

Research Procedures:

The research processes described here will only take place with students who are data sources. Your child can be a data source if he/she and you agree, by signing the form that accompanies this letter.

I will have one more opportunity to interact with students who become data sources, approximately one week after the interactive writing has been completed. If your child is a data source, I will write a "narrative text" which will represent your child's story of how he/she engages as a learner of mathematics. Your child and I will meet again to discuss this story. We will ensure that the story portrays their mathematical engagement appropriately. We will consider what steps the student perceives as ways to develop their engagement as they move toward high school. Like the first interview, this 20-minute interview, which will take place in a private conference in the school during class time, will be audio-recorded.

It is at this point that as a researcher I will become an interpreter of the perspectives of all the students who have chosen, with their parents' permission, to be data sources. The data which I will use in the interpretive process of this study

are: interactive writing responses, audio-recordings of the two interviews and the final narrative texts.

Confidentiality:

All university research is carefully designed to protect the confidentiality of data sources. I would like to inform you in detail about how the data will be handled. I will be the only person to view the students' writing and I will be the only person who listens to the recordings. I will keep all data in a secure, locked location. After I am done, I will destroy all paper data and erase all audio recordings, to protect all data sources from identification.

As I interpret the data to complete my research, I will be careful to ensure the confidentiality of all data sources. I may be quoting from individual students in my writing, but I will not be using any details or quotes that could be traced back to a particular data source. I will use pseudonyms when referring to individuals. Because I am likely to be including the final narrative texts that I write for each data source in my thesis, I will be ensuring that the narrative texts include no details that would enable readers to identify data sources. However, before agreeing to allowing your child to be a data source, you should know that observers of the research process, including the teacher and your child's classmates, are likely to be able to discern who is and who is not a data source, because data sources will be participating in the final interview. More generally, even though the site of the research will not be divulged in the writing, people may be aware of the school and the classroom where it took place.

This letter of information and the attached consent form are only two parts of the process of informed consent. It should give you the basic idea of what the research is about and what your child's participation will involve. For those who want more information, there will be an information session on (date) at (time) in your child's classroom. This will provide another opportunity for your and your child to ask questions and gain insight into this research. If you would like more detail about something mentioned, or information not included, please feel free to ask me.

Please feel free to contact me at anytime.

Gwen Birse, Researcher.

Telephone: 864-2515 e-mail: gwen.birse@7oaks.org

You are also welcome to contact my thesis advisor for any reason.

Dr. Ralph Mason, Room 272, Faculty of Education, University of Manitoba

Telephone: 474-9086 email: masonrt@cc.umanitoba.ca

This research has been approved by the Education/Nursing Research Ethics Board (ENREB). If you have any concerns or complaints about the project you may contact any of the above named persons or the Human Ethics Secretariat at 474-

7122, or e-mail margaret_bowman@umanitoba.ca . This consent letter is yours to keep for your records.

To become a data source, a student must sign an assent form and return it to the secretary of the school. As well the secretary of the school must receive a consent form (provided with this letter), signed by the student's parent or guardian. Even after you have given consent, you still have full control over the participation of your child in the study. You will always have the right to withdraw your child from further participation in the research process. You will always have the right to request that any or all data be excluded from the study and destroyed. Just contact me or Dr. Mason through any of the above means.

Thank you for taking the time to consider your child participating in this research. I look forward to helping Mrs _____ in the classroom over the next few weeks. I look forward to both the instructional and the research activities outlined here.

Sincerely yours,

Gwen Birse

Consent Form

To give your consent for your child to become a data source for this research please return this signed form to the school secretary in the office.

Research Project Title: Their Stories: Students' Perceptions of Engagement with Middle Years Mathematics

Researcher: Gwen Birse, Graduate Student in the Faculty of Education, University of Manitoba.

Participant's name

Parent/Guardian's Signature

Date

If you would like to receive a brief summary of the research when it is completed, please provide an e-mail address or a mailing address.

Appendix 3

Questions for Transitional Interview

[These interviews will be open ended and build on the three writing prompts which have been selected based on the interpretive framework of affective engagement, cognitive engagement and behavioural engagement. The questions are guides as the interviewer will encourage the participant to expand on their responses and to reflect deeper into their responses.]

Interviewer: Thank you so much for the writings you have completed in the last two weeks. I really appreciate the thoughts which you have written down. I have chosen three of them for us to talk about. Shall we look at them together? *(Interviewer will bring out interactive writing folder to refer to during the interview questions.)*

Questions 1, 2 and 3 will follow the same format for the three identified responses.

1. Let's look at what you wrote for number _____. *(Student response will be orally read by the interviewer with the student following along. Interviewers question will identify one aspect to explore.)* Tell me what you mean by this? Is there anything which you would add onto this?
2. Let's look at what you wrote for number _____. *(Student response will be orally read by the interviewer with the student following along. Interviewers question will identify one aspect to explore.)* Tell me what you mean by this? Is there anything which you would add onto this?
3. Let's look at what you wrote for number _____. *(Student response will be orally read by the interviewer with the student following along. Interviewers question will identify one aspect to explore.)* Tell me what you mean by this? Is there anything which you would add onto this?
4. What are you doing as a student when you feel that you really understand the mathematics being studied in the classroom?
5. What do you do when you "Get Stuck" on a problem?
6. How do you feel when this happens?
7. How do you know that you understand the mathematics?
8. How do you feel when this happens?
9. Do you find that you learn differently in math than your other subjects?
10. Tell me what I would see and hear when you are learning mathematics?

11. Would your teacher tell me that you were an engaged student? How would she know this?

12. Can all students learn middle years mathematics?

13. Let's say that you had a chance to talk to your teacher next year, what would you tell them that you need to understand math?

Thank you for your responses. I am going to take all of the information you have shared and write it in a narrative text. I will be back in a week and we will meet again and be sure that the text tells "your story".

Appendix 4
Example of development of a narrative text

Step 1: Initial draft composed from interactive writing responses.

Dear Wendy

You have seen that your learning from previous years is important. You have built on previous concepts this year. You realize that visualizing numbers helps you to build understanding. The story of your Mom using the little beans is very special.

You enjoy math because it is a challenge. You are determined to learn the concepts and are very intentional in what you do to achieve this.

You practice your math processes. You compared it to practicing your band instrument when you are learning a new rhythm.

Thank you for sharing your responses with me. They are even more special when I think back to Grade 3.

Mrs. Birse

Step 2: Notes made by researcher from transitional interview recording.

Independent learner – always pay attention, do your work. I keep on track myself.

Challenge – Like it. when it is easy it is just time consuming and it is repetitive because you know how to do it. In Grade 2 we had levels, same things but at different levels. Different levels of work. Kids wouldn't do any work if they had the choice.

Get Stuck – ask my mom or sister and then I would wait and ask the teacher.

I make myself a visual. I do it all the time. Mrs. Y will do it on the board and I will copy it down.

Learning math and music are the same because of the notes and the fractions.

Teacher – make sure you explain things and go it once quickly and then add deep detail about the concept. It takes longer but it helps.

Step 3: Draft of narrative text to be used during the reflective interview.

Dear Wendy

You are a very confident learner of mathematics. You are able to relate math to real life and to apply the concepts you have learned. You can work with math as a whole and relate it to other things you do. You do not see math as a separate entity which is isolated from your other learning. You see the math in music and compare how you learn in math and how you learn your instrument. In math you practice the process just like you do a new rhythm in band.

You have seen that your learning from previous years is important. You have built on previous concepts this year. You realize that visualizing numbers helps you to build understanding. The story of your Mom using the little beans to teach you multiplication in Grade 3 is very special.

You enjoy math because it is a challenge. You are determined to learn the concepts and are very intentional in what you do to achieve this. You are an independent learner who always pays attention in class and completes the assignment. You are not upset if you do not understand something at first; you will ask for help and try to look at the question different ways.

Thank you for sharing your responses with me. They are even more special when I think back to Grade 3.

Mrs. Birse

Step 4: Notes made by researcher from reflective narrative interview recording.

Notes

I guess that is me

Paragraph 1 – Ok

Paragraph 2 – OK

Paragraph 3 – OK

Most important – third paragraph because it does give me a challenge and when there is a challenge you get more involved and you want to learn about thing. You want to complete the challenge like video games you want to beat the level.

High School Maples – I don't think so, I hope not.

Step 5: Revision of narrative text if necessary.

Appendix 5

Questions for reflective narrative interview

[A three paragraph narrative text will be composed by the researcher based on the interactive writing responses and the individual interview. The following questions are guides as the researcher will ask probing questions throughout the interview to allow the participant to expand on their responses.]

I have brought with me the narrative text which I have written from your writing responses and the time we talked last week. I am going to read you what I have written and then we can talk about it. [Entire text is read orally. Written copy of text is jointly looked at by the researcher and the participant when each paragraph is reviewed.]

1. When I read this to you, how did you feel?
2. Let's look at each paragraph and we can talk about each one.
3. Does this text describe you as a learner of mathematics?
4. Tell me why?
5. What do you feel is the most important part of the test? Why?
6. What do you want teachers to learn from your story?
7. What have you learned about yourself from us writing this story together?
8. What is one thing you could do in the fall to change how you do math so that you could create stronger understandings?
9. Do you think you will learn math differently in high school?
10. If we did this a year from now, what do you think would have changes?

Appendix 6

Final Narrative Texts

Dear Alice

You told me that you have learned many things in mathematics this year; ratio, scale, integers, geometry and the Pythagorean Theorem. Being an active learner is an important part of this process. You always listen to the lessons that the teacher is giving and write notes which you can refer to later. You use the book and study for tests and keep trying until you can do the questions.

You see the connections in mathematics and that the concepts build on each other. This helps you learn because you can build on previous learning and you see mathematics as having connections and patterns in it. You can solve problems by creating a simpler question.

You used different kinds of the arts to make the math in your scrapbook gorgeous. I think that this helps you enjoy it. You feel that your experiences working in your family store helped you learn math and caused your grades to improve. This opportunity gave you a practical way to view mathematics.

I am glad that you are confident that you will be successful in Grade 9 mathematics. The connection which you made between real life experiences and mathematics is important to my research. I see potential in your mathematics learning because you have lived that connection.

Thank you for sharing your story of engagement with me.

Mrs. Birse

Dear Belinda

You see yourself engaged with mathematics and have been able to learn many new things this year. You have found that by continuing to work on certain questions you build your understanding more and more each time. Using tips and rules helps you solve problems and makes you confident that you can work on questions which are harder for you to complete. You have been able to build on the math you have learned in other school years and you see the importance of this.

Mathematics is your favourite subject and you see a purpose in learning it. You were very specific in saying that it is of your future. You are confident that you will be able to be successful in mathematics in high school and show determination to ensure that this happens.

To learn mathematics you complete your homework daily, listen to what the teacher says, take notes and study for tests and assessment. You are able to use mathematics in your everyday life and your example of estimating sale prices shows this. You work with your friends to be sure that each person can understand the mathematics being learned. You have built a strong system to allow your independence for learning mathematics and the interdependence of the learning of your friends to compliment each other. I see this as being an important piece for you to continue in high school mathematics.

I wish you the most of success in your future learning of mathematics. Thank you for sharing your story of engagement with me.

Mrs. Birse

Dear Carol

You find that completing your homework helps you learn math. You make connections between the math you are learning in school and the real world. Your scrapbook is full of articles to demonstrate this. When you are thinking mathematically, you are comparing a new concept to previously learned ones and try to make connections. You use the strategy of working backwards to help you understand a question. You are not afraid to make a mistake in math class; you consider this a part of your learning.

You find math fun when you can see progress in your understanding of mathematics. You find the math concepts you are learning are connected to each other and there is a purpose for learning the current material. I feel that you are proud of yourself when you recognise that you have truly understood a concept when it flashes back to you at a later time.

You stated that to be good at math you need to take responsibility to learn, try different skills and enjoy math. I am very interested that you see engagement with mathematics as you being inside the process. You are not an outside observer of learning mathematics but inside the thinking and learning of mathematics. I anticipate that your commitment to being involved in math will continue in high school because you are very proud of your progress. Never be afraid to take a risk in your math class.

Thank you for sharing your story of engagement.

Mrs. Birse

Dear Derrick

You have many strategies to help yourself learn mathematics. You listen to the teacher when she is explaining, you write down all the examples and notes, you check your answers in the book or with a friend to be sure you are doing the questions correctly. You study for tests and analyse your errors to understand why you had the incorrect answer. You can identify the different parts of mathematics in a question to isolate the exact nature of the error you have made.

As a student, you enjoy mathematics because you learn new things and enjoy the challenge of building new understandings. Derrick, I heard a real determination in your responses to understand the mathematics being studied no matter what it took. You are confident that you will be able to learn mathematics.

I am very interested in the way you have described how you think mathematically. You have a method for thinking through a question, to build understanding and to use all the tools available, (calculator, notes, teacher, and friends) to support your learning. You have a strategy for thinking independently at first and then interactively. You can describe how you think through a question and this is an important skill to have. You focus on your work and you concentrate in class.

Your confidence, determination and enjoyment of learning mathematics will serve you well as you continue learning mathematics. Thank you for sharing your story of engagement with me.

Mrs. Birse

Dear Elaine

You engage with mathematics by listening and thinking through the questions with the teacher. You have clearly told me that you need to be an active part of the process of learning mathematics. However, the teacher needs to match their pace with you. You will continue working on something until you understand it and you need the teacher to wait for you. As you worked through subtracting integers with Mrs. Z, you were able to improve your test score. You showed that if you don't understand something at first and do not give up you will be able to learn it if you continue to try. You are a very conscientious student and you always complete your homework. Your teacher sees you listening, not talking to your friends and concentrating on the lesson. Your teacher knows you are doing your best.

You enjoy math class when you are able to demonstrate true understanding of a concept. It is fun to realise that something you have been learning is now easy for you. You are proud that you are doing better this year and you want to continue

doing better next year. Mathematics has become more enjoyable for you this year. However, you are nervous about your grades in math. You want to do well and to understand the work. You want teachers to know that if you don't understand something it is not because you are not trying. You are scared to make a mistake in math. Elaine, that is one way of learning mathematics so allow yourself to make a mistake.

You have shared with me that one way you learn mathematics is to build connections to previously learned material. You can see that you have built on your learning of integers from Grades 6 and 7. This year you have become more confident as a learner of mathematics. Remember that you can ask for help or for more time when you are learning something. I hope that you will be comfortable to share with your teacher that it helps you learn when things are broken down into smaller steps. We all learn differently and you have learned some of the things which help you and I know you will be sure to continue them next year.

Thank you for sharing your story of engagement with me, Elaine. I really appreciate the time and thought you put into your responses.

Mrs. Birse

Dear Fred

You shared with me many things you do to be engaged with mathematics. You complete all of the math sheets, study for tests and listen in class. You sometimes also complete extra questions if you understand the math you are doing. You are focused in math class and have made a decision to stay on task. When you talk in class it is to work together with your friends to understand the assignment.

You enjoy mathematics because it is a challenge for you. I am interested in this because you are not deterred by learning things which you need to work at. You have seen that being able to learn mathematics means that you need to be able to think through things even when they are difficult. This is also true for your classmates. Don't be reluctant to share your answers during whole class activities. Even if they are not correct, someone in the class will learn as you think through the question together.

Your learning which occurred in grades 6 and 7 helped to build your understandings of integers. You made connections to the previous math concepts you learned. You helped yourself by taking notes and referring to them while you are completing your math assignments. The rules which are created in class help you to become efficient with calculations because you understand how the generalizations were developed.

In high school you feel math will be difficult at the very beginning. You are more worried about learning math than your other subjects. I hope that the way you feel when you succeed when challenged by mathematics will be a huge benefit to you as you continue to learn mathematics. You are confident that you can do it and have made the decision to be on task and to do your best.

Thank you for sharing you story of engagement with me Fred.

Mrs. Birse

Dear Gerry

You reflected that you are engaged in math class. Your teacher would know this because you answer the questions correctly and you help other people. You see the learning of mathematics in the classroom as everyone helping each other to understand. The classroom works as a team to be sure that everyone is successful on the tests.

You enjoy math and take pride in your work. You made drafts of your article questions so that the final copy did not have any mistakes in it. Math is your favourite subject because it does not involve as much language as other subjects. This allows you to concentrate on learning the math concept. You appreciate it when teachers make math fun by creating games and challenges with math questions.

Your response, “Math makes sense to me when I work with it, talk about it and think.” is very important to my research. You have included a multifaceted description about how you learn mathematics. I am anxious to share this with my fellow teachers.

Thank you for taking the time to be so insightful in your responses.

Mrs. Birse

Dear Helen

You are an active participant in your learning. When you listen to the teacher you select what to write down dependent on your understandings. You determine what you need to review and to try again in math class. You are listening for the “why” in class and when this makes sense you know that you understand the concept. You check your answers to be sure that you are completing the work correctly as you go.

You care about achieving good grades on your math tests. You practice and prepare for the tests and worry that you might not do your best. You show excitement when you understand the math being studied by shouting out the correct answers. However, you are reluctant to answer questions if you do not think you have the right answer. You feel that all students can learn math if they decide that they want to and put the effort in to it.

Your response, "I will be the best I can be." is important for my research. This is something teachers need to hear and you phrased it beautifully. As you grow as a learner of mathematics, you will increase the strategies you have to work through problems. Thank you for taking the time to share your story of engagement with me. Good luck in math next year and keep dancing.

Mrs. Birse

Dear Isabelle

Isabelle, you feel that you have done well in math this term. You pay attention in class and participate when reviewing the answers. You do what is necessary to be sure that you understand a concept before you move on to the next assignment. You shared with me that you use the calculator as a tool in mathematics. If you cannot do a calculation in your head you use the calculator so that you can think about the math you are working on.

You enjoy mathematics when you understand it. Your success in mathematics is tied to your enjoyment of the subject. Teachers need to make math interesting for students to be engaged with it. It is also important that they pace the lessons properly; if teachers go too fast student's don't understand and lose interest and on the other hand if teachers go too slow there is no challenge and student also lose interest in their learning. Isabelle you want to be challenged by the math you are learning but you also want it to be presented so that you can understand the concepts. This balance makes math enjoyable for you.

Integers is a topic which you have studied over two years. This has allowed you to build your understandings on prior knowledge. You have witnessed how new concepts build on previous ones. Next year you will ask questions and use your textbook to provide examples of similar problems to support your leaning. Good luck next year and let your beautiful personality shine through.

Thank you for sharing your story of engagement with me.

Mrs. Birse

Dear John

You shared with me that you are a very conscientious student. You always complete your homework and hand in all assignments. You are engaged in the lessons in class and make decisions about what notes to make to refer to later. Engagement to you is how focused you are and that the material is understood. You see engagement as a process where you are learning mathematics. If a person is not successful in mathematics he/she is not engaged.

You are a confident learner of mathematics. You quickly understand the work and continue with the assignments. You enjoy mathematics when it is really difficult. You enjoy the challenge of learning something new. Your friends ask you for help and you are pleased that you are able to do this. Your success in learning mathematics makes you feel good about yourself as a student.

John, you use the assignments in mathematics to build your understandings. Completing your scrapbook allowed you to ensure that you understood all of the concepts. When you were not sure about probability you made the effort to build your understanding. You independently read through the textbook to support your learning. You are an active participant in the process of learning mathematics and you are making informed decisions based on your understandings of the concepts.

By choosing the advanced mathematics option in high school you are creating opportunities to build your understandings. The decisions which you have made to ensure that you understand all of the math you are studying will provide a sound base your continued learning.

Thank you for sharing your story of engagement with me and good luck next year.
Mrs. Birse

Dear Kristen

Kristen, you shared with me that engagement is participating in math class by answering questions correctly because you understand the mathematics. You do not feel that you are engaged because you sit quietly in class and listen to the teacher and usually do not understand the lesson.

You have many things which you are doing to help yourself learn mathematics. You are listening to the teacher and asking your friends questions. You always try to do the work first by yourself but you will eventually ask your friend and occasionally the teacher. You write notes so that you can refer to them later when completing the work. You are completing your work and “always try your best on doing things”.

You feel that you are a weak math student because of the test marks you receive. It seems to you that everyone else just gets it and you do not. This makes you feel sad about yourself. You do not understand why you cannot learn the math because you try hard. Continually listening to the teacher does not help you understand the mathematics. Someone making it simpler does help you understand the mathematics. Working with someone helps you enjoy mathematics because you do not understand it on your own.

Thank you for sharing so honestly during our short time together. What you have said will be important words for teachers to hear. I hope next year that you will find it in yourself to ask questions knowing that this is what the teacher wants to hear. That is how they learn about you and how you are thinking mathematically. Good luck.

Mrs. Birse

Dear Leonard

You describe yourself as a very competent math student. You are engaged in math class because you answer a lot of questions and you understand the work being studied. You complete your math homework on time and take it home when you need to. You are focused in class and work independently, thinking through each question. You use the strategies, rules and handy tips your teacher gives you to help your understandings.

You enjoy math because you see it as important to your future. You feel that people need to be competent in mathematics to have a successful life. This is important to you and you have made a commitment to learning mathematics. You appreciate it when the teacher uses simpler numbers when introducing a new concept. This allows you to focus on the new content and not the calculations.

You know that you understand a concept when you achieve a high grade on a test or when you can apply it to the real world. Completing the articles for your scrapbook was an opportunity for you to reflect on your understandings. You have noticed that you build your understandings on the work which you have completed in previous years. You see how math concepts connect to each other and are not separate entities. You are thinking through the questions with the teacher.

Leonard, your confidence and commitment to the learning of mathematics will be an asset as you continue this journey. You are making an intentional decision to be engaged with mathematics. Thank you for sharing your story with me. Good luck next year.

Mrs. Birse

Dear Mona

You think math is very wonderful. You enjoy learning math and working in your math class. You are proud of your success in math and have made a commitment to achieve good grade in mathematics.

You are engaged in math class because you listen carefully and complete all of the work. You have discovered that to understand the math you must listen very carefully to the teacher. This helps you learn mathematics. You see other students not engaged in math class because they are fooling around and not listening.

Your experiences with mathematics have allowed you to build on your understandings from other years. You remember the concepts you have learned in previous years; area, perimeter, ratio, integers, and have added new concepts this year, graphs and Pythagoras theorem. You understand how the rules given in class are developed. This helps you apply them properly.

I agree with you Mona, that you will be successful in mathematics. Your determination to succeed is very clear in your responses. You feel that as you continue learning mathematics it will get easier because your knowledge base will be broader. This is a very insightful reflection. Thank you for sharing your story with me.

Mrs. Birse

Dear Neil

You demonstrated to me that you can complete calculations with fractions. You feel that you really understood this unit and have remembered it past the end of the unit. You complete your math work and get caught up when you are away. You like art and appreciate it when this is apart of learning mathematics.

Your enjoyment of mathematics is tied to whether you understand the concept. Math is your thing and you would choose to do math over ELA. In math you are learning with the teacher and in ELA you are learning on your own. You feel that when you are in university you will be able to work on math on your own because you will know more of the concepts.

Engagement is how you are in the process. For example; paying attention, asking questions and completing your work. You identify that being engaged is being in the middle of the learning process. You have many strategies for working through math problems. You reread the question, identify important words, divide it into smaller parts and will work through it with someone else. You do not give up if you are challenged with a question.

Thank you for sharing your story of engagement with me Neil.

Mrs. Birse

Dear Omar

You use the complexities of mathematics in your real life. In Monopoly you need to play smart so you are making decisions about how to use your money so that you can stay in the game. These same decisions will be real when you are older and you will use your math skills to make sure you use your money well.

In math class you are not engaged and have given up. You shared with me, Omar that you are not interested in the math which is being learned. You do not interact with your classmates in math class but you will ask your teacher for help if you think you can understand it. Sometimes when you understand a concept like integers you are more interested in doing the work.

You appreciate it when a teacher helps you. Having actual objects to move and not just pictures on a page helps you to understand math. When the teacher can make the question simpler this helps you. You want your teacher for next year to know that you will need help. You are not shy about telling them this.

I enjoyed your responses to my questions Omar. Thank you for taking the time to share your story.

Mrs. Birse

Dear Patty

You describe yourself as a responsible math student. This means that you always do your math homework and you make an immense effort to learn the mathematics being studied. You realise that the math you are learning this year will be important for next year. You see a purpose in learning the mathematics and have a career goal which will use mathematics extensively.

You are fascinated with some of the mathematics you have learned this year especially Algebra. You are surprised that yes you do enjoy mathematics and do find some of it very interesting. You are proud of yourself when you learn the math but you do not share this with your friends. It is not cool to like math so you keep it to yourself.

You are an independent learner of mathematics. You have many strategies to work through problems on your own. You know that you understand the math being studied if you can do the homework by yourself without any trouble. A high test mark will also tell you that you understand the math. You prepare for tests by re-reading your homework and practicing a few questions. You want to know if you understand it before you write the test.

I agree that you Patty, that you will be successful in mathematics at high school, if you continue to be a responsible student and can apply the lessons that you have learned properly. Good luck next year and thank you for sharing your story with me.

Mrs. Birse

Dear Quinton

You are a confident math student. You achieve excellent marks on your tests and you are proud of this. Your high test scores illustrate that you are engaged with mathematics. You see yourself as very engaged in math class. You write down the notes the teacher gives you and add additional things to be sure they make sense to you. You work on the assignments on your own because you usually understand them very well.

You enjoy working with mathematics. The fact that you do well in math makes it enjoyable. Working with numbers is something which is interesting to you. Math is different to you and is one of your favourite subjects.

You have shown me some strategies you use to complete mental calculations. The teacher working through examples on the board really helps you learn the material. When you are away you take the initiative to catch up on the work. You appreciate it when the teacher takes their time and breaks a question up into smaller parts. You don't like to be rushed in your learning.

You are confident that you will continue to achieve excellent grades in mathematics in high school. You have shared with me some of the things you intentionally do to ensure that you are learning mathematics. Good luck next year, Quinton.

Mrs. Birse

Dear Roberta

You shared with me some of the things you do in class to help you learn math. You write down the notes from the board and include examples with them. You refer

back to these notes when you are completing the assignments. You can see that this improves your test scores.

You do not really enjoy mathematics. You can see that it will be useful in your life when you are buying things. It is not a subject you would choose to study. You feel you are engaged in math class because you listen to the teacher and write down the assignments.

You see that you are building on the math concepts you have previously learned. You are hopeful that when you review the concepts in grade 9 that your understanding will improve. This is an important thing to remember when you are learning mathematics. Very few people, if any will achieve 100% on every test. The main thing is that they are building their understandings slowly but surely.

Thank you for sharing your story of engagement with me, Roberta. Good luck next year.

Mrs. Birse

Dear Sally

You have many strategies to help yourself understand math. You listen in class to the lesson and ask questions when you need to. You have found that when you can spend one on one time with your teacher, your understanding improves. You continually ask why certain things are done in mathematics. This is important to your learning.

You do not enjoy math class. The concepts are difficult for you to understand and have been in all grades. You are a great student in all of your subjects but there is something about math that does not make sense to you. You find it frustrating when you do not understand a concept and continuing to listen to the lesson does not help you.

You are engaged in math when you understand it. You have discovered that when you help other people understand the problem you also improve your understanding. You have a plan to have a tutor to help you in high school. Your determination to build your understandings of math will be your greatest asset next year. Good luck on your journey and thank you for sharing your story with me.

Mrs. Birse

Dear Thomas

You are an active learner of mathematics. You complete most of your assignments, orally answer questions when you know your answer is correct and work through the questions with your friends. You usually can finish the work in class and do not have much homework.

You enjoy math when you understand it and also when you need to work it out. You are a confident math learner who feels that you will be successful in the future. You do not find math difficult to learn. You appreciate it when your teacher explains things in different ways. This helps you improve your understandings. Sometimes you find it difficult to learn math.

Thank you for sharing your responses with me.

Mrs. Birse

Dear Ulysses

Ulysses, you feel that engagement is reflected in the grades which you achieve on your math tests. If you are doing well on the tests then you are engaged in your learning. When you completed the integer test, you were able to complete it in 5 minutes and you found it to be easy to do. However, not all the math is easy and some parts you really need to work hard at. You do not just use rules but need to understand why they work.

You have built on your learning from last year and this has improved your understandings of certain concepts. You can see your improvement in working with integers this year. You have very specific ways to study for tests. You cover up the answers and redo the questions to be sure that you can do them.

You are confident that you will do well in math next year. Math is enjoyable for you and you want to learn it well. You appreciate it when the teacher goes over things step by step so that you can follow along with their thinking.

Thank you for taking the time to share your responses with me.

Mrs. Birse

Dear Xena

You have related engagement in math to how many questions you answer orally. I find this very interesting because this would be something that your teacher would

notice. You are very comfortable when you are listening and taking in the information and thinking about the mathematics without outwardly joining in the discussion. You are engaged even when you are thinking through the question. The teacher will only know that you are engaged by your test mark or if they ask you a question in class.

You are making a commitment to improve your understandings in math. You enjoy working with math but can get frustrated when you don't understand something. You find that real life applications help you to understand math concepts. Percents and decimals when related to sales tax helped you to understand it. Your math scrapbook is also an example of this.

You shared with me many things you do to help yourself understand math. You write side notes from the teacher's explanation, work backwards from the answer, ask a friend to work through it with you and re-read the question again. These are all important things for you to continue. Good luck next year and remember, your teacher wants to hear your questions.

Thank you for sharing your story with me.

Mrs. Birse

Dear Veronica

You find math in grade 8 to be very easy to understand. You have made connections between the different math concepts you have learned. You have also made connections within certain units. Thank you for your wonderful example from fraction.

You are very specific in your methods to complete mathematical processes. You work through assignments in an organized and precise fashion. You use the calculator as a tool to help yourself focus on the new concepts being learned. If you can calculate a question in your head you do. You are not an auditory learner and cannot learn from just listening to the teacher talk. Math is easier for you when you are with your friends. They are there to answer you questions and you also help them a lot.

Math can be enjoyable for you but it can also be frustrating when it is difficult. It is one of your favourite subjects. You know that you are engaged with mathematics because you are thinking mathematically individually and with your teacher during the lessons. You write notes and take down the examples so that you can refer to them later.

You description of a good math student is one which I will use in my research. "It means someone who puts effort in their work and always tries their best. It doesn't matter about your marks, but how willing you are to learn." Thank you for these complex words and your reflective responses.

Mrs. Birse

Dear Wendy

You are a very confident learner of mathematics. You are able to relate math to real life and to apply the concepts you have learned. You can work with math as a whole and relate it to other things you do. You do not see math as a separate entity which is isolated from your other learning. You see the math in music and compare how you learn in math and how you learn your instrument. In math you practice the process just like you do a new rhythm in band.

You have seen that your learning from previous years is important. You have built on previous concepts this year. You realize that visualizing numbers helps you to build understanding. The story of your Mom using the little beans to teach you multiplication in Grade 3 is very special.

You enjoy math because it is a challenge. You are determined to learn the concepts and are very intentional in what you do to achieve this. You are an independent learner who always pays attention in class and completes the assignment. You are not upset if you do not understand something at first; you will ask for help and try to look at the question in different ways.

Thank you for sharing your responses with me. They are even more special when I think back to Grade 3.

Mrs. Birse