VOICES INSIDE THE CLASSROOM: STORIES OF BECOMING IN MATHEMATICS

By

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A Thesis
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Acknowledgements

The stories told in this document are the stories of learners who were in the process of *becoming*. For me, it was a privilege to be included in their journey. It was with pleasure that I listened to their stories and it was with honour that I was able to tell them to others. Their contribution to my learning and to the ideas contained in this document is compelling. To each of these learners, *Thank You.*

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Abstract

This thesis tells the stories of eleven students in Senior 2 Consumer Mathematics. The participants began the class unsure of their mathematical ability and apprehensive about mathematics class. These learners' stories are unique – they tell about the process of becoming successful in mathematics class, an occurrence these learners had not experienced recently. I intended to inquire into how the nature of success of learners evolves over a semester by *listening* to the learners' experiences. The inquiry had two foci – to come to understand what the nature of learners' success is and how their success evolved as they built on their successes.

In order to collect the stories of the learners, I used narrative inquiry (Clandinin & Connelly, 2000) as a guiding method. Narrative inquiry respects the interpersonal nature of teaching and learning, and so I conducted the inquiry in my own classroom, as an act of practitioner research. Narrative inquiry is also responsive to the growth of individuals, so data collection and interpretation occurred in cycles as well as simultaneously. Data was generated in the form of interactive writings, portfolios, field notes, narratives, and informal interviews.

Through the complexity of our journey, the learners and I contributed to an understanding of success in Consumer Mathematics. Each of the learners in the inquiry had themes of success that were particular to their lived experiences. However, a generalized theme of *emergent/ce (of) voice* was drawn from the data. The learners' success was their engagement in a dynamic process of the emergence of voice. Emergent voice emerged from voicelessness. It is characterized by being vocal, verbal, and

intentional, yet it is tentative in nature. Throughout the course, the learners were forming their identity as students, learners, and human beings. Their stories were stories of *becoming*.

Chapter 1

Why Inquire into Success in Mathematics Class?

The story of mathematics education is constructed, told, and retold by its characters, researchers, educators, administrators, students, and parents. Over time, one theme has remained unchanged, *the necessity of learning mathematics in school.* Recently, a variety of complications have contributed to the shaping of the theme. The publication of national averages from international standardized tests (such as the Third International Mathematics and Science Study (Nagy, 1996)) has heightened the public's awareness of the story of mathematics education. Various public movements such as "back to the basics" and "mathematics for all" have drawn new characters into the storyline. Reforms created and promoted by researchers and education groups such as the National Council of Teachers of Mathematics (NCTM) have also affected the story. They have articulated new ways of understanding how individuals learn, how to teach effectively, and the changing nature of mathematics. Even the expressed needs and wants of society, such as employees who can follow directions and solve problems and citizens who are technology-savvy, contribute to the story of mathematics education. Mathematics education as a meta-narrative continues to evolve.

As a meta-narrative, mathematics education has no winners or losers – only issues and positions. The protagonists and antagonists are not clearly outlined, and perhaps that is appropriate. Mathematics education is a story with characters only on a much smaller scale. The integral characters in the story of mathematics education are the teachers and

learners who live out the tensions of teaching, learning, and studenting each day within a classroom. It is individuals who fashion and form the story. The teacher and each learner have stories of their own that are being lived, told, and retold. They are stories of their lived experiences, from inside mathematics classrooms. The theme of these stories is about growing, changing, *becoming*.

In contrast to the meta-narrative of mathematics education, the individual character's stories are much shorter. The story of a teacher is a single, unfinished tale. The story of a learner is an incomplete anthology of short stories, some stories as long as a particular mathematics course, and some stories as brief as a single event. While the short stories remain distinct, similar themes run through and the progression of time and of the character's development does matter. The complexity heightens as the story of a teacher and the story of each learner interweave and affect each other. And each has an important story to share – a voice to be heard.

Bringing Myself to the Inquiry

After two years of teaching mainly academic mathematics, I found on my teaching schedule two sections of Senior 2 Consumer Mathematics for the following year. This success-based course invites learners not intending to study pure or applied mathematics, to think and communicate mathematically through engagement in financial/consumer topics and skills/concepts used in daily life (Manitoba Education, Training and Youth (METY), 2002). It was not a course I had envisioned wanting to

teach, although the possibility always existed. My original impression of the content was coloured by disappointment with the absence of symbolic manipulation and formal mathematics, topics I enjoyed inviting my students to interact with by thinking, noticing, describing, conjecturing, and generalizing. Although the course was still rigorous, I noticed a revisit of some grade eight and nine concepts with many topics that prepare students to be wise consumers. I wondered how I was going to engage the students with these topics. Of course, before meeting the students I could not be entirely sure. Nevertheless, I planned in the same manner as I had for other mathematics courses, looking for ways to engage my future learners in actively thinking, noticing, describing, problem solving, and reasoning.

I knew that I would be engaged with a group of high school students who mattered as individuals and as learners, but who were not necessarily enthusiastic about being in a mathematics course. So I worked on getting ready for them, thinking about how their personal and educational needs would differ from the students I had been teaching. I experienced a rewarding teaching and learning time, teaching students in Senior 2 Consumer Mathematics. It was their journey during the semester that was a pleasure to watch, and a pleasure to be a part of. There were many challenges, but those challenges led to changes that were more visible, and because of the visibility, perhaps seemed larger. These changes were not limited to cognitive growth, but to affective growth connected to evolving beliefs about the nature of mathematics and knowing. And not every student experienced success (at least, in a popular culture definition of success) – some of the students left school altogether, but it makes it more poignant because of the possibilities I saw in them as individuals and human beings.

Perhaps this signifies the biggest change I have observed in my teaching and my philosophy of teaching and learning over the past three years. Yes, inviting students to think mathematically is still an important goal that I pursue. But the individuals that enter my classroom are much more than just mathematics students. They are unique and particular, learning and growing, interesting and interested human beings who bring their whole selves to class and to learning, molding each of their stories. When I see each of them as a whole person, it causes my goal for them to be much more than just thinking mathematically. I want them to be competent and caring individuals, people who can interact positively with others and ideas.

A sense of inquiry into my teaching and the learning in my classroom is what led me to this study. In every class I teach, I have found myself undergoing significant growth within a learning process that is challenging and encourages me to inquire further. Because of my inquiring stance, I have come to see over the last few years that it is not the content that is important about teaching; it is the learners and the relationships we form, the growth that I see in them as human beings, and the learning and growth I experience as a result of interacting with each learner. It was because of this inquiring sense that I chose to engage in *this* inquiry. I wanted to learn more about how students in Consumer Mathematics were successful, how they grew during a semester in the course. I also wanted to learn more about why teaching within a relational framing was vital to the growing and becoming of each individual in the classroom. As I considered my learning goals, I came to see that what I wanted to do was notice and understand the lived, yet barely articulated stories of learners in Senior 2 Consumer Mathematics.

Understanding the Context of the Inquiry

Understanding how I came to this study is important because of the practitioner-based element of the inquiry, that I affected not only the inquiry process but the events that occurred in the classroom. Even though the inquiry was formed to support my growth as a teacher and inquirer, it is the learners in Consumer Mathematics who are the focus of this inquiry. The voices that are amplified in this study are the ones that were living, telling, and retelling *their* stories, the stories of individual learners. This document will share the experiences of learners and their journey in Consumer Mathematics – but it is important to begin by visualizing the setting of a success-based course like Consumer Mathematics. The specific learners participating in this inquiry will be described in more detail in Chapter 3.

The students who chose to enrol in Senior 2 Consumer Mathematics have had one of two mathematics education experiences in their previous year of school. Some students came directly from Senior 1 Mathematics, where they experienced incidents that led them to believe that learning mathematics was not a realistic possibility for them. They were resigned to taking a mathematics course because it is required. Often, the results from the provincial standards test are poor and the students come to a self-realization that they have marginally passed and believe they have a certain mathematical deficiency. Other students came from one of several courses, such as a Senior 1 repeater mathematics course or a Senior 2 Pre-Calculus, Applied, or Consumer Mathematics course. They have already experienced failing a high school mathematics course, which necessitates their enrolment in another mathematics course in Senior 2 to "catch up" on

their mathematics credit requirements. Although there are some similarities for both groups of students, difficulty and lack of success in previous mathematics courses, each student was distinct with each of their intentions, goals, and behaviours often quite different.

As the students and I shared a class over the semester, our interactions were guided, in part, by the intentions and goals of the Senior 2 Consumer Mathematics course (METY, 2002). The rationale for the course, that individuals "must be mathematically literate", is based on the understanding that students who choose this course will need to be responsible consumers and informed and active citizens (p. 3). The student goals, depicted in Figure 1, support this underlying philosophy through the intentions of the last four goals. However, the student goals bring another element to the teaching and learning in the classroom. By implementing the student goals in an authentic manner, learners were invited to modify their stance in mathematics class – to imagine the possibility of being successful and enacting the possibility.

Student Goals

- Students should learn to value mathematics
- Students should become confident in their mathematical abilities
- Students should become mathematical problem solvers
- Students should learn to communicate mathematically
- Students should develop proficiency in basic skills and concepts
- Students should become proficient users of technology

(METY, 2002, pp. 3-4)

Figure 1

In order for students to consider the possibility of changing their stance in mathematics class, and then actually doing so, I believe that they needed something more

explicit and tangible than the goals of a curriculum document. Three characteristics of learning events that attempted to meet this need were course content, mathematical processes, and assessment practices. A summary of course outcomes would be: one-third relate to consumer or financial mathematics, one third relate to mathematical skills and concepts with applications to daily life (primarily a revisit of ideas previously encountered), and one-third relate to mathematical processes. The learners in this inquiry viewed this content as being relevant and authentic to them. The Senior 2 Consumer Mathematics course uses nine mathematical processes as a foundation for exploring and learning the content contained in the general and specific learning outcomes. These mathematical processes include communication, connections, number sense, organization and structure, patterns, problem solving, reasoning, technology, and visualization (METY, 2002, pp. 4-8). Finally, a focus on assessment, instead of solely on evaluation, allowed learners to focus on the areas of their success and promote goal setting for areas that needed improvement during the semester.

I, as the teacher, was embedded in the implementation of the curriculum and the nature of classroom discourse. My intention was to foster the success of each learner, through two different means. First, I intended to foster success through *relational being* – developing a pedagogical, personal, interpersonal, and professional relationship with each of the learners. A relational sense of teaching and learning nurtures a classroom milieu where learners sense that they are cared for and are encouraged to take risks. Second, I intended to foster success through *mathematical learning* – believing that learning mathematics is important for all individuals, emphasizing learning processes over content within a constructivist framework, and using assessment as a vehicle for

learners to notice their success. With my underlying philosophy of teaching and learning and the implementation of the Senior 2 Consumer Mathematics course, opportunities were provided for students' stance in mathematics class to evolve from failure to success.

The course also situates itself within the broader setting of a large suburban high school, comprised of Senior 2 through Senior 4 students. The reputation of this high school is contained in the history of academic excellence with a competitive athletic program, an expanding modern languages department, and an enviable musical arts program. The Senior 2 students were, for the first time in school, provided with a choice in mathematics courses. About 12% chose Senior 2 Consumer Mathematics. About 59% chose Senior 2 Pre-Calculus Mathematics, an academic course that prepares students for post-secondary education and careers that require understanding of advanced mathematics. About 29% chose Senior 2 Applied Mathematics, a course that emphasizes problem analysis and problem solving with the use of technology.

Shaping the Inquiry

I decided to use narrative inquiry (Clandinin & Connelly, 2000) to guide the process of the inquiry. Narrative inquiry respects the complexity of individuals and recognizes the personal and interpersonal nature of learning and teaching. By constructing the teacher's narrative and the narratives of learners, I envisioned drawing out a theme that described the evolution of the success of learners. I intended to design and implement an inquiry that would watch carefully and listen to the lived experiences

of the learners and me in our Senior 2 Consumer Mathematics classroom. The narratives were to be constructed from the living, telling, retelling of experiences in the classroom as a way to tell the stories inside the classroom and to come to understand what the stories meant to the learners' success. To understand lived experiences in a deep and connected way required a classroom-based inquiry, conducted by a teacher who is in pedagogical relationship (van Manen, 1986) with each learner. The inquiry explored factors that foster success of learners, observing a classroom community that was shaped by caring relationships and encouraged rich and authentic mathematical learning.

The impetus for this inquiry was my experience that Senior 2 Consumer Mathematics could be a place where learners are sponsored to and can be *successful*. I believed that success was a possibility, perhaps a probability, for the learners involved in this inquiry. And as success occurred, I believed that the learners would have stories worth telling. I anticipated that the narratives would be both captivating and compelling in their own right. But more than narratives worth *telling*, I believed that these would be narratives worth *understanding*. What I saw in coming to understand the learners' experiences was a quest. This quest, shaped by sensitive and critical listening, required of me to engage in the searching for and the describing of a *significant theme* that emerged from the narratives in the classroom. This significant theme would be the theme for a *collection* of the narratives lived and told during the inquiry.

What does it mean to draw out a significant theme from a collection of narratives? At the outset of this inquiry, I proposed that a significant theme would become insightful when it fulfilled four facets of this inquiry. A significant theme would be *illuminative*. It would highlight important lived experiences and stance shifts of the participants. A

significant theme would be *explicative*. It would aid in describing the phenomena as they were lived and then relived through the telling. But more than just describing the experiences and stance shifts, a significant theme would be *interpretive*. It would aid in understanding these phenomena, providing a coherent and considered explanation. Finally, a significant theme would be *effective*. Its efficacy would combine the highlighting, describing, and understanding of experiences in communicating the stories. I anticipated that this communicative act would empower my learners and me, and that it could invite other mathematics educators to understand and frame their own and their learners' experiences.

In constructing the narratives of the teacher and learners, I believed that there was an understanding to which the learners and I could contribute. I wanted to invite learners, through the inquiry, to think critically about themselves as individuals, as students, and as learners. I anticipated that it would contribute to a stance shift in their understanding of their learning and the nature of mathematics, and to their self-concept. This movement, which I believed would demonstrate success, would be a growth characterized by simultaneous movement, or multiple successes, as students would be in the process of forming themselves as interdependent learners and competent and caring individuals. Constructing the narratives invited me, their teacher, to think critically about myself as an individual, as a teacher, as a learner, and as an emerging inquirer. I anticipated learning about teaching, learning, and the complexity of individuals and their interactions, as I came to understand our lived experiences. I also anticipated that the narratives would amplify the voice of these learners to a broader audience, contributing to their understanding of the complexity of Consumer Mathematics students, the nature of

success, and the nature of learning mathematics in high school. I anticipated that others could come to see that all high school students should be given opportunities to think mathematically and that all students can engage in *doing* mathematics – encouraging them to listen to the learners in their classrooms.

In this inquiry, the question I posed that framed my intentions and directed the drawing out of a significant theme was: **How does the nature of success of learners evolve in Senior 2 Consumer Mathematics?** The inquiry question brought a bifurcated focus to the inquiry, to explore what the nature of success of learners is and to examine how that success evolves during the course. My intention in this inquiry was to watch and listen to the lived experiences of individuals in Senior 2 Consumer Mathematics. My conceptualization of learners' success as a journey, or a process of becoming, was an underlying assumption that guided my interpretation of our mutually lived experiences. By relating personally and interpersonally and by actively engaging the students in doing mathematics, I anticipated coming to understand how students develop a successful stance. As you share in the lived experiences by reading the narratives and coming to understand them, I believe the narratives will illustrate the complexity and challenges of teaching and learning, where the possibility of success and a safe environment was an impetus for growth and change. I believed an understanding of the nature of this success could empower the learners and me, and encourage others to action. As interconnected narratives of a teacher and her learners unfold in this document, tied together by a significant theme that emerged from the inquiry, the evolution of the nature of success of learners in Senior 2 Consumer Mathematics will be captured to inform a process of *becoming*.

Chapter 2

Situating an Inquiry into Success

In the previous chapter, I have provided a rationale for my inquiry into the success of Consumer Mathematics learners, and have provided intentions for what I believe it means to inquire into success. With noticing and describing success as a focus for this inquiry, it is necessary to situate the inquiry in the context in which the lived experiences of the learners and I occurred. I believe that exploring the context of the inquiry is important to interpret success because it will provide a more insightful understanding from which a significant theme of success can be drawn. The inquiry, which was conducted in my Senior 2 Consumer Mathematics classroom, is situated within a milieu that was created by the decisions I made as a teacher, guided by my philosophy of teaching. The decisions that I enacted in the classroom were based on my intentions to foster the success of learners. It is also important to explore the ways in which success could be described through the use of previous educational research.

The purpose of this chapter is to explore factors that sponsor learners to be successful and to describe several frameworks that can be used to interpret learners' success. Two broad factors will be described to situate the study and to provide a literature-based understanding of the milieu of a classroom that fosters success. The first factor will examine my philosophy of teaching. My philosophy of teaching as caring will be used to establish what it means for a teacher to be in a multifaceted relationship with learners. The second factor will explore my teaching of mathematics. The Senior 2

Consumer Mathematics curriculum and related literature on mathematics-for-all will describe a curriculum and my implementation of the curriculum that fosters success. A relational teaching philosophy and implementation of a success-based curriculum cannot be viewed as single-faceted factors of success, nor should they be viewed as causal or absolute in the fostering of success. Rather, these two factors that foster success are multifaceted. The complexity of the two factors is derived from a dialectical tension of relation and content, as they are lived out in the classroom. Although exploring factors that foster success of learners in mathematics class is a foundational element to noticing learners' success, the focus of this inquiry is noticing and interpreting this success. Within the classroom milieu, created by an interplay of teaching philosophy and curriculum, I will suggest several frameworks that I believed would be useful in noticing and interpreting the success of learners in Consumer Mathematics.

Fostering Success Through Relational Being

Sponsoring every learner to become and continue to be successful must be grounded in a philosophy of teaching and learning that provides opportunities and methods to foster success. Relational being recognizes the complexity of a teacher and learners being in relationship in the classroom. Relational being also recognizes that being in relationship is the basis of all interactions and actions that are enacted in the classroom. In this section, I will describe my philosophy of teaching that causes me to maintain a specific way of being with learners in the classroom. Through relational

being, I attempted to forge a pedagogical relationship (van Manen, 1986) with each learner. The forging of a pedagogical relationship is a complex process, but is supported by interactive writing and a sense of community belonging.

Interpersonal Caring: A Philosophy of Teaching

To foster success for each individual learner in a classroom, a teacher should consider adopting and molding a philosophy of teaching that establishes a risk-taking and nurturing environment. This philosophy requires a responsiveness and sensitivity to each individual, supporting the growth and development of the best version of the person possible. Noddings, a former high school mathematics teacher and an educational philosopher, developed a philosophy of *teaching as caring* that encapsulates this notion.

Noddings sees relation as the basis of existence for humans and a caring relation as ethically basic. Her feminine approach to ethics leads to her development of an ethic of caring that is "rooted in receptivity, relatedness, and responsiveness" (1984, p. 2). She defines a caring relationship as "a connection or encounter between two human beings – a carer and a recipient of care, or cared-for" (1992, p. 15). In *Caring: A Feminine Approach to Ethics and Moral Education*, Noddings clarifies the roles of the one-caring and the cared for. The one-caring initiates the relationship and must be receptive to the cared for and regards "the other's reality as a possibility" (1984, p. 14). However, with this thought and act the caring relationship is not complete. For it to be complete, the cared for must recognize and respond to the caring. Thus, the caring relationship is a relationship of reciprocity (1984). A distinction must be made between *caring for* and

caring about. Noddings describes "in one sense, 'caring [for]' refers to an actuality; in the other, it refers to a verbal commitment to the possibility of caring" (p. 18).

In a pedagogical relationship, the teacher initiates the relationship with each learner and fulfills the role of the one-caring. As each learner responds to the caring, he/she fulfills the role of the cared for. Noddings describes this caring relationship, situated in a classroom, as *moral education*, "in the sense that those planning and conducting education will strive to meet all those involved morally; and it refers to an education that will enhance the ethical ideal of those being educated" (1984, p. 171). The *ethical ideal* is the ability to care, encouraging individuals to become "competent, caring, loving, and lovable people" (1995, p. 366). Noddings believes that this primary purpose of education should guide all other educative purposes, such as intellectual development.

When an ethic of care guides a philosophy of teaching, it defines a relational way of being with learners and what they are learning. Noddings draws heavily on Dewey's conception of experiential learning (1938) – building areas of study that come from the experiences of the learners. Beginning here, she describes how students can be guided to care for oneself, others (intimate others to strangers), animals, plants, things, and ideas by interactions with both these themes of caring and traditional subject matter (1984).

While recognizing that an equal quality of education is important for all students, Noddings does not believe that means an "identical education for all" (1992, p. 42). Her feminine approach to relationships and people provides a different focus for the future roles and occupations of individuals. No longer is a career title or remuneration central to a person's function in society, but the ability to care for others and things. It provides a

positive sense of possibilities for *every* high school student. In this sense, success means the ability to care for oneself, others, and things.

Some educators have regarded Noddings approach to education as an invitation to make a difference in schools and classrooms. Meier (1995), guided by a belief that teachers and students could value caring highly, established a school that was based on democracy, experiential learning, community, and respecting individuals and their ideas. She took seriously the idea that to experience caring in a school, students should remain with the same teacher for more than one school year (Noddings, 1992) – keeping elementary school students with the same teacher for two years and scheduling extended class times for high school students (Meier, 1995). Meier's vision to foster caring as a central theme at a school-wide level is important to observe, but caring relationships are mediated in each classroom and fostered between each teacher and student. Where can we find a story that focuses on the interactions between a specific teacher and her/his students?

Ohanian, in her book *Caught in the Middle: Nonstandard Kids in a Killing Curriculum* (2001), relates her ten years of experience teaching in a junior high reading recovery program. She understands and implements Noddings' sense of care when she states "we must help these children develop the skills and talents that will guide them in finding useful and satisfying lives in the real world. And we must strive with them to make this world a better place" (p. xii). Although she describes the students in her class in rich ways, missing from the complexity of the stories is evidence of a framework in which she could interpret her experiences and successes with children. She recognizes specific outcomes of a caring environment in her classroom – less, or non-existent,

misbehaviour of students, few issues with attendance, and student interest in learning and teaching peers – and reveals her value of each unique student by not missing "the kids' struggles and approximations" above content outcomes (p. 13). The ability and actualization to care for learners is difficult to express – and only in reflecting on the vignettes Ohanian shares throughout her book does this become clear to the audience. It demonstrates the necessity to care for learners and then share their stories, and the teacher's story, with others in an articulate and meaningful way. Ohanian's story of caring for struggling junior high students is compelling – we need to hear similar stories of teachers caring for high school students.

I believe that learners need to sense that their teacher cares for them, that he/she believes that they can be successful in their stance as students and as learners, and ultimately as caring and relational human beings. Learners also need to know that their teachers care for them beyond learning traditionally prescribed course material. Students grow and thrive, not only personally but also academically, when they feel cared for. To do this is to recognize and appreciate the complexity and uniqueness of every individual.

Noddings' philosophy of caring does not need to remain an ideal, nor an intellectual endeavour. It can be tangibly seen and experienced in any classroom, and specifically in a high school mathematics classroom. To care for students within a pedagogical relationship means that a relationship is formed with the intention of being characterized as teacher-with-learner and learner-with-teacher. There are three distinct facets to the teacher-learner relationship that demonstrate a caring ethic of teaching. These three facets, which will be explored in the subsequent sections, are *authentic seeing and listening*, *interactive writing*, and *community belonging*.

Authentic Seeing and Listening: A Pedagogical Relationship

A pedagogical relationship forms a basis for the teacher-learner relationship and establishes the tone for interactions within a classroom. Forging and sustaining a pedagogical relationship can be accomplished by a teacher's observation of each learner, by seeing and listening to her/him. The conception of seeing and listening to each individual in a classroom is complex because of the complexity of the learner, of the teacher, and of their interactions. Van Manen, in his book *The Tone of Teaching* (1986), attempts to describe through vignettes what characterizes a teacher who really sees and listens to each individual child. He understands that this "pedagogic thoughtfulness is sustained by a certain kind of seeing, of listening, of responding" (p. 12). These characteristics of a teacher form the basis of his conceptualization of a *pedagogical relationship* as one in which the teacher sees a student "as a whole human being involved in self-formative growth" (p. 17). The receptiveness (Noddings, 1984) of a teacher in pedagogical relationship demonstrates that although the task is complex it is a necessity for a caring relationship to exist.

Van Manen (1986) recognizes that a teacher's pedagogical relationship with each of her students is particular and unique. It is defined by a desire to see a student in multiple ways – as a learner, as a student, as an individual, as an adolescent, as a human being. Each of these ways of seeing a student is related to the student's positioning with school, the teacher, and others. As the student's positioning changes based on context, the nature of the interaction between teacher and student varies. The knowledge gained from each of these facets of the relationship meld together to create a view of a learner

that is full and complete. When a teacher draws on this intricate knowledge of an individual, to really listen, the learner can experience authentic listening. Not only does the teacher hear with her ears, but with her body and heart as well. To listen in this way demonstrates caring.

Dryden, in his research for the book *In School*: *Our Kids, Our Teachers, Our Classrooms* (1995), sat at the back of classrooms in a Toronto school, observing and interviewing students and teachers. His storytelling is remarkable for an outside observer. However, the stories lack the depth and the notion of authentic seeing and listening because he was not in pedagogical relationship with each student. He could observe and recount the number of times students were late for class, what words or ideas they contributed to class or the superficial interactions with classmates and teachers. An insight into the individual students he followed did not occur. His vignettes of the adolescents described the function of studenting, and not of learning. Even when he poses an important educational question, "*why* does this kid learn, and that one doesn't?" (p. 40), only a teacher in a pedagogical relationship with that *particular* learner can answer that question. In order to begin a journey of success, learners need teachers who will engage in authentic seeing and listening of *that* learner.

Other educational researchers have claimed to listen to the individuals in their studies, not as students, but as learners. However, they demonstrate by their interpretations that their actions only activate *cognitive listening* – listening to the cognition of learners without listening to the whole learner. Several educational researchers have recognized the importance of cognitively listening to students to affect teaching (Henderson, 1992; McCaslin & Good, 1996). Mathematics educational

researchers have observed that cognitive listening contributes to enhanced student learning and use of mathematical language (Pirie, 1996), effective remediation (Montis, 2000), and noticing students' conceptual understanding and problem-solving processes (Baker, Cooley, & Trigueros, 2000).

One example of cognitive listening that requires a closer inspection is Davis' study of a junior high mathematics teacher and her manner of listening to students. He describes the focus of his study as suggesting "a way of looking at teaching that might allow us to embrace the insights of constructivism without losing the substance of the social critics' arguments" (1997, p. 355). He recognized three different types of listening: evaluative (listening for correct answers), interpretive (listening for information), and hermeneutic (listening with awareness to context of learning). Each of these types of listening focuses on the sense-making of the learner, without attentiveness to the student as a whole individual. Consequently, his example points only towards cognitive listening and I believe the absence of authentic listening makes his goals of recognizing socio-political factors in mathematics teaching and learning difficult to attain. I also believe that Davis' intent is fundamental to better teaching and learning. I anticipated that my inquiry would fulfill the intent Davis expressed by exploring and understanding how I nurtured a caring relationship between each learner and me.

By forging a pedagogical relationship with *each* learner, a teacher can enact a way of fostering success in a Senior 2 Consumer Mathematics class. The sensitivity of the teacher's relationship to the learner was captured when van Manen described it as "a very personal relationship with a child. At the same time, there is a distance which makes the teacher a special pedagogic observer. By knowing *this* child, a teacher can hold back

superficial judgment about him or her" (1986, p. 19). By listening to the whole individual, the teacher comes to know her/him as a student, a learner, and a human being. A pedagogical relationship is formed through interactions that are informed by authentic seeing and listening.

Interactive Writing: A Personal and Interpersonal Relationship

The pedagogical relationship of teacher-with-learner and learner-with-teacher is formed and re-formed continually through a series of negotiations between both individuals. While authentic seeing and listening is a characterization of a caring relationship between teacher and learner, that complexity is fashioned through numerous and varied interactions. The verbal dialogue of a teacher with a learner, observations of a learner, and assessment of written products are a variety of methods that teachers can use daily to gain knowledge essential to building a pedagogical awareness of a learner. However, a teacher's understanding of a learner through written work does not need to be limited to assessing mathematical products. The teacher can encourage her students to write with her about mathematics and learning. It is in the writing between teacher and learner that an important facet of the relationship, of a personal and interpersonal nature, can be given time to grow and affect the pedagogical relationship.

Mathematical communication in the form of journal writing has become a well-established strategy for learning and method of assessing student cognition. When learners write to explain specific mathematical concepts it enriches their learning in several ways. By explaining in words, learners can develop a better understanding of the

concept under inspection (Pugalee, 1997). Masingila and Prus-Wisniowska describe this as helping learners "build a mental network of representations" (1996, p. 95). Assessing journal writing enables a teacher to identify complete or incomplete learner understandings (Masingila & Prus-Wisniowska, 1996; Chapman, 1996). The *Principles and Standards for School Mathematics* (NCTM, 2000) encourages teachers to use journal writing to sponsor students' use of precise terminology as a way of communicating mathematically.

Communication in a mathematics class, in the form of journal writing, does not have to be confined to explaining mathematical concepts. Borasi (1996) has recognized the importance of journal writing for the development of the role of student and learner. She has suggested that mathematics journals can address issues of mathematics anxiety, student identity in mathematics class, and students' sense of what constitutes mathematics. By using journal writing, Dougherty (1996) has found that students' affect towards mathematics develops in a positive sense. These examples of expanding the role of journaling provide a different focus and intention for student writing. To actualize caring within a writing environment, the method of student journaling needs to be elaborated further so that mathematics teachers can develop a personal and interpersonal relationship with each learner.

I have incorporated and refined a process of interactive writing with learners in my mathematics classes. The students write about various topics, including learning goals, study skills and their effect on marks and learning, and specific mathematical content. This interactive writing does not sustain the whole pedagogical relationship of teacher-with-learner, but helps to forge the personal and interpersonal nature of the

relationship. Interactive writing is personal because the learners choose how to reply to a writing prompt, with the intent to respond, report, reflect, and/or relate (Mason & McFeetors, 2002). The *authenticity* of a learner's response lets the teacher understand the writer as a particular individual. Interactive writing is interpersonal in nature because it affords a way in which learners and their teacher come to understand each other's views – listening and relating. In responding to learners, I write "as their mathematics teacher, not their friend – advising, correcting, judging, encouraging" (Mason & McFeetors, 2002, p. 535).

Interactive writing is a tangible example of the caring relationship between a teacher and each learner. Ohanian's (2001) use of interactive journals was a part of her caring stance. I believe interactive writing allows the teacher, as one-caring, to be receptive to each learner and to displace her motivations in order to care for each individual. However, to complete the caring relationship the students, as cared for, must respond (Noddings, 1984). In this interactive writing, the students respond in several ways. If expectations for an entry are not clear, some students are disappointed when they do not receive a written response. Students often look forward to reading the response provided the next day. As well, I often see an acknowledgement in future entries that the students have listened to and thought about my responses, often applying suggestions to develop as a student or learner. As the writing continues, learners write with more complexity. Not only does reciprocity exist, but each interaction further develops the interpersonal nature of the pedagogical relationship.

I believe that interactive writing is a powerful way for a teacher to demonstrate to each learner that she cares for her/him. Why is this process, and the nature of a personal

and interpersonal relationship, important to fostering success in a mathematics classroom? The process of interactive writing is important to the forging of a personal and interpersonal relationship because it is a venue, just between teacher and learner, where dialogue can occur. Learners are willing to share their thoughts, and they know that their teacher has heard them – in the literal words that they write as well as the intentions with which they write. Interactive writing is also a context in which a learner and teacher can have a dialogue about progress, creating opportunities to notice and celebrate success. Further, it helps the teacher recognize what can be done to sponsor each individual's success in mathematics class. The recognition of each learner as a person builds an environment that invites each individual to become the best learner, student, and human being that he/she can be.

Community Belonging: A Professional Relationship

Another facet of the pedagogical relationship is the notion of teacher-with-learner and learner-with-teacher. This *withness* recognizes the desire to minimize the traditional power and authority of a teacher over students, providing a collaborative milieu in which students emerge as learners. I understand "traditional" to describe an established and passed-down role, characterized by lack of thought (intention and knowledge of origin) and sustained because of past traditions and present culture. Romano describes a teacher's role within a professional relationship with learners as being "as much a participant as a person who leads the students, yet retains the responsibility for the learning, the teaching, and the environment in the classroom" (2000, p. 59. See also

Davis, 1997.). So, although the teacher recognizes her responsibility, she is also aware of her ability to learn from her students. Meier (1995) described interactions within a professional relationship as a democratic process. As a relationship of mutuality evolves, encouraging learners to take risks within a process of growth fosters success.

The idea of *taking risks* is integral to success; to be on a journey necessitates leaving a place of comfort to traverse along an unfamiliar path in search of the unknown. Because being stretched is integral to growth, I believe that if learners do not engage in risk-taking they will not be challenged to learn and thus be successful. By creating a community of learners, teachers not only build a trust relationship between themselves and their learners (and among learners), they encourage learners to take those risks. For students in Senior 2 Consumer Mathematics, there is familiarity in being unsuccessful – to succeed would mean to understand or see themselves differently and to renegotiate their self-expectations. In order to recognize and come to terms with this inner tension, I believe there needs to be a safe and trusting community to belong to and to depend on.

Romano's exploration of an educative community led her to observe that such a community is built on a foundation of trust between a teacher and her learners. She describes *trust* as "an outgrowth of dialogic relationships, where the teacher is wholly present in listening to students, recognizing and respecting their agency" (2000, p. 57). Not only is listening to learners central to her understanding of an educative community, but that the teacher and learners are situated in an environment where they "learn about being in relation to one another and what it means to be a member of a community" (p. 117). This fosters Noddings' conception of ethical ideal (1984) and so, a sense of

community belonging is found to be a result of the enacting of a caring relationship, built on authentic seeing and listening.

Another characterization of community is a *knowledge community*, where a group of individuals form because of their willingness to learn something together. Craig (1995) formed a definition and understanding of knowledge communities through a narrative inquiry study with beginning teachers. She conceptualized a knowledge community as a group of individuals who affect each others' sense-making in a particular context. Through my past experiences of teaching Senior 2 Consumer Mathematics, I had seen a similarity in the individuals within the class mediating the sense-making of mathematics and of self-knowledge. However, Craig only explores the idea of a knowledge community within pre-service and in-service teachers, communicative individuals who have developed capabilities of being self-reflective and self-descriptive. Within this inquiry, I believed there was a need to expand this sense of a knowledge community to include high school students who are growing and developing as people and in their ability to communicate with others.

Craig (1995) observed that beginning teachers are often members of several different knowledge communities. I have previously observed that this is also true of mathematics students in Senior 2 Consumer Mathematics. Because these individuals are situated within a mathematics class, one of the knowledge communities they are a member of focuses on learning mathematics. A large community, consisting of all learners, is formed and sustained in a similar way to Romano's educative community. There are also smaller communities within the larger – a learner and her/his table partner (learners sit in pairs at tables), a pair of table partners or larger cooperative groups. These

smaller communities provide learners with the safety of trusting a few close others with their questions and thinking as they learn to construct their own mathematical knowledge. The power of constructing knowledge collaboratively and being able to become interdependent with other community members fosters a sense of belonging.

Another knowledge community that develops in a mathematics classroom focuses on learning about self and learning about learning. In this knowledge community, the teacher and each learner become members as they interact with each other. The community is forged through a caring relationship and through directed interactions between the teacher and each learner that encourage dialogue about metacognition, learning, and self-awareness. Interactive writing encourages learners to begin a process of looking at self and provides opportunities for their teacher to notice and understand more clearly emerging knowledge relevant to this specific knowledge community.

I anticipated that the learning-focused knowledge community would be present in this inquiry as a result of my intention to engage in a deliberate and purposeful look at what it means to learn mathematics, my intention to invite students to grow mathematically, and my intention to foster the personal and interpersonal evolution of each learner. I expected that I would be an authentic learner within this community. As well, inviting students to actively engage in the knowledge community would sponsor them to think and learn about themselves as students, as learners of mathematics, and as competent and caring individuals. Again, Craig's study provides a similar focus, observing, "how fresh knowledge emerged in community and how horizons of knowing were renegotiated through narrative acts" (1995, p. 157). I believed, at the outset of this

inquiry, that as the students and I forged a community, we would together learn about our selves and our learning as we engaged in telling and retelling our lived experiences.

Community belonging, an understanding that each member is a willing, active, and sensitive participant, is a way in which an ethic of care is activated and recognized within a mathematics classroom. The process of building a community of learners, through trust, is important to the forming of a professional relationship with students. This facet of the pedagogical relationship is formed with each learner – actively learning with the learners as well as guiding them to learn mathematics. The sense of belonging to a community is important in order to invite learners to take risks, and it is only in challenging oneself with risks that learning and growth will occur.

Fostering Success Through Mathematics Learning

To sponsor every learner to become and continue to be successful, I have claimed that both my intentions as a teacher and my pedagogy needed to be guided by the ethical ideal conceptualized by Noddings (1984). The nature of this success is the actualization of a competent and caring individual – one who is self-aware, and who respects others and things. If success is a pedagogical goal, the conception of success as personal growth of each individual needs to pervade the intentions and purposes of a teacher in any content area. But, there is also an understanding that the nature of the learning and the manner in which knowledge can be constructed in each content area may vary.

Mathematics is a way in which individuals can interpret and interact with the world around them. The mathematical success of learners, then, not only helps them understand the discipline of mathematics (processes, concepts, skills, knowledge) but also to grow personally and interpersonally. The learners that are the focus of this section, and indeed this inquiry, are individuals who have in the past struggled with learning and struggled with learning mathematics. They could be non-academic in focus, but education and school is not just about academics, and I believe their mathematical success is still important in their growth. This section will summarize current ideas about the mathematics-for-all movement and then proceed to examine what it means to be mathematically successful. Implicit in this exploration is the inquiry into how a teacher might foster success for *every* learner in her classroom.

Mathematics-for-All: What is it? How is success fostered?

In Manitoba, all high school graduates are expected to complete and pass a Senior 4 mathematics course (METY, 2001), eliciting discussions about a mathematics component (including a provincial standards test) for graduation. Recognizing that not all high school graduates intend to study pure mathematics or its applications after graduation, *mathematics-for-all* is being questioned and discussed. However, Manitoba is not the only province that is faced with addressing this issue – the issue is still of concern even if students are only required to complete a Senior 3 mathematics course. Literature originating in both Canada and the United States broaches questions of, not only whether mathematics credits should be required of all high school students, but what

does mathematics-for-all really mean? How should curriculum be designed and implemented? What mathematics should all students engage in and learn? Should all students learn the same topics? An inspection of the related literature should provide an insight into these questions – and perhaps direct the way in which mathematics teachers and researchers can begin to construct an informed response and infuse classroom practice. I will use mathematics-for-all as a label for the various intentions to shape and implement a set of principles for mathematics courses that are appropriate for all high school students.

A Rationale for Mathematics-for-All

I believe the discussion should begin by regarding the questions: Should all high school students be required to take mathematics as a requirement for graduation? If so, what rationale can be provided for such a stance? There is relative agreement among mathematics educators that students should be required to take a mathematics course every year they are in high school (although a few omit the final year of high school). In order to contextualize mathematics-for-all, Usiskin (1994) provides a historical perspective of the movement from teaching mathematics for some students to teaching mathematics-for-all. He observes three factors that contribute to the movement, including "the teaching of more and more mathematics to more and more people", "the emergence of computer technology, which enables much mathematics to be done more easily than ever before", and an increase in the percent of the population that attends and/or completes high school (pp. 341-342).

The historical perspective provides an understanding of the beginning and current trends towards mathematics-for-all. There are, however, a variety of reasons why mathematics educators support mathematics-for-all. The reasons include an assumption that all students need to study mathematics (NCTM, 2000), increased accessibility and/or availability (Hodgson & Muller, 1994; Usiskin, 1994), use of mathematics in the workplace and society (Alper, Fendel, Fraser, & Resek, 1997; Bottge, 2001; NCTM, 2000; Paquette, 1995; Smith, 1999), development of an ability to contribute as valuable citizens to society (Hodgson & Muller, 1994; Burke, 1991), development of confidence in learning and using mathematics (Hodgson & Muller 1994), and mathematical literacy (Pugalee, 2001b). Although there is a wide range of reasons for students to study mathematics in high school, these reasons were intended to provide a rationale for inclusion of students who previously would not have taken mathematics in high school.

It is Davis (1995) who presents the most compelling reasons for teaching mathematics-for-all simply as: you need it! He legitimizes this claim by describing that an understanding of mathematics is required to function in a society that privileges mathematics and it provides a way in which we can learn about ourselves. Clearly stated, "learning mathematics affects who we are, what we do, how we stand in relationship to others, and how we situate ourselves in our world" (p. 7). Several years later, his refined rationale for teaching mathematics-for-all includes three concise reasons: 1) there is, on the part of educators, an "obligation and mindfulness … the ethical and the moral"; 2) that "mathematics plays a vast and shaping role in the collective unconscious … common sense"; and 3) a belief that "perceptions, forms, beliefs, activities, and so on are profoundly mathematized – and that can only happen by knowing something about

mathematics" (Davis, 2000, p. 170). In order to grow and develop personally and in relationship with others, learning about (and through) mathematics is essential.

A Critical View of Mathematics-for-All

With this intention underlying the rationale for teaching mathematics-for-all, dissension exists with the movement. Critical education theorists provide the strongest voices against implementing mathematics-for-all. The conception of current unequal distribution of cultural capital (Bourdieu & Passeron, 1977) concerns these pedagogues. They believe that because the understanding and use of mathematics is viewed as privileged in Western cultures, teaching mathematics to all students will lead to greater inequities between social, racial, and gendered groups (observed by Kozol (1991) and Willis (1977)). McLaren believes that movements like mathematics-for-all, where tracking might occur, foster situations where "low-track students are taught low status knowledge, which has little exchange value in a social or economic sense" (1994, p. 10).

I believe that teaching mathematics to all students does not inevitably propagate inequities between learners. Mathematics educational researchers can move forward, sensitive to issues of cultural capital and hegemony (McLaren, 1994), to invite *all* students to be successful at learning mathematics. In fact, McLaren's definition of empowerment, "the process through which students learn to critically appropriate knowledge existing outside their immediate experience in order to broaden their understanding of themselves, the world, and the possibilities for transforming the taken-for-granted assumptions about the way we live" (p. 193) clearly supports Davis' (1995) rationale for teaching mathematics-for-all. This includes the stance that educators are

morally and ethically bound to include all students in the teaching and learning of mathematics so that they can develop as competent and relational persons.

As well, mathematics educators cognizant of these inequalities can address some of these issues through their relationship with each learner. Although Bourdieu and Passeron (1977) would argue that social capital is not as valuable as cultural or economic capital, a reorientation towards an ethic of care (Noddings, 1984) would depose many constraints of cultural capital. Noddings explains that if schools care for students and their education, and students care for each other, then part of the purpose of education becomes valuing many forms of intelligence and valuing skills that lead to many types of occupations. Education would not value the hierarchy of specific subject matter or skills, but would provide an equal quality of education for all students without requiring "identical education for all" (Noddings, 1992, p. 42). An educative aim of encouraging the growth of relational beings, individuals who experience satisfaction in whatever they do, would foster genuine growth of every student within a mathematics class.

Relational being, teacher-with-learner and learner-with-teacher, is only one of the ways in which the concerns of critical education theorists can be addressed. While relationships within the classroom are important, pedagogy and content topics merit a thorough examination. Silver (1994) is one of the few researchers to consider the effects of mathematics-for-all on lower-ability mathematics students. His suggests developing a curriculum for students that includes topics that reflect the "thoughtful aspects of mathematics" characterized by sense-making, an emphasis on mathematical communication, and collaboration (1994, pp. 213-316). But what should a curriculum that supports mathematics-for-all look like?

A Vision and Realization of Mathematics-for-All

While many mathematics educators support mathematics-for-all in a prescriptive sense, this vision must lead to curricula that can be implemented effectively. Effective implementation, in this context, means fostering success for *all* students. The belief that all students need to and are capable of learning mathematics is clearly established as a purpose; however two other aspects of the curriculum model developed by Tyler (1949), namely content and organization, can help us gain a better sense of how mathematics educators visualize mathematics-for-all in a classroom.

Being responsive to a change in the content topics requires mathematics educators to be flexible in their understanding of what ideas are authentic for students and how to incorporate mathematical thinking into the topics the students explore. Building on Dewey's (1938) sense of experiential learning, the issue then becomes: does mathematics-for-all mean the *same*-mathematics-for-all? In a review of literature, the answer is affirmative. Students will study the same algebraic and geometric topics, as well as statistics, probability, and logical thinking (Burke, 1991; Hirsch & Coxford, 1997; Meiring, Rubenstein, Schultz, de Lange, & Chambers, 1992; NCTM, 2000). No literature could be found arguing for the inclusion of topics such as financial planning, investing, or making informed consumer decisions. The largest content change acknowledged in American literature (referenced above) is to integrate algebra and geometry topics into one course (which has already occurred in Manitoba). Even with these small changes to content topics, literature has not been published that indicates implementation of these content changes.

Mathematics Teacher, a journal offering "activities, lesson ideas, teaching strategies, and problems through in-depth articles, departments, and features" for senior years classrooms (NCTM, 2001-2002) should be one practice-oriented publication that provides suggestions for teaching mathematics to all students. Analysis of the 2001-2002 subscription year provides the following data. Of the 51 high school content-based articles, only one was written focusing on teaching mathematics-for-all, and only two were written specifically for non-academic mathematics students. The focus of the remainder of the articles is on content for academic mathematics courses. The current literature offers few alternatives to the content that already exists in most mathematics curricula. Unfortunately, the inclusion of mathematics-for-all does not recognize the particular learning needs of students who have difficulty with mathematics, but rather makes all students struggle through courses laden with abstract (and perhaps irrelevant) mathematics.

The issue of the same-mathematics-for-all can also be seen clearly in the suggestions for the re-organization of high school mathematics courses. In providing implementation suggestions for NCTM's 1989 *Curriculum and Evaluation Standards for School Mathematics*, Meiring et al. (1992) published *The Core Curriculum* to explore how to engage all high school students in studying mathematics. It suggests three different models that assume the same-mathematics-for-all: 1) Crossover Curriculum (streamed, as academic and non-academic, studying the same topics with different rigour); 2) Enrichment Curriculum (heterogeneous classes with academic students receiving enrichment assignments with higher levels of abstraction); and 3) Differentiated Curriculum (heterogeneous classes with differentiation incorporated into each learning

task). Each of these models assumes compulsory enrolment for Senior 1 through Senior 3 in courses that cover the same content, with mathematics as an option in Senior 4. The Pre-Calculus, Applied, and Consumer Mathematics courses (in Manitoba) differ from all three models in that they do not assume that mathematics-for-all should be equated with the same-mathematics-for-all.

The Core-Plus Mathematics Project (Hirsch & Coxford, 1997) implemented a curriculum based on the Differentiated Curriculum Model (with the exception of a choice between three courses or selecting no mathematics course in Senior 4). These alternative structures and similarity in content demonstrate that although mathematics educators are willing to support mathematics-for-all, their efforts to realize this vision are discouraging. For students who do not intend to study mathematics after high school and struggle with high school mathematics, no alternative ideas have been suggested that incorporate equal quality of mathematics education without the same-mathematics-for-all.

In response to a study, Alper et al. ask a crucial question for future research: "Is a single core curriculum for all students the best design to meet both the needs of individual students and the overall needs of society?" (1997, p. 176). I believe that the recent curriculum development efforts in Manitoba form an informed negative response to this question. The needs of and consideration of authentic tasks for academic and non-academic students are quite different. I return to Silver's (1994) comment that we need to encourage all students to *engage* in mathematics and develop the ability to *think* mathematically. I believe this can be accomplished by approaching curriculum, teaching, and learning with different topics while maintaining equal rigour. The equality in rigour can be seen in the strong correlation between student goals and mathematical processes in

Senior 2 Consumer Mathematics (METY, 2002) and Pre-Calculus Mathematics (Manitoba Education and Training, 1998). Although the content differs, the approach to learning mathematically and overall goals for students empowers learners in either course. This invites all learners, regardless of the course they engage in, to think mathematically and learn authentic mathematics. Although current literature does not provide constructive suggestions for designing and implementing mathematics-for-all as a success-based endeavour, I believe that there is an opportunity to consider Consumer Mathematics as a powerful component of mathematics-for-all.

Mathematical Success: What is it? How is it fostered?

If mathematics-for-all is vital, we must develop an understanding of what it is students should learn and how they can succeed. There are two critical questions that must be addressed: what is the nature of mathematical success? How can mathematical success be fostered in non-academic students? Although I believe that personal and interpersonal growth is of great importance, this discussion will focus on the learning and sense-making of mathematics. This matter of clarification draws attention to the complexity of teaching and learning within a classroom and is supported by Brousseau's understanding of the interplay between the function of mathematical knowledge in a classroom and the social functions of education. The interplay is exemplified through the conception of didactique. Herbst & Kilpatrick describe Brousseau's conception of didactique in the following manner:

> *Didactique* constructs a political economy of the field. It compels us to see mathematics education as dealing not with a collection of "obvious" components,

> but rather with phenomena best studied by analyzing the knowledge at stake in a given situation. Students come to know in situations where any knowledge that society in general and their teacher in particular wants them to acquire must undergo transformation so as to be meaningful. Meanings emerge in situations that can be engineered by analyzing a situation and developing an array of possible meanings for students to take from it. Knowledge is won in a game learners play against the *milieu* set out by the didactical situation. The teacher as actor must give the student freedom to act, but cannot forget his or her own role and script in the play. Both student and teacher work within an implicit contract they continuously negotiate to regulate their actions. (1999, p. 9, italics in original.)

There are several ideas worth highlighting in Brousseau's conception of didactique because they point in a direction that can aid in defining the nature of mathematical success of learners in high school. What is significant is his acknowledgement of the complexity of learning, teaching, mathematics, and the classroom – and the interconnectedness that fosters success. The four ideas within Brousseau's conception of didactique of most value are highlighted in the next four sections with italics.

Numeracy

Although a narrow definition, *the [fundamental] knowledge at stake* in a mathematics classroom is mathematical literacy, or numeracy. Being mathematically literate includes a number of fundamental characteristics and behaviours. Numeracy, or having a number-based conception (including quantity and measurement), is a minimum expectation of being mathematically literate (Steen, 1999; Noss, 1998). Pugalee (2001a) and Carl and Frye (1991) emphasize systematic thinking as a behaviour of mathematically literate individuals, supporting sense-making of mathematical concepts. These skills would enable learners to apply mathematical concepts and skills flexibly in and out of the classroom. Writers who espouse "Algebra for All" have also defined

mathematical literacy as success at algebraic thinking (Choike, 2000; Fouche, 1997; Lesser, 2000; Silver, 1997), including selecting and applying appropriate mathematical models (Heid, Choate, Sheets, & Zbiek, 1995). Steen (1990) develops the idea of algebraic thinking further by defining the essence of mathematical literacy as the recognition and appreciation of various patterns.

I believe that several of the above characteristics are important for students who will not pursue post-secondary study of pure mathematics or its applications. A conception of quantity and selection of measurement systems, being able to use logical reasoning and thinking to make informed decisions, and a comprehension of the beauty and power of patterns will help them be successful as they interact with others and with the world in which they live. The Senior 2 Consumer Mathematics course has, as its underlying aim, a conception of mathematical literacy that includes these characteristics (METY, 2002). Mathematical success can be fostered through an awareness of the importance of and the desire to become mathematically literate.

A Focus on Mathematics Processes

Many of the important characteristics of mathematical literacy can be described as processes, rather than specific products of learning. Brousseau understood that the knowledge students *acquire must undergo transformation so as to be meaningful*. This statement, although acknowledging the learning of specific content, focuses on the importance of mathematical processes in developing meaningful understandings. There is a dichotomy presented in literature that conceptual understanding is sponsored by process learning (knowledge production) and that procedural knowledge is sponsored by

content learning (knowledge acquisition) (Costa & Liebmann, 1997b; Hiebert & Lefevre, 1986; NCTM, 2000). This corresponds to a trend Bempechat noticed in mathematics education as focusing "on the *process* of learning … rather than the *products* of learning" (1998, p. 74). Costa and Liebmann recognized that a reorientation towards process learning would support the development of "people who understand their individuality as well as their interdependence" (1997a, p. xviii).

Teachers can foster success for Consumer Mathematics learners when mathematical processes are valued in their classrooms over mathematical products. I believe that these ways of thinking and learning will help students develop confidence as they flexibly apply processes to various learning situations, thus leading towards the success of learners in mathematics class. The Senior 2 Consumer Mathematics curriculum encourages process learning by being designed around nine processes (2002, p. 4). However, guiding learners to develop these processes requires an innovative set of instructional techniques which differ from direct instruction.

Mathematical Tasks

Innovative pedagogy requires mathematics teachers to encourage learners to *do mathematics*. The process of *doing mathematics* requires of the learner engagement in activities such as exploring and observing patterns, conjecturing, justifying, communicating ideas, problem solving, and thinking in order to create meaning of the object of study (i.e. a mathematical concept or skill). These *meanings emerge in situations that can be engineered* and are engineered by the teacher. In designing and implementing rich learning situations, mathematics teachers need to be guided by a

responsibility to *invite* learners to participate in and learn mathematics (Mason, 2000). Rich and meaningful learning of mathematics cannot occur by coercion or manipulation; instead, learners must accept the invitation, *doing mathematics* by engaging in the learning situation. Mathematical success is accepting the invitation. Languaging such as sponsor, guide, educe, encourage, foster, support reflect this perception.

Davis (1986) describes the idea of *doing mathematics* as a thinking process – one in which students come to create their own knowledge and understandings. This stance draws on a constructivist view of learning, one in which each learner actively creates and forms her/his knowledge which is built on her/his past and experiences (Pugalee, 2001b; Ward, 2001). Within this view, interaction with others and with ideas is critical to constructing knowledge and leads to communication of understanding and knowing. Constructivism values process over product, active construction over passive reception (Pugalee, 2001b). However, Simon (1995) points out that constructivism provides a framework to think about learning and how it occurs, but it does not suggest a concrete teaching model to be employed in the classroom. Aside from the principles of process learning, how might a mathematics teacher design learning situations that reflect the constructivist view of learning?

Learning tasks is one way success can be fostered in mathematics class. Two representative conceptions of learning tasks in literature should be examined. In a case study, Borasi (1992) explores *humanistic inquiry tasks* as tasks that "engage students in genuine attempts to 'make sense' of mathematics phenomena" (p. 180), characterized by open-ended and context-rich problems, collaboration, and communication. Many of her examples include elements of pattern-noticing, pattern-describing, and generalization of

formal mathematical topics. Broadening the use of inquiry tasks for Consumer Mathematics is required, where course content focuses on fiscal responsibility, statistics, probability, problem analysis, spreadsheets, and spatial geometry. A focus on constructing mathematical knowledge through problem solving and decision-making must be developed. Flewelling and Higginson (2000) have explored the use of *rich learning tasks* to sponsor rich learning. The tasks "give students [an] opportunity to choose from, and to use, a larger set of mathematical and non-mathematical skills and to use them in an integrated, creative, and purposeful fashion" (p. 12). Its complexity is illustrated in the invitation to learners to integrate several mathematical processes as they learn new concepts, skills, and knowledge. These tasks are often presented as relevant, open-ended problems, requiring students to work in collaboration and communicate mathematically. Because of the common conception of these educative tasks, the terms 'mathematical tasks', 'rich tasks', and 'learning tasks' will be used interchangeably.

The mathematical tasks that teachers invite learners to engage in need to be more than relevant. Relevancy points to real world applications or use in daily life, concerned primarily with how learners will use the knowledge or understandings they construct. The tasks need to be *authentic* – this combines the above conception of relevancy with the manner in which learners construct the knowledge – they are offered the opportunity to use and refine mathematical thinking and reasoning skills, make connections, communicate, and solve problems. Not only is the product authentic, but so is the process used to create the product. When learners come to see the authenticity of learning tasks and engage in those tasks, they become successful mathematics learners.

Henningsen and Stein (1997) explored the nature of the set-up and implementation of mathematical tasks to begin to explain learners' success. Their study involved "students attending middle schools in economically disadvantaged communities" (p. 527); students the researchers believed had the potential to learn mathematics, but were not afforded exceptional instructional practices, thus contributing to low achievement. Henningsen and Stein define success as learners maintaining high-level mathematical reasoning and thinking throughout the implementation of a mathematical task. Some factors they noticed that contributed to learners' success at mathematical tasks included connecting tasks to learners' prior knowledge, Vygotsky scaffolding, classroom climate, and the request to justify and explain the meaning of the learning. Their study provides useful propositions for sponsoring learners to succeed at mathematical tasks; however, I intended that this inquiry would extend and broaden the nature of success in the context of Senior 2 Consumer Mathematics.

From the current literature, it is apparent that in order to sponsor deep understandings and rich mathematical learning, authentic learning tasks must be integrated into classroom practice. Bednarz, unfortunately, recognized that "at this point, we are witness to a gap between the discourse concerning mathematics teaching for all … and teaching methods, as actually practised in the field" (2000, p. 186). In my past experience of teaching Consumer Mathematics and with the students who were the focus of this inquiry, it was my intent to build authentic experiences into the Senior 2 Consumer Mathematics course. The curriculum supports the notion of students *doing mathematics* and focuses on many processes of learning mathematics (METY, 2002). Inclusion of mathematical tasks required of me an awareness of opportunities that can be

formed to use and refine mathematical processes, encourage students to construct knowledge, and be situated within authentic contexts.

An example can be used to illustrate the inclusion of authentic learning tasks in Senior 2 Consumer Mathematics. One unit project that I implemented invites students to investigate decisions made during grocery shopping. The project guides students to create a one-week menu plan, detailing all the groceries that would be required. Students then comparison "shop" at two different grocery stores, using coupons and in-store specials, to purchase the best groceries. Explanations of the choice of food, selection of two grocery stores, and where each item should be purchased are required to complete the project. This represents a rich learning task because the content is relevant to students, it requires communication of planning and decisions, it requires them to use mathematical skills as well as demonstrate and refine problem-solving and decision-making skills. A mathematical task such as the grocery-shopping project sponsored learners to be successful because of its invitational and authentic nature. In Chapter 9, I will also describe in more detail another authentic learning task that encouraged mathematical thinking.

Assessment and Evaluation

Initially, when many individuals, educators, students, and others articulate what success means in school they often define it in terms of marks. Brousseau observed that *knowledge is won in a game learners play*, and part of the school game students believe in is getting marks. Perhaps it is a concrete way to view progress, or lack thereof, of students – the scale is pre-determined and understood by all. When individuals truly

believe this statement, two concerns arise immediately. First, the scale is not understood by all: does the mark indicate a percent of what the student knows? A percent of what the student understands? The amount of effort the student has put into the course? Has the student *earned* the mark or has the teacher *given* the mark? There is little clarity (Romagnano, 2001). Second, in teaching with the ethical ideal (Noddings, 1984) as a primary purpose of education, and a learner experiencing mathematical success as an educative purpose, competition does not affect a community of learners. A mark provides discrete information on a particular student, not in comparison to others.

However, a teacher does need to ascertain the mathematical knowledge and understanding a learner is constructing, as well as issues of affect and metacognition. Until we begin to value and use *assessments* instead of *evaluations*, the focus will not be on success but what a student cannot do. The purpose of an evaluation tool (for example, a test or an exam) is to discriminate between students and their knowledge and understandings. Popham describes this discrimination in stark terms: "A test item that does the best job in spreading out students' total-test scores is a test item that's answered correctly by about half the students" (1999, p. 12). He goes on to describe the implications of such tests as not evaluating important content and placing difficult questions on tests. In comparison, an assessment tool provides information to the teacher and learner about what the learner does know and understand. Noddings' describes this stance shift towards assessment as "Has Johnny learned X? to the far more pertinent question, What has Johnny learned?" (1992, p. 179)

I believe that we need to value assessment methods where the focus is observing what students *can do* instead of what students *cannot do*. This will help build a

community of learners and foster a safe environment where learners feel they can take risks and succeed as students and as mathematics learners. And then we need to provide an opportunity for them to notice and articulate their success. Assessment tasks, such as portfolios, interactive writing, self-assessment, and learning tasks (METY, 2002; Flewelling & Higginson, 2000; Mason & McFeetors, 2002; Meiring et al., 1992; Shepard, 2000), could be implemented by teachers with a success-based focus. To provide one example, as a summative unit assessment I employed the use of portfolios in the Senior 2 Consumer Mathematics course, instead of a unit test (defined by testing all mathematical content at the conclusion of a single unit to notice learning and growth). Using unit portfolios provided an opportunity for learners to notice where growth had occurred and what pieces in the unit showed their best thinking, learning, and studenting. As well, the students demonstrated to me, as their teacher, success in being reflective individuals, gaining more self-awareness.

Frames for Noticing and Interpreting Success

I have attempted to clarify two factors that I anticipated would foster the success of learners in Consumer Mathematics. The most critical aspect, one that leads and directs all individuals and interactions in a classroom, is the forging of a relationship between the teacher and *each* learner. As the different facets of the relationship develop, learners are encouraged to take risks to become successful. To become and continue to be successful in mathematics class, students are sponsored to learn about themselves, their interactions

with others, and their learning. The second aspect of fostering success is scaffolding mathematics for all high school students, and the nature and shaping of mathematical learning through experiences. To become and continue to be successful in mathematics class, students are sponsored to use and refine mathematical processes that guide them to make sense of mathematical skills, knowledge, and concepts, and are given opportunities to demonstrate their learning.

I believed that these two relational and cognitive factors would contribute to fostering the success of learners in Senior 2 Consumer Mathematics class. I have intimated that a successful learner can become a competent and caring individual. However, an initial conception of success has not been clarified. I anticipated, at the outset of the inquiry, that *success* would not be a pre-determined or explicit stage. Instead, it would be a way of being, living, and learning. Success would be a *process*, not a result. It would be *dynamic*, not static. And, as individuals learned more about themselves and grew, the way they defined success for themselves would evolve. Success would be individual and *particular*, it would be personal and yet at the same time *interpersonal* (because we live with and are defined by interactions with others). So, the vision of a competent and caring individual would perhaps be the indication of success, but I believed success would encompass the travelling on a journey towards that outcome.

This conception was my conjecture of an authentic understanding of success, at the beginning of this inquiry. I anticipated that my understanding of success would grow and evolve as I learned with my students, listened to their stories, and interpreted and amplified their voices. I realized that if I were to notice and describe the success of

learners during this inquiry, I would need tools to help me frame that success. As I wondered what kind of frameworks or models would be effective in supporting my quest, I considered a variety of frameworks to support my understanding of success.

As I searched and re-searched for models that would be effective, I did not find a single model that I believed helped me understand my past experiences in teaching Consumer Mathematics students. So, in order to find a place to begin, I prepared myself with several interpretive frameworks or models to guide my initial thinking and understanding of learners' success in Senior 2 Consumer Mathematics. In this next section, I will describe a collection of six models that I was prepared to use to interpret the lived experiences of learners. Belenky, Clinchy, Goldberger, and Tarule (1986) and Baxter Magolda (1992; 2001) provided epistemological models. Chickering and Reisser's (1993) model described a psychosocial framework. A psychological framework was drawn from Weiner (1972). And finally, Dudley-Marling and Searle (1995) extended Weiner's idea of locus of control to ownership and responsibility. While I believed that the students in this study would change (and grow) in some way, there was a possibility of resistance to change and success. Romagnano (1994) contributed a framework to observe and understand such resistance.

Belenky et al.: Knowing

The research of Belenky et al. (1986) has focused on the stance women take with knowledge, the acquisition/creation of knowledge, and authority. Their interest arose from the dissatisfaction they felt with Perry's 1970 study, which they viewed as male-

dominated. They conjectured that listening to women and exploring critical situations in their lives would provide a different framework for how women, and perhaps men as well, understand the nature of knowledge and knowing. The five-year study involved interviewing 135 women from various backgrounds and at various stages in their lives. Most women were only interviewed once, their stories collected and then interpreted. In analyzing and interpreting their data, Belenky et al. developed five positions that described ways of knowing. These positions, I believe, define more than a way of knowing; they describe a process of learning, a way *of coming to know*, more than *of knowing*, and a situating of the individual in relation to authority figures. Because a position characterizes a learner's way of knowing, the term *knower* naturally describes that learner's stance.

The first position that is described is *silent knowing*. Silent knowers rely on authority that they perceive to be all knowing. Their lack of confidence in their ability to know and learn is exemplified in the difficulty they experience describing themselves and engaging in self-reflection. I understand this position is not a position where all individuals begin their orientation towards knowledge and authority. Instead, some experience(s) have occurred to silence their voices, giving rise to *silenced* knowers. Belenky et al. (1986) point towards abuse and violence. Experiences, not as stark and extreme as the above, could silence a learner in mathematics class, such as humiliation by authority and peers, feelings of inadequacy or falling behind, lack of support (educationally and emotionally), or low marks. As they draw on these previous events, they experience difficulty in participating in learning and relating to others in the community. While Belenky et al. (1986) recognized that responsibilities of motherhood

often moved women away from a position of silence, I anticipated that the factors fostering success that I have identified could act as a catalyst for a stance shift for the learners in this inquiry. The necessity for these students to be in a success-based environment is highlighted by the researchers' observation: "That anyone emerges from their childhood years with so little confidence in their meaning-making and their meaning-sharing abilities as did Ann and Cindy signals failure of the community to receive all of those entrusted into its care" (p. 34).

Received knowing is the second way of knowing that is described by Belenky et al. (1986). As the term indicates, these knowers do not construct their own knowledge (because they do not see it as a necessity), but feel secure in accepting and regurgitating knowledge from another. Rote memorization is valued over understanding. Received knowers still maintain a strong reliance on authority, but their stance differs from silenced knowers because they respect and value the knowledge and truth provided by the authority figure. Several studies, described below, noticed that the majority of learners could be described by this position. It is a safe positioning of oneself – towards learning (which requires inner tension to sponsor growth and development) and towards authority (alleviate conflict between individuals, here between teacher and student). Belenky et al. noticed that these learners "may be quite successful in schools that do not demand a reflective, relativistic stance" (1986, p. 43). I noticed a complexity here as I wondered, at the outset of this inquiry, whether a classroom that values reflection would sponsor learners to move from silenced to received knowing, guiding them to become aware of themselves as learners. I anticipated that a learner's stance shifting from silenced to received would indicate a beginning journey of success; however, a movement away

from received knowing in terms of a decreased emphasis on external authority would elicit richer learning and understanding.

I have decided to explore the silenced and received ways of knowing in detail, and will outline the nature of the other three positions briefly. I initially believed that most of the learners would orient their learning in mathematics class to the first two positions because of their past experience in mathematics classes and perhaps what they believe characterizes the nature of mathematics. The third way of knowing is *subjective knowing*. It is represented by a change "from passivity to action, from self as static to self as becoming" (Belenky et al., 1986, p. 54), where the individual believes that knowledge is created by listening to her/his inner self and begins to gain a voice as she/he feels no longer subjected to external authority. The fourth way of knowing, *procedural knowing*, depends on reason (which is more objective than inner voice) to control life and justify actions, viewing knowledge as a process. However, procedural knowing varies from the other ways of knowing because it bifurcates. Separate knowing characterizes knowledge as mastery over an object, separating ideas from self and ideas from others, and often trusts authority to direct the individual. Connected knowing acknowledges an "intimacy and equality between self and object" (p. 101), trying to understand others (including authority). The fifth way of knowing is *constructed knowing*, which is the interweaving of separate and connected knowing. Constructed knowers believe that each individual constructs her/his knowledge, that truth must be contextualized, and that life is characterized by complexity (because of the integration of reason and intuition, objective and subjective, personal knowledge and other's knowledge).

I found two educational studies that used the framework of Belenky et al. (1986) to observe and interpret women's understanding of the nature of mathematics. Brew (2001) studied women, who on returning to college, enrolled in a mathematics course. She integrated the frameworks of Belenky et al. (1986) and Baxter Magolda (1992) to analyze the experiences of these women and notice their shift in stance towards learning mathematics. Brew's results indicated few silenced knowers (most of these were moving towards received), with the balance of the participants being characterized by received knowers – that is, in relation to the content of mathematics. In Brew's *Discussion* (2001, pp. 28-30), she questions the need for developmental movement of a silent knower through received knowing to subjective knowing. She provides only a summary of other studies, with limited interpretations from her own data.

Koch (1996) conducted a study that investigated whether stages of mathematical development existed that could be interpreted by the framework of Belenky et al. (1986). She observed two female college students, Ann and Barb, in a summer preparatory mathematics course. In the vignette that is presented, Ann demonstrates a received knower stance throughout the course, believing that the teacher is the arbiter of mathematical knowledge. Barb, initially seen as a received knower, is open to taking a risk and the researcher and reader see the emergence of a connected way of knowing. Rather than using Belenky et al.'s model (1986) as a way to categorize learners, it provided an opportunity to notice a transition for Barb, and to notice a non-linear movement between Belenky et al.'s ways of knowing. Koch draws two conclusions from the vignette and her study of Ann and Barb: 1) "mathematical voice does not come without giving up some beliefs about learning mathematics" (p. 174); and 2) a possibility

of stages of mathematical development. As I began to understand Belenky et al.'s framing through these two students, I came to realize that in a classroom where the feminine ethic of caring (Noddings, 1984) is emphasized and actualized, *women's* ways of knowing could be appropriately used to understand and situate any high school learner.

The power of interpreting the nature of success of learners within Belenky et al.'s model (1986) is the ability to notice success as a change in the epistemological stance of a learner. However, there are some concerns that require deliberation. There was a danger in using this model to stop as soon as a learner has been categorized. Using this model required an awareness and sensitivity to view the model as a transparency to interpret the words and actions of a learner (to help understand elements of success), and not as a way to label a learner. If the model, in its intention, is not developmental, I struggled with how I could use it to explain growth. I came to see that although learners might not progress systematically through all five ways of knowing, there could be movement from one position to another – and that I would regard as a success a learner becoming aware of her/his cognition and way of coming to know.

Even with the above concerns, I believed this framework would help me illuminate where learners were situated in their learning when they begin this course and would aid in describing a learner's stance shift. It was of use for me to consider as I readied myself to notice and interpret the success of learners. Brew, in using the models of Belenky et al. (1986) and Baxter Magolda (1992) states that "epistemological perspectives are the ways students interpret or make meaning of their educational experience" (2001, p. 16). I believed that a framework examining the nature of knowing and knowledge could be useful in illuminating and understanding how Consumer

Mathematics learners interpreted their learning and their stance towards mathematics class. Listening to and thinking about the way in which learners come to know (whether it is self knowledge or mathematical knowledge) could bring to light their definition of success. To a silent knower, it could mean active participation in class and in learning. To a received knower, it could mean memorizing and retaining facts.

As I previously acknowledged, Belenky et al.'s (1986) model addresses individuals' positioning with authority figures. I felt, at the outset of the inquiry, that exploring the relationships between authority (the teacher) and the students would be of value. I anticipated that a re-positioning with authority might be a component of learners' success, especially within the context of build a community of learners in the classroom. However, as I began to notice the success of learners in this inquiry, Belenky et al.'s understanding of individuals positioning with authority became central in my sense-making of success. Although I had prepared myself with this model to consider authority as a component in the learners' becoming, I had not anticipated the significance of this component.

Baxter Magolda: Self-Authoring

Baxter Magolda's research has focused on the development of college students. Her epistemological study (1992) extended Perry's 1970 research (also influenced by Belenky et al. (1986)), developing a model that describes students' stance with knowledge, with its construction, and with authority. She summarized these stances into four positions, spanning over five different educational domains. Further, Baxter

Magolda used her understanding of ways of knowing and applied it to a longitudinal study, focusing on the self-authorship of college students (2001). Her complexity in the latter study recognized not only an epistemological stance, but also dimensions of intrapersonal and interpersonal stances in the development of college students. The self-authorship study will frame a summary of Baxter Magolda's research.

The development of self-authorship in students traverses linearly through Baxter Magolda's four-stage model (2001). (See tables on p. 41 and p. 189 (2001).) Each of these stages is characterized by growth in an epistemological dimension (nature of coming to know/knowledge; nature of coming to believe/truth), an intrapersonal dimension (awareness and understanding of self), and an interpersonal dimension (how we relate to and build relationships with others, including authority). In the first stage, *following external formulas*, learners use frames from authority figures to make sense of the world and their interactions. In the second stage, *cross-roads*, learners recognize the necessity of inward reflection to begin to understand themselves, their interactions, and the world. In the third stage, *becoming the author of one's own life*, learners begin to explore and discover self in all three dimensions. In the fourth stage, *internal foundation*, learners experience power over their own lives, with an interdependence with others. The value of this model is that every stage is described in terms of shifting stance – the transitions in ways of knowing, self-reflection, and interactions with others do not only occur between the stages, but *within* the stages as well. The journey is constant.

The foundational element to Baxter Magolda's latter self-authorship model was her conceptualization of ways students come to know (1992). (See tables on p. 30, p. 81, p. 114, and p. 147 (1992).) A closer examination is required as it could stand alone as an

interpretive frame, and it does differ in some respects from Belenky et al.'s model (1986). Baxter Magolda identified four stances towards knowing, guided by five domains including the role of the learner, the role of peers, the role of the teacher, evaluation mechanisms, and the nature of knowledge (1992). Another complexity is built into this model, a bifurcation of gender-based reasoning in the first three stages. The first stage is *absolute knowing*, where the teacher possesses all knowledge, knowledge is seen as absolute, and knowledge is acquired through memorizing facts. The second stage is *transitional knowing*, where the teacher does not hold absolute authority of knowledge, knowledge is absolute in some disciplines (not all), and knowledge is acquired through understanding and applying concepts. The third stage is *independent knowing*, where the teacher organizes learning experiences, knowledge is relative, and the learner begins to see herself/himself (and peers) as constructors of knowledge. In each of these stages one of the knowers is characterized by a relative-*interdependence* with authority and/or peers and/or coming to know (received-absolute, interpersonal-transitional, and interdependent-independent) while the other is characterized by a relative-*independent* stance (mastery-absolute, impersonal-transitional, and individual-independent). The fourth stage is *contextual knowing*, where learning is characterized by "thinking through problems and integrating and applying knowledge in a context" (p. 68), the teacher establishes such learning environments, and knowledge is constructed by self within the context. Baxter Magolda also identified three underlying story lines, general threads running through each student's story, including "development and emergence of voice", "changing relationship with authority", and "relationships with classmates" (p. 191).

The dimensions of intrapersonal and interpersonal development build the complexity of humanity and relational being into Baxter Magolda's (2001) conception of self-authorship. The intrapersonal dimension, an individual's self-perception, describes growth from external expectations to inner-voice used to define self-identity. The interpersonal dimension, an individual's perception and formation of relationships, describes growth from relationships that are forged by an externally-defined self to an internally-defined self. Baxter Magolda uses Josselson's words, "'Identity is what we make of ourselves within a society that is making something of us'" (2001, p. 18), to signify the reciprocal mediation of these two dimensions. She determined that the gender-based conceptions of agency (individuality and separation) and communion (connection and collaboration with others) operate within both dimensions, which forms her sense of bifurcation in the first three ways of knowing.

Educational research studies incorporating Baxter Magolda's developmental stages are not common. In fact, studies using the self-authorship model could not be located (publication on the model is quite recent and demands an extended research timeline). However, Brew's study (2001) described above integrated Baxter Magolda's (1992) ways of knowing with Belenky et al.'s (1986) framework. She found that the five domains were useful in structuring her observations and data interpretations, and the gender-based reasoning provided additional insight into her participants' stance with knowledge and coming to know. An important element of stage development that was not identified in Brew's (2001) study was Baxter Magolda's recognition of constant transitions between and within stages. In Brew's limited data interpretation, she observed no college students situated in the independent or contextual categories. Brew also

indicated a need to observe and analyze situations that provide motivation for women to shift "to more complex ways of knowing" (2001, p. 29). I intended to address this issue in this current inquiry by a limited exploration of factors that foster success in Senior 2 Consumer Mathematics learners.

There are several concerns that need to be raised with employing Baxter Magolda's latter model (2001). When she provided an overview of the four stages, they were described in the context of maturity and age (where "internal foundation [is] rarely solidified before 30" (2001, p. xix)). If the development described by self-authorship is closely tied to age and maturity progression, I anticipated having difficulty applying it to my context with 15-year old learners. Nevertheless, I was prepared to see if the model could be applied, setting aside the correlation of the age and maturity of learners, to support the interpretation of learners' success. Of less concern is the linear movement of learners through this model, different from Belenky et al.'s epistemological framework. Perhaps what I found initially appealing about Belenky et al.'s (1986) understanding is that learners do not necessarily move in a linear fashion. Rather, I anticipated noticing and respecting the *particular* nature of the *unique* journey of each learner, not as a journey that would match exactly the journey of other learners.

I had anticipated some benefits from having Baxter Magolda's (1992; 2001) frameworks available to interpret the success of Consumer Mathematics students. The transitional nature of the model resonated with my sense of success – what I wanted to notice is the learner's shift in stance towards learning as it unfolded. Baxter Magolda believed that some learners "were just arriving at that way of knowing, and others were nearly ready to leave it" (1992, p. 11). The idea of self-authorship as indicating growth

also resonates with the focus of storying within narrative inquiry, the methodology on which this inquiry is based. Even on its own, I believed that understanding the epistemological frame of Baxter Magolda's early work (1992), as a separate model, prepared me to notice and articulate the success of learners. It differs enough from Belenky et al.'s model (1986) in its situating of the framework within a learning environment to be effective, evidenced by the five domains running across the four ways of knowing. I anticipated a stance shift from rote memorization (absolute knowing) to conceptual learning (transitional knowing) could describe a success that was within my learners' reach.

Three unanticipated results did arise from the use of Baxter Magolda's model. First, I had not anticipated that not only would my learners' growth precede the self-authorship model, but that their growth would also, in some ways, precede the former epistemological model. In fact, the success of my learners and their placement in the epistemological model demonstrated the mismatch of the model. Second, I had not anticipated the importance of Baxter Magolda's underlying story lines as I engaged in the process of drawing out a theme of success from the volumes of data I had collected. Third, I had not anticipated that the important successes of learners would not be as dramatic as a shift from one way of knowing to another. Rather, success required closely watching and listening to notice, but was significant to the learners' becoming.

Chickering & Reisser: Vectoring

A model that focuses on the development of college students was delineated by Chickering (1969) and later revised by Chickering and Reisser (1993). They describe their model as focusing on the feelings and relationships of students, something they believed was missing in previous studies (such as Perry's 1970 study, Gilligan's 1982 study, Kegan's 1982 study, Belenky et al. (1986), Baxter Magolda (1992)). Chickering believed that "higher education should be about developing those aspects of self that had the most value for the individual and the society" (as described by Reisser, 1995, p. 505). The 1993 edition revised the model to incorporate current research and broaden the notion of college students (from only small liberal-arts colleges to larger institutions). They described students' development with a *vectoring* model. The metaphor of a vector is significant – each vector "has direction and magnitude" (Chickering & Reisser, 1993, p. xv). Each of the vectors represents the direction in which the student is moving or growing and the intensity with which the movement occurs.

Seven vectors have been identified as illustrating and interpreting the growth of college students (Chickering & Reisser, 1993). I will describe five vectors briefly, and then describe two in more detail. The vector, *Managing Emotions*, describes change in an individual as growth in identifying a range and intensity of emotions (both negative and positive), an increasing understanding of the cause of the feeling, and improving the ability to balance all emotions. The *Developing Mature Interpersonal Relationships* vector values relationships with others as "powerful learning experiences" (Reisser, 1995, p. 507), where a knowledge and understanding of others, different from self,

demonstrates growth of an individual. Combining all the vectors together creates another vector, *Establishing Identity*, in which a student comes to define for herself/himself who she/he is, demonstrating growth from a lack of perception to awareness of self. The vector identified as *Developing Purpose* demonstrates the growth of an individual as he/she makes decisions about the direction of his/her life, established from his/her interests and priorities. *Developing Integrity* is a vector that focuses on the student's emerging sense of identity and purpose, and how that ethically and morally interacts with others. Although I am aware of the importance of all seven vectors in student development, I chose to decrease an emphasis on these five vectors because I did not believe they would help illuminate the stance shift of learners from lack of success to being successful.

I did recognize the importance of preparing myself to notice and interpret the growth of Consumer Mathematics learners with two of the vectors. *Developing Competence*, the first vector, is characterized in terms of intellectual, psychomotor, and interpersonal competence (Chickering & Reisser, 1993). This sense of competency develops from a confidence that combines the three facets and comes from the understanding that "one can cope with what comes and achieve goals successfully" (p. 53). As students come to see themselves as able to achieve valuable milestones, a sense of competency within an individual grows out of a feeling of successful accomplishment. It is the *feeling* of competency and confidence that sets this model apart from Belenky et al. (1986) and Baxter Magolda (1992). So, growth and stance shift is demonstrated in a movement towards feeling competent (not just being competent) and confident.

Chickering's work in 1969, described by Reisser (1995), only moved from dependence to independence or autonomy in the *Moving through Autonomy toward Interdependence* vector. In the later reconceptualization, the vector moves past independence and towards interdependence with others. It is characterized by three facets. First, emotional independence demonstrates movement away from continual reassurance and approval from external sources. Second, instrumental independence demonstrates a movement towards self-monitoring and self-discipline in completing worthwhile activities. Third, interdependence is "an awareness of one's place in and commitment to the welfare of the larger community" (Chickering & Reisser, 1993, p. 117) – a balance between the oscillating movement between dependence and independence. There is some indication in this vector that an individual moves through independence before he/she can reach interdependence.

Few other studies have used the vectors conceptualized by Chickering and Reisser (1993) to interpret the development of individuals. Several studies rely on this vectoring model to demonstrate an emphasis on observing systematically the growth of college students, but stop short of using the model to understand the students they observe (Grunder & Hellmich, 1996; Wahl & Blackhurst, 2000). Valentine and Taub (1999), in working with college athletes, found the vectoring model "a solid foundation on which to build practical solutions for student athletes" (p. 176) and encourage further research that identifies the developmental stance and needs of these students.

Before the inquiry began, I noted a concern in considering the use of the Chickering and Reisser's (1993) model. The concern came from observing, in their description, that an individual's growth is characterized as a movement towards

interdependence *through* independence. When exploring the three facets of this vector, I envisioned Consumer Mathematics students maintaining a sense of separate identity and dependence on the community, yet not developing instrumental independence. If the independence needed to occur before interdependence in the model (especially self-monitoring and self-discipline), I was concerned that there would be a linear progression that would be too easy to get caught up in and therefore not notice and describe the stance shift of learners effectively.

Even with this concern, I anticipated some positive ways in which I could use the vectoring model to notice and interpret the stance shift of learners in Senior 2 Consumer Mathematics. The metaphor of a vector vividly illustrates movement – it does not pause at specific stages or points, but moves continuously. The continuous movement resonated with my sense of success as dynamic. A vector, as a visual image, also clearly demonstrates the direction in which an individual is growing and the intensity with which the growth is occurring. As I interpreted the data for this inquiry, I found the model of *vectoring* an effective way of conceptualizing the learners' growth, even though the individual vectors did not serve as interpretive tools. As well, incorporating the feelings of a learner in her/his journey was absent from the epistemological frameworks described earlier. I anticipated that this additional dimension would be useful in supporting my understanding of the connection between a learner's ability that I noticed and the ability that he/she noticed in himself/herself. It extends the notion of success as not only a journey, or a destination, but as an individual's *feeling* of her/his progress. I had intended, through this inquiry, that the students would come to notice and express their success, and part of the evolution of success I found came from their feelings of

competence and confidence. As well, I anticipated that the Developing Competence vector could help place the intricate details of Weiner's (1972) psychological model of attributing success to ability within a larger framework.

Weiner et al.: Attributing

Weiner's *attribution theory* (1972; see also Weiner et al. (1972)), which analyzes motivations, differs substantially from the previous three models that were explored. The study of motivation attempts to analyze and determine the *cause* of an action or event and then predicts future actions. Although a subset of psychology that is concerned with *cognitive* motivation, it focuses on the thinking that leads to an individual's actions. This frame stands in contrast to the epistemological frameworks, underlying the previous three models, where the cognitive focus was on thinking about ways of knowing and the source of knowledge. Attribution theory seeks to identify broad elements to which an individual might direct the cause of her/his success or failure at a particular task. Attributes of success or failure could be described in relation to one specific task, for example a test or an assignment.

Weiner et al. (1972) identify four elements that can be used to interpret and predict the outcome of a specific task. (See table on p. 356 (1972).)

1) *ability*: an individual's natural capability; function of the individual's past success and inversely related to others' success at the task
2) *task difficulty*: perceived complexity of the task itself; function of "social norms" (p. 99) and individual's past correlation with social norms

3) *luck*: random probability of success or failure; use when individual's past performance contains highly variable outcomes
4) *effort*: degree to which an individual attempts a task; function of perceived value (and/or incentive) of task and individual's past performance

Weiner describes one categorization of these elements as *locus of control*, indicating where the control of the element resides in relation to the individual. Ability and effort maintain an internal locus of control, while task difficulty and luck maintain an external locus of control. Stability dimensions, a second classification of these elements of attribution, groups ability and task difficulty as elements that are stable and effort and luck as elements that are unstable.

Weiner et al. (1972; see also Weiner, 1972) have explored how an individual's past performance and perception of future performance affects motivation. These researchers found that students attributed performance to unstable elements (luck and effort) when the current outcome was contrary to past performance and attributed performance to stable events (ability and task difficulty) when the current outcome was consistent with past performance. In stating beliefs about the outcome of future tasks, the researchers noticed, "that expectancy shifts are primarily determined by the stability, rather than locus of control" (1972, p. 97). For example, if a student attributes the outcome of a prior performance to ability or task difficulty, he/she will most likely predict that the outcome of the next task will remain the same. Because of issues of self-image, a negative outcome indicated the most variation in predicting future success. The implications for Consumer Mathematics learners, who have experienced minimal success in the past in mathematics class is of concern. No matter to which element they decide to

attribute their prior performance, I anticipated that their expectancy of success would be low – exhibiting a challenge to sponsor a shift in their aspirations.

I believe several concerns needed to be addressed in using attribution theory as a framework for interpreting the success of learners in Consumer Mathematics. The model did not seem to be a direct match to the intentions and focus of this study. I did not intend to explore the *cause* of success, but rather to notice the nature and evolution of success of Consumer Mathematics learners. Much of the study and description of the results of Weiner et al. (1972) has overlooked the larger view of education. They seem to operationalize and simplify the causes and effects of success and failure, failing to remember that the learners are complex and complicated individuals. As well, their focus on single events made it difficult to integrate with my conception of success as a journey, not as a single, landmark event. Finally, the complexity with which this model requires learners to reflect on their learning and success is minimal.

However, I prepared myself with this psychological framework to be ready to interpret the success of learners. I believed, initially, that there might be some benefits in listening to what elements learners attributed their success because the idea of attribution seemed to be a simple beginning for students. I thought it might lead to a more complex discourse about success. I also anticipated being able to hear attribution easily in the learners' written and spoken words – phrases like "I tried hard" or "I can't do those kind of questions" are often natural for learners to express. I hoped to notice growth by a change in attribution from unstable to stable elements. Although attribution theory did not emerge as a frame for understanding success, I believe readying myself with this frame provided support in my careful listening to the learners' expressions of their

success. The idea of using attribution theory as part of a broader interpretation of the experiences of learners in Consumer Mathematics seemed to me a simple starting place to build an understanding within a complex and intentional study of success.

Dudley-Marling & Searle, Chase & Doan: Owning

Dudley-Marling and Searle (1995) and Chase and Doan (1996) have recognized the importance of learners to have control over their learning in order to be successful. In the preface to their book Chase and Doan state, "Children learn when they want to learn. When they feel ownership and control of their learning, not only will they enjoy that learning, but they will challenge themselves to ever higher learning" (1996, p. 1). Ownership, often described in terms of choice or control or responsibility, corresponds to two important ideas in this inquiry. I believe that encouraging students to assume ownership of their learning is one way in which success can be fostered, observed through community building. However, I also believed at the outset of this inquiry that assuming ownership and responsibility could be a used as a frame to notice and describe the success of learners in Senior 2 Consumer Mathematics. Although no theoretical model exists, the work of Dudley-Marling and Searle and of Chase and Doan provides an understanding of how to notice students assuming ownership of their learning.

In their introduction, Dudley-Marling and Searle conceptualize ownership as containing several dimensions. They state:

> As a political concept, ownership describes the power relationship between teachers and students. As an epistemological notion, ownership describes the complex ways in which individuals make sense of their experience and of the world around them. As part of the human enterprise of teaching, ownership is

> complicated by the individual personalities of teachers and students, their respective background knowledge, culture, gender, race, ethnicity, and socio-economic status. (1995, p. viii)

They capture the complexity of the classroom, individuals within the classroom, and the notion of students assuming ownership in their emergence as learners. Both pairs of authors have observed and interpreted learners' ownership of learning in the context of elementary language arts programs. They, and other educational researchers, have noticed that learners need to experience ownership over the process of learning, not just the product (Searle & Dudley-Marling, 1996, p. 22). Rhodes (1996) extends this notion when she applies it to student ownership through self-assessment. Peer tutoring is another application of student ownership (Searle and Dudley-Marling, 1996).

The shift from students assuming no responsibility to assuming responsibility for their learning was difficult to ascertain from these authors' writings. In sharing vignettes, the authors recounted the stories of the learners before assuming ownership and then after they assumed ownership, without noticing the learners' shift in stance. However, in many of the accounts there was an implied narrative of students gaining voice, and attending to their self-voice through reflection (Dudley-Marling & Searle, 1996). What I anticipated was that the process of becoming responsible and assuming ownership would parallel a movement through Baxter Magolda's epistemological model (1992), her self-authorship model (2001) or stance shifts described by Belenky et al. (1986).

Despite the fact that a theoretical model, based on classroom experiences, has not been delineated, I anticipated that ownership would be one way the success of learners could be noticed. The process of assuming responsibility resonated with my conception of success as a journey. I believed that movement towards active involvement in learning

and interacting with peers would help explain growth in personal responsibility and interdependence, and moving further towards self-assessment of learning and progress, confidence in the process of learning (about self and mathematics), and even pride in the obtaining of significant learning milestones. I believed that using ownership as an interpretive frame would be beneficial because it notices the stance shift from student to learner, especially if a movement from a political to an epistemological positioning of ownership is observed. However, as the inquiry progressed, I found that the lack of structure and description in this frame and the lived experiences of the learners did not make this frame a match for the success the learners experienced.

Romagnano: Resisting

The previous five interpretive frames were selected as a way to notice and interpret the way in which learners succeed in Consumer Mathematics. I chose these models with the assumption that the learners involved in this study would grow and succeed over the semester. As with all assumptions, I also recognized that this would not necessarily be true, and I needed to be ready to notice students' active resistance to change. Juxtaposed against the intentions of this inquiry, to notice how the *success* of learners evolves, was the reality that the nature of *resistance* might have warranted a closer inspection. As with the conception of ownership, no framework was available to notice how the nature of resistance of students evolves, so I relied on two specific studies of resistance instead.

Romagnano (1994) conducted an action research study in a grade nine general mathematics course (lowest of four streams – streaming began in grade eight). The goal of the study was to improve the teaching and learning of mathematics in general mathematics by changing the content (focus on functions instead of arithmetic skills) and instructional practices (constructivist, inquiry, problem-based instead of traditional, textbook-based). As the study progressed, students began to resist the changes by disengaging in class activities. This reaction led Romagnano to question, "How could I establish a 'mathematical community' in a class in which kids find struggling with ideas so onerous? Why was that struggle so unpleasant for them?" (p. 58)

While the resistance was revealed through disengagement, Romagnano's (1994) questions struck at the core of the issue – the nature of the resistance and why it had occurred. He found four reasons for the resistance.

1) changed role of students: active engagement instead of passive reception
2) changed nature of classroom work: open-ended problems instead of paper-and-pencil assignments
3) changed nature of instruction: ambiguous prompts and less-directive instructions instead of clear prompts and explicit instructions
4) changed nature of mathematics: "inquiry mathematics" instead of "school mathematics" (terms Romagnano adopted from Richards)

These changes in classroom discourse signalled a break the didactical contract of the classroom (Brousseau in Herbst & Kilpatrick, 1999) and left the students with a lack of awareness of the aim of education. Meier describes this as: "many kids don't want to be 'well-educated' because they can't even imagine what it is that could be 'wantable'"

(1995, p. 163). The four reasons for resistance noted above all have a common theme of dissonance between the teacher's beliefs and expectations and those of the students.

Romagnano touched on another important issue when he asked of himself, "What was it in our approach that was so *threatening* to students?" (1994, p. 60, italics mine). In his interpretation, Romagnano cites the above reasons of dissonance; however I believe a more insightful interpretation of dissonance is required. The dissonance is in the role of each of the students in the classroom. They were used to the role of student, perhaps not comfortable with it but it was familiar. The approach to learning, teaching, and mathematics that Romagnano was implementing required of the students to be learners – actively involved in the constructing of knowledge and assuming responsibility for their learning. They did not ask for the role of learner, so their resistance developed from the change that they were *required*, not *invited* to make. This could be perceived as threatening and students would naturally act to minimize the risks they would take.

Houssart (2001) provides another example of resistance in her description of 'whisperers'. These four boys, considered to be in the lower 25% of their grade in mathematics, consistently made whispered comments throughout the school year. Houssart categorized the comments as discoveries, extensions, and dissensions. The whisperers' resistance resulted from a dissonance between the teacher and whisperers' sense of the nature of mathematics. Contrary to the placement of individuals into Richards' two categories in Romagnano's study, the teacher represented a "school mathematics" orientations and the whisperers an "inquiry mathematics" orientation. It is important to notice, again, that resistance was observed in relation to dissonance between teacher and learners' expectations of the nature of mathematics in school. Even in this

resistance, Houssart noticed the whisperers because she was *listening*, while they went mostly unnoticed to the inattentive teacher. Perhaps a teacher who listened could have alleviated the discord between the two classroom discourses.

I proposed, at the outset of this inquiry, that there could be two types of resistance observable in the students' actions. First, students could have been resistant to becoming and being engaged, often demonstrated by a lack of effort. Many Senior 2 students, I have noticed previously, arrive in Consumer Mathematics with an expectation that it is a "math course for dummies" and consequently they believe little will be required of them. This was certainly demonstrated in Romagnano's study (1994), where resistance occurred because of a dissonance between teacher and students in terms of the nature of instruction and the role of students. I anticipated this frame of resistance being helpful for interpreting learners' actions if dissonance between their beliefs and my implementation of rich learning tasks occurred. Second, students could have been resistant to growing, learning, succeeding. I found it difficult to locate literature on this – except perhaps for silent knowers who remain silenced (Belenky et al., 1986). I believe there is a difference between this type of resistance and the type of resistance that Romagnano noticed. His observations were rooted more in lack of effort (a function of the role of student); whereas resistance to change is grounded in lack of willingness to take risks in order to change (a function of the role of learner and a fragile self-concept). The learners in this inquiry experienced many different kinds of successes; resistance did not characterize their lived experiences.

Situating the Inquiry for Understanding

In order to draw a significant theme from data, I believed that it was important to construct a foundation on which the inquiry could be based. This theoretical foundation needed to be formed and informed by two important dimensions. The first dimension was to situate the inquiry of success within a particular context. This context included my philosophy of teaching and the way in which I implemented a success-based curriculum in a Consumer Mathematics classroom. The second dimension was to provide models that I believed would be useful in noticing and describing the success of learners and how that success evolved. Although guided by my past experiences of teaching Consumer Mathematics, studies related to factors that foster success and interpretative frameworks were explored so that I would be prepared to draw a significant theme from the data I collected during the inquiry.

This chapter has provided a sense of the factors that I anticipated contributing to the defining of success and the evolution of a theme of success within a Senior 2 Consumer Mathematics classroom. In describing and examining what it means to be in pedagogical relationship with learners, my intention was to capture the particularity and complexity of relational being. I believed that relational teaching would sponsor students to become successful. Relational teaching provides for mutuality to exist in the classroom between the learners and me. By exploring what it means to invite all learners to learn mathematics in rich ways, and what that looks like in a high school mathematics classroom, my intention was to provide my understanding of effective teaching and learning of mathematics. Not only was this related to the curriculum that guided the

course, but also my implementation of the curriculum, inviting students to *do mathematics* that was authentic and relevant. I anticipated that situating this inquiry within two broad factors that sponsor students to engage in a stance shift towards success would help myself and a broader audience come to an understanding of the nature of success of learners in Consumer Mathematics.

This chapter has also provided an overview and application of interpretive frames with which I readied myself to notice learners' success. I explored six frames to help draw out a significant theme. Belenky et al. (1986) formed an epistemological frame that focuses on a feminine perspective on different ways of coming to know and positioning with authority. A self-authorship model, with an embedded epistemological frame, was created by Baxter Magolda (1992; 2001). Chickering and Reisser (1993), observing vectors of change, developed a personal growth model that leads toward interdependence. Attribution theory, articulated by Weiner (1972), provides a psychological model that aids in analyzing the attribution of success in relation to a specific experience. Dudley-Marling and Searle (1995), and Chase and Doan (1996), have explored learners developing ownership of their learning and studenting. These five frames focus on the success and growth of learners. I have also explored the research of Romagnano (1994) who noticed resistance in learners.

My intention was to have the interpretative frames available to support the drawing out of a significant theme that is effective in illuminating, explaining, and interpreting the shared, lived experiences of me and my learners. I also recognized that by weaving these frames into the conversations with the learners, the frames would support the growth of the learners and me. I anticipated the frames helping the learners

and me to tell learners' stories of success in Senior 2 Consumer Mathematics. At the outset of the inquiry, I did not anticipate that the six interpretive frames would directly correspond to the experiences of the learner-participants, but that they would be used as a place to begin and to inform an interpretation of success. I found as the inquiry progressed that I was well prepared to listen carefully to the success the learners were experiencing. Even though I did not use all of the interpretative frames within this inquiry, I believe they each contributed to my readiness to notice success and my ability to describe the learners' success and their evolution of success.

Chapter 3

Gathering and Understanding Successful Moments

Selecting a methodology within which a set of inquiry intentions can be pursued is critical to the quality of the study and the learning that takes place as a result. Bempechat (1998) attempted to understand at-risk students who were successful in school. She felt strongly about the importance of the study, but came to realize that the research methodology she chose did not support her development of a deep and rich understanding of how the poor and minority children came to be successful. Instead, she calls for a methodology that is "more authentic and true to life – that is, in-depth, open-ended interviewing and ethnography" (p. x).

The similarity of her study and this current one, in terms of understanding the experiences of learners in the classroom and factors that sponsor success, led me to agree that educational researchers "need to sit down and talk with children. … [This] will give us the opportunity to learn firsthand how children and the adults in their lives actually think about schooling and the role that education plays in their lives" (Bempechat, 1998, p. 120). Because I believe that what the learners themselves and their teacher have to say is integral to pursing my inquiry focus and fulfilling my intentions for this study, I endeavoured to find a research methodology that would listen to and amplify those voices. *Narrative inquiry* provided the strongest manner in which I could pursue my research interest. In this chapter, I will summarize the purposes and constructs of narrative inquiry, address the issue of teacher-as-researcher, provide a justification for the

use of narrative inquiry to support my learning and inquiry intentions, and describe a specific method founded on narrative inquiry.

Narrative Inquiry

Clandinin and Connelly (2000) have conceptualized a form of inquiry that respects the complexity of individuals and classroom interactions as being educatively valuable to understanding teaching and learning. The intention of inquiring into teaching and learning led Clandinin and Connelly to recognize that events in the classroom are the experiences of individuals and their interacting with each other. They drew on Dewey's sense of experience as being intimately connected to education and to life, aspiring to "think of the continuity and wholeness of an individuals' life experience" (Clandinin & Connelly, 2000, p. 17). The experiences of individuals came to be seen as stories, or narratives, that individuals lived and then told. Clandinin and Connelly believed a correspondence between method and researched phenomena would strengthen their understanding, which led to an exploration of the use of narrative to inquire into narrative. Thus, narrative inquiry employs narrative in two ways – it is "both phenomena under study *and* method of study" (p. 4, italics in original).

A Professional Examination of Narrative Inquiry

In inquiring into educational phenomena narratively, the inquirer is a collaborator in the construction, the telling, and the retelling of the stories. Clandinin and Connelly believed in the importance of listening to the stories in the classroom and then using those stories to understand the experiences being lived in the classroom. They describe narrative inquiry as:

> a way of understanding experience. It is a collaboration between researcher and participants, over time, in a place or series of places, and in social interaction with milieus. An inquirer enters this matrix in the midst and progresses in the same spirit, concluding the inquiry still in the midst of living and telling, reliving and retelling, the stories of the experiences that make up people's lives, both individual and social. Simply stated … narrative inquiry is stories lived and told. (Clandinin & Connelly, 2000, p. 20)

This statement of intention contains many of the purposes and elements that characterize narrative inquiry. As a more in-depth survey of the methodology is explored, the multilayered goals of narrative inquiry will be presented.

Narrative inquiry is situated within a *three-dimensional narrative inquiry space* comprised of temporal, situational, and interaction dimensions (Clandinin & Connelly, 2000). Temporal refers to the past, present, and future – the times in which the experiences occur – demonstrating the continuity of the lived experiences and their authoring. Situation refers to the physical location of the inquiry. Interaction refers to the personal and social issues that affect the experiences and the storying of the experiences. The interactions are described as vectoring in four different directions. An inward vector includes the emotions and internal thoughts of the individual, whereas an outward vector attends to the environment. Backward and forward vectors connect the

interactions with the temporal continuum of the stories told and retold. As integral as the temporal and situational dimensions become to the experiences and stories, the personal and social interactions is the dimension that becomes valued in the living, telling, and retelling of the storied experiences of individuals in the classroom.

> The acknowledgment that narrative inquirers and their participants do not work alone within the three-dimensional space accentuates the relational quality of narrative inquiry. It is relational in two ways. First, it is relational because the experiences occur within a social context. Clandinin and Connelly view narrative as "a term for representing what we, and our research participants, saw as healthy, productive, human relationships" (2000, p. 18). Therefore, narrative inquiry acknowledges the complexity of individuals and the relationships they form – that to every interaction each individual brings their history, their intentions, and their individuality. Second, narrative inquiry as a method is relational, requiring of the inquirer to forge relationships with the individuals in the inquiry space. Only then can the sense-making of experiences, another purpose of narrative inquiry, occur. As the inquirer experiences the experiences, he/she is able to share these understandings with all involved, with the explicit purpose of "enhancing personal and social growth" (p. 85). Clandinin and Connelly view relationships as "key to what it is that narrative inquirers do" (p. 189) because relationships are fundamental to the phenomena and the method in narrative inquiry.

Because narrative inquiry is guided by the experiences of the inquirer and participants, a traditional sense of method is difficult to describe. However, clarification of some key terms will help provide a sense of flow of a narrative inquiry study. More

than a research question or problem, the focus of a narrative inquiry is a "research puzzlement" that arises from the inquirer's experiences (Clandinin & Connelly, 2000, p. 41). The inquiry puzzle takes on a malleable quality throughout the inquiry, never purporting to provide a single solution because the experiential and relational elements direct the purpose and shift the focus.

Drawing from experiences, rather than theory, the narrative inquirer immerses herself/himself in more experiences within the inquiry space. The gathering of voluminous field texts, or data, begins immediately and continues through the rest of the inquiry (does not end when data analysis begins). Field texts vary widely, with no prescribed list of collection devices. The field texts need to appropriately capture the stories from the inquiry space and could include autobiographical writing, journals, field notes, letters, conversations, interviews, documents, and personal artefacts (Clandinin & Connelly, 2000). These field texts are not necessarily stories but "actions, doings, and happenings, all of which are narrative expressions" (p. 79) used to provide details and aid the inquirer's stance shift from living the experiences to telling and retelling the narratives that emerge.

When an inquirer asks "questions of meaning, social significance, and purpose" (Clandinin & Connelly, 2000, p. 120), this signifies a transition from field texts to research texts. A traditional research paradigm might see the construction of research texts as data analysis and interpretation. However, interpreting the experiences or narratives is an ongoing process (even within field texts interpretation exists) and critical, for growth and change occurs as the stories are retold. There is no clearly delineated process of retelling the stories. In order to retell the stories, the inquirer pours over the

field texts by reading, rereading, and coding (using narrative terms). As the inquirer contemplates the meaning and purpose of a story, he/she can begin to draw out themes or metaphors that are significant to the inquiry puzzlement. Previously established theoretical models sometimes aid in the process of drawing out a theme from data (Clandinin, 1986). The reconstructions are shared with the participants in the inquiry and a cyclical process of recording more field texts and transforming them into research texts ensues. During the construction of the research texts, Clandinin and Connelly (2000) advise the inquirer to return frequently to the three elements of the three-dimensional inquiry space to guide their experiencing of the experiences.

Because of the tradition of experimental research, focusing on quantitative methodologies to study educational phenomena, some researchers identify areas in which narrative inquirers need to be sensitive. The debates between the dependability of methodology and knowledge contributions from qualitative and quantitative research studies have been clearly outlined by others (Eisner, 1997; Kennedy, 1997; Mayer, 2000). However, inquirers that use narrative inquiry recognize that there are some complexities that arise from the nature of the involvement of participants and the personal and interpersonal nature of the inquiry, that need to be addressed in their methodology (Clandinin & Connelly, 2000; Conle, 2000; Ritchie & Wilson, 2000).

Involving and being involved with participants raises concerns about ethics, ownership of stories, and anonymity (Clandinin & Connelly, 2000). I value the pedagogical relationship that I form with each learner in my classroom, and decisions made within that constraint are guided by an inherent moral and ethical sense. I encouraged joint ownership of the stories by sharing in the telling and in the shaping of

the retelling of the stories through conversation. And in the telling and retelling of the stories, anonymity of the participants was maintained through use of pseudonyms.

Personal and interpersonal involvement with the participants and in the inquiry space also draws out issues related to selection of data, critical analysis, and intersubjectivity of interpretation (Clandinin & Connelly, 2000; Ritchie & Wilson, 2000). Bias in selecting data and in the selective telling of stories cannot be eliminated in narrative inquiry, but can be identified through autobiographical narrative included in interpretations of the field texts. Throughout this inquiry, I endeavoured to find a balance of critical analysis by always valuing the individuality of the participants, yet using field texts as a tool to "slip out of intimacy" of the inquiry space (Clandinin & Connelly, 2000, p. 82). Because of the nature of experience and telling of experience, there exists no one interpretation – which makes all interpretations of experience subjective regardless of research methodology. As well, the interpretations constructed were informed and deliberate because of the relationships forged between the participants and me, and sensitivity to the context. I will address issues of data interpretation at the end of this chapter. Clandinin and Connelly see *wakefulness*, or the "need to be alert and aware of the contexts for our work, and … of questions about field texts and research texts from the point of view of the three-dimensional narrative inquiry space" (2000, p. 182) as being central to alleviating concerns of field text construction and the retelling of stories.

A Practical Consideration in Narrative Inquiry: Teacher-as-Researcher

As well as raising a concern of ethics, the role of teacher-as-researcher has been seen in literature to create a tension for the teacher-inquirer. Wong (1995) asserts that the role of researcher and the role of teacher in the classroom are incompatible, indicating a sense of conflict between the two roles. He views a dichotomy in aims (a researcher tries to understand classroom interactions and contributes to theoretical knowledge; a teacher transmits knowledge and contributes to practical knowledge) and decision-making (a research is lead by inquiry, analyzing the response of subjects as reflection; a teacher selects instructional strategies and evaluates students). Because of this incompatibility, Wong claims that the questions that teachers and researchers decide to ask and attempt to answer cannot be reconciled in the enacting of one person.

In Wilson's (1995) dissent with Wong's position, she views herself as teacher-researcher in a relation, who asks "questions of interest to both teachers and researchers. They require neither a split in attention nor a conflict in intention" (1995, p. 20). The ethical and moral notion of improving teaching and learning leads researchers and teachers to the same intentions. Wilson, alternatively, would see both the teacher and researcher's decision-making as inquiry and reflection at every step and simultaneously in her relationship to learners and to learning.

By implicating myself in the inquiry as a participant, it required of me to identify, question, and challenge my biases/assumptions as I engaged in making decisions. However, implicating myself in the inquiry is not the only manner in which I acted in response to the decision-making concerns Wong (1995) raises. He is correct in

describing a researcher as one who requires an inquiry-stance and a systematic approach to learning about teaching and learning. However, I believe that this is inherent in my practice as a teacher already. As I conduct lessons, I continually ask of myself how the learners are coming to know, guiding them as they construct knowledge, and then I assess and interpret. So, my classroom experience that has existed within a constructivist framework has already provided me with opportunities to think about and practice the fine balance of inviting students to learn yet allowing learners to take ownership of their learning. This tension exists, not uniquely to a teacher-inquirer, but for *every* teacher.

Hidden in this debate is a discussion about the objectivity versus subjectivity of analyzing and interpreting data. Clay (2001) describes that a typical outside researcher would be characterized as being objective and an inside researcher would be characterized as being subjective. I believe that the dichotomy of the discussion cannot exist if any researcher is a human being, living in relationship with others (and bringing her/his bias and background to the research context). Romagnano, in discussing assessment in mathematics states, "In education assessment – the myriad processes by which humans try to determine what other humans 'know' – objectivity is a term that simply does not apply. Alternatively, we can strive for 'agreed-upon subjectivity'" (2001, p. 35). This is true of inquiry into teaching and learning; one cannot astutely *know* and wisely describe *knowing* devoid of social context, personal history, and interpersonal interactions. The complexity of each of the individuals involved and their interactions preclude complete objectivity. As well, the quality of my relationship with each learner does not limit me as an inquirer in the classroom. Instead, it empowers me to understand the living, telling, and retelling of learners' stories and my own story, leading to more

insightful analysis and interpretation. So, the "agreed-upon subjectivity" of the teacher provides me with an enriched sense of how to make decisions regarding inquiry design and interaction with the data.

One reality inherent in a teacher-researcher stance is the traditional power relationship between teacher and students, often characterized in the form of evaluation (or student marks). Anderson and Herr raise this concern by asking "how do teachers and administrators deal with asymmetrical power relations that might distort data or unwittingly place participants at risk?" (1999, p. 14). They remove the conflict of teacher-as-researcher in a role dilemma, and ask important questions: what about the learners? Are they at risk when a teacher engages in systematic inquiry about their learning? I believe that the asymmetrical power relationship is inherent in the interactions of students with teachers, devoid of a teacher's specific inquiry task engaged. By acknowledging this power differential, I become more sensitive and aware of the relationship that is forged with each learner and possible sources of conflict. My sense of ethic as a teacher, acting within a philosophy of teaching as caring, did not at any point allow me to be less *teacherly* in my relationship with my learners.

There are several specific decision-making acts that demonstrated my acknowledgement and sensitivity to the asymmetrical power relationship inherent in the classroom. At the beginning of the inquiry, another individual invited all learners to participate – being clear that participation was not mandatory and would not reflect in their evaluation (allowing for them to opt out at any time without consequence). By maintaining the anonymity of learner-participants, I committed myself to the safety of their identity. As well, thoughts that they shared with me, either in their interactive

journals, portfolio reflections, and shared conversations did not influence their evaluation in the course. In fact, I am always conscientious about explaining to learners that my expectation of interactive writings is that they are thoughtful and reflective.

Another general response to the issue of placing participants at risk would be to look at the role of knowledge communities in the classroom. Within the community of learners that focuses on learning mathematics, comprised of the high school learners only, my role is *teacher*. But, within the community of learners that focuses on learning about learning and success, my role is *learner*. The teacher-learner (which Freire (2000) also describes as teacher-student) role here is better described as *educator*, a term that removes the traditional sense of power over students from the title of *teacher*. I have claimed previously that the building of this community increases the security and safety of the members that belong to it. The complexity of teacher-as-researcher highlights the complexities of the relationships of teaching and learning, educator and learners within a classroom. However, it is this complexity that makes the journey, and the reflection on the journey, of value to the educator and learners.

A Personal Rationale for Narrative Inquiry

Although some concerns arise with the use of narrative inquiry, it resonates with my sense of inquiry and with the goals and purposes of this inquiry. As I endeavoured to listen to learners and come to see and understand their experiences, narrative inquiry supports this coming to understand by celebrating and drawing on each experience. It recognizes the past the learners bring to the current experience, and looks toward the

future – similar to my conception of success as a journey. As well, through the temporal dimension, narrative inquiry supports my inquiry into the learners' *evolving* sense of success. The situation dimension provides a way in which I can explore the factors that foster the success of learners, highlighting the context in which the experiences are lived, told, and retold.

The relational nature of narrative inquiry (interaction dimension) resonates with my philosophy of teaching and learning. The pedagogical relationships that I forged with my learners valued each of them and their experiences. My caring stance recognized the complexity of each learner and our interdependence, which characterizes the very nature of narrative inquiry (Clandinin & Connelly, 2000; Conle, 2000). Ritchie and Wilson (2000) point towards writings such as Noddings (1984) and Belenky et al. (1986) as influencing the development of narrative inquiry. Building a community of learners is a goal I have for each of the mathematics classes I teach, and the active involvement of the inquirer in the inquiry space corresponds with this goal. The parallel in shifting the asymmetrical power relationship (teacher to educator; researcher to inquirer) signifies the match between my teaching and narrative inquiry. The fact that many of the field texts that I gathered from the inquiry space, such as interactive writing and portfolios, were already part of my teaching practice demonstrates the compatibility of my teaching practices and a narrative inquiry methodology. These types of assessment tools (teaching) and field texts (inquiring) provide a focus on understanding and appreciating the experiences of a whole person.

Narrative has been central to my sense-making of teaching and learning. My reflections on teaching and learning come as stories. Usually these are stories of learners;

occasionally they are stories of me. Through reflection, by telling and retelling stories, I become aware of my emerging sense of teaching and learning, what I value as a teacher and learner, what is of concern to me, and areas that I want to explore further. Because this is my mode of sense-making about my profession, it follows naturally that a mode of inquiry that highlights the living, telling, and retelling of stories would resonate with my emerging stance as inquirer. But selecting narrative inquiry as a methodology was more purposeful than just the rationale of telling of stories. Narrative inquiry provided a structure of reflection for me that led to interpretation of words and ideas, and of drawing out themes from data. Narrative inquiry provided a framing through which I believed I could catch a glimpse of what occurs during the learners' journey and through which I believed I could critically view a telling and retelling of the lived experiences.

I anticipated that there would be two groups of individuals that would benefit from the living, telling, and retelling of the experiences that occurred during this inquiry. By using narrative inquiry, I hoped to draw an audience in to listen closely to the stories of the learners and me, encouraging the audience to be reflective about their own teaching and inquiry practices. Clandinin and Connelly (2000) have recognized the power of stories to educate others. However, I intended that the educative value of using narrative inquiry for this study would not just extend outward, but more importantly, inward. Ritchie and Wilson provide a more active stance believing that if we use narrative inquiry to "compose, articulate, and reinterpret our lives, it can move us toward action" (2000, p. 21). My overwhelming sense of inquiry was that all the participants would have the opportunity to grow and change as a result of their involvement. I

believe narrative inquiry sponsors inquirers and participants to be thoughtful about their teaching, learning, and interactions with others.

A Particular Exemplar of Narrative Inquiry

Clandinin and Connelly (2000) provide limited methodological considerations in their description of narrative inquiry (in keeping with the open-ended nature of narrative inquiry). From this, Craig (1995, 2000) has developed a more specific process of gathering and interpreting narratives about teaching and learning. In inquiring into the development of personal practical knowledge in beginning teachers, the method of "telling stories" emerged (1995). She describes her construction of field texts most clearly in this study as: the inquirer and participant each write their own stories about the participant's experiences, they exchange narratives, and then reflect on them in writing. This cycle continues until the inquirer completes a research text. Craig built on the "telling stories" method to sculpt the "parallel stories" method (2000), both of which this study will employ. In the latter method, Craig develops the stories of schools and a teacher's story in parallel, both from the viewpoint of the teacher-participant. The narratives were seen in parallel because they were developed around the same theme, the "walls theme" (Craig, 2000). She noticed the interaction between the two parallel stories when she stated about the stories, "All are intermingled; all are interdependent. And all are incredibly complex" (2000, p. 37).

I intended to use Craig's (1995) conception of "telling stories" as a way to construct field texts, with some modifications. I perceived, at the outset of the inquiry,

two stories situated in the inquiry space that were fundamental to exploring the nature of the evolution of success of learners. The story of each learner focused on the lived experiences of each learner. These stories were told by a narrative the teacher-inquirer wove together, and then were retold by learner-participant and teacher-inquirer in conversation. The teacher's story was the narrative account of the teacher, told and retold by the teacher-inquirer. Stories were gathered through "actions, doings, and happenings" in the classroom (Clandinin & Connelly, 2000, p. 79). During an informal interview process, the inquirer and the participants approached these stories more directly, by being in reflective conversation about the narratives of the learners.

Even though the narratives of the learners and teacher were in parallel (focused on the success of the learners), a common theme such as Craig's "walls theme" (2000) did not emerge. Rather, I see the parallel structure of the stories as being aligned by the main character of the story. One set of stories was the narrative about and by each learner-participant. The second set of stories was the narrative about and by the teacher-inquirer. Because of the complexity and interdependent nature of these narratives, I intended to use Craig's (2000) notion of "parallel stories" to translate my field texts into research texts (analysis and interpretation of field texts). Even with Craig's particular example, she did not explicate interpretation of data. I anticipated a significant theme emerging from the data that was collected.

On first impression, this structuring of stories from the viewpoint of the teacher or the learners might seem to contribute to an unequal relationship in the learning community. However, much of the reflective storying from the learners' viewpoints was shorter vignettes contained within interactive writing and portfolios. This scaffolded the

learners' contributions to field texts, providing prompts from which the learners could begin to share the telling of their lived experiences (Mason & McFeetors, 2002). Another rationale for the adaptation of Craig's method is the nature of the participants. Craig's participants were reflective, communicative adults in contrast to my participants, who were emerging reflective and communicative individuals.

Method

In order to be able to retell an insightful and educative story that is situated in a Senior 2 Consumer Mathematics class, stories of the participants were gathered, told, and retold. Narrative inquiry guided this general process, a methodology that provides opportunities for the inquirer to always be aware of the temporal and situational placements of the pieces of narrative, and the personal and social interactions of the individual whose story is being recounted (Clandinin & Connelly, 2000). These narratives were lived and collected during the fall semester, September 2002 to February 2003 inclusive. In this section I will outline and describe the participants involved in the study (including method of selection), the manner in which I had planned to gather and construct the field texts, and how I intended to make the transition from field text to research text.

Participants

The Senior 2 Consumer Mathematics class that was a part of this inquiry was made up of twenty-two students. All students in this class were invited to participate in the inquiry. The purpose of the inquiry and my intentions in conducting the inquiry was described to them and they were then invited to participate on a volunteer basis (which was also determined by the completion of permission forms by the students and their parent/guardian). Eleven students decided to participate. When referring to these students as sources of data, I will refer to them as learner-participants. The field texts, outlined below, were collected from all the learner-participants, with many of the classroom documents collected from all students in the class.

However, the nature of the research question and intentions for inquiry do not focus solely on the learner-participants. In studying how the success of learners evolves, there is a necessary interweaving of the teacher's story. So although I am an inquirer and teacher in this inquiry space, I am also implicated in the inquiry into success. To observe and understand factors in a classroom that foster the success of learners, my decision making in teaching mathematics and my stance as an educator needed to be explored. Specific field texts were also gathered from the teacher-participant-inquirer.

Collection of Field Texts

I planned to gather field texts in a variety of forms, recognizing the complexity and interdependence of each of the participants. Because this study intended to tell and

retell the teacher's story and stories of learners, all participants were active in constructing stories about themselves and each other. Outlined below are the specific field texts that I planned to collect from the teacher-inquirer and the learner-participants, including the frequency of collection and a general time frame. See Appendix A for a detailed, chronological listing of the collection of field texts.

Teacher-Inquirer

There are two different types of field texts that I intended to gather from myself, the teacher. I planned to write field notes after class each day. The field notes were meant to reflect the thoughts and concerns that I had while I was engaged in teaching. The purpose of these notes was to record the chronology of the class and relate any specific incidents. Because of the open-ended nature of the inquiry, I had expected the notes to focus on many of the details of the class, not discriminating among them. At the same time, I expected the field notes to also represent my attempt to remain aware of the details that were included and those that were overlooked.

At the end of each week, I had intended to write a reflective journal entry. The weekly reflective journal was meant to be an attempt to gather the teacher's story and was meant to support an initial interpretation of the field notes. Not only was it to contain the events that I viewed as significant, but it was also meant to be an interim research document with my interpretation of those events. The tone of the weekly reflective journal entry was to be reflective and autobiographical in nature. I did not plan to use any specific prompts to guide the journal writing. Instead I believed that issues

that did arise or did not arise would help guide me towards drawing out a significant theme for the teacher's story and stories of learners.

As well, as the inquirer I planned to be actively engaged in constructing the interim research texts throughout the study. These will be described in more detail in relation to the learner-participant interviews.

Learner-Participants

I expected to gather a variety of field texts from the learner-participants during the inquiry. Each of the pieces I planned to collect were part of the instructional process in the classroom. Interactive writing and portfolios were already a well-established process that I had used in previous courses. The narratives (an inquiry-constructed piece) and the conversations were an instructional process that I was adding on as a new instructional process. I photocopied or transcribed all the field texts as they were gathered.

Interactive Writing. One type of classroom assessment piece that I had intended to gather from the learners was the interactive writing entries from their mathematics journals. I have described interactive writing in Chapter 2. For further details on the interactive writing process, see *Interactive Writing in Mathematics Class: Getting Started* (Mason & McFeetors, 2002). I had intended to collect approximately ten interactive writing entries, approximately one every other week, throughout the semester.

As an inquirer, I anticipated relying on the interactive journals as a place where students felt safe to share their goals for and concerns about their development in the course. I also viewed interactive writing as a place where students used a specific instance, like a mark on a test or report card, to begin a discussion about their feelings

and my personal and interpersonal reaction to their progress. I expected that as the students grew, they would become more strategic in articulating their goals and be able to develop a sense of self-efficacy as they looked back on their progress.

Portfolios. Portfolios were the second type of classroom assessment piece that I had intended to gather from the learners. I used portfolios, rather than tests, to assess students' learning over a whole unit. Aside from some organizational features and the inclusion of at least one test that was written during the unit (tests occur every five concepts – usually twice a unit), learners selected the rest of the items. Along with each item is a reflection describing the importance of the artefact. The portfolio concludes with an overview reflection that describes the learner's sense of her/his progress over the unit. (See Appendix B for detailed portfolio guidelines.) I do not respond to the reflections in the same manner as I do with the interactive writing. I had intended to collect six unit portfolios during the semester. As well, I intended to collect a final semester portfolio (six items are required with more detailed reflections). The semester portfolio invited learners to notice and celebrate the little learning successes and more long-term learning progress over the semester.

As an inquirer, I anticipated several parts of the unit portfolio being integral to the field text collection process. I expected the item and overview reflections to be useful as a learner's telling of her/his growth or progress over a specific unit. In fact, my verbal prompt was for the learners to tell me a story of their learning over the entire unit. I believed it would also be helpful in demonstrating how a learner believes he/she comes to know, showing the movement from not knowing or not understanding to knowing or understanding. In articulating the mathematical process(es) used in each piece, I also

view the process to support the learners' development of communicative skills necessary for interacting in later conversations. I also planned to rely on the selection of pieces that each learner made to indicate her/his sense of the nature of mathematics and to demonstrate a sense of self-efficacy.

Conversations. The third type of field text that I intended to gather from the learner-participants was a set of three informal interviews over the semester. Because I added this process as an instruction process in the course, all learners in the class were expected to attend the conversations, regardless of participation in the inquiry. I planned to conduct the interview in an informal manner, much more like a *conversation*, to create an atmosphere in which the learner-participant feels safe to share her/his reactions to the experiences in class and the narrative (described below). Although I had planned to focus on one learner-participant in each conversation, I provided an opportunity for them to bring one classmate to the interview. The conversations were scheduled for 10 to 50 minutes (increasing time for each of the three cycles of conversations), taking place in an office at the school. I planned to tape record and transcribe all the conversations. As well, I had intended to record some field notes during the conversation.

As I began to collate all the other field texts together, I planned to begin constructing the story of each learner. These stories were meant to be interim research texts (which I refer to as narratives) that would become the focus of discourse in the conversation between the learner-participant and me. More than just a collection of the various field texts, these narratives were my attempt to begin interpreting the experiences of the learner, drawing out significant themes, metaphors, or elements describing and highlight the learner's success.

In the first cycle of conversations, which I planned to schedule during October, I intended to bring a narrative of each learner. Before this conversation occurred, I planned to have gathered at least four interactive writings and at least two unit portfolios. I intended for each narrative I constructed to be approximately two paragraphs in length, based on classroom interactions, field notes, my journal, and the learners' field texts. The first paragraph was to be descriptive, describing the stance of the learner that I have observed over the previous seven weeks. The second paragraph was to be interpretive. I intended to weave a specific detail into the narrative, in an attempt to invite the learner to articulate an intention for the lived experience.

I planned to begin the conversation by reading the constructed narrative, inviting the learner to react to the narrative by expressing whether the telling of her/his lived experiences is accurate and suggesting what might make the narrative more authentic. Although I was interested in their general response, I also intended to author prompts that would direct the learners' attention to specific ideas within the narrative. I believe that this retelling of the learner's story, by the learner, would add richness to the cycle of storytelling. As well, I had in mind that the learner-participant would also bring her/his binder, from which she/he could select some other artefact from among classroom products that would illustrate a successful moment. I anticipated that the selected artefact, along with the narrative, would provide specific starting points in the conversation to focus on the learner's intentions for the course, hopefully leading towards an awareness of success for the learner-participant.

I planned to schedule the second cycle of conversations in December. I intended to bring a second version of a narrative for each learner, expecting to have gathered at

least two more interactive writings, at least two more unit portfolios, and have available the telling and retelling from the first conversation cycle. I intended for each narrative I constructed to be approximately four to five paragraphs in length. In addition to folding in the previous narrative, I wanted to expand on the learner-participant's stance towards class, learning, and/or mathematics in the first two paragraphs. More importantly, I anticipated being able to highlight the learner's shift in stance that I had noticed since the last conversation. In the third and fourth paragraphs, I had planned to weave into the interpretation a specific experience of the learner-participant. This interpretation was to either extend the notions contained in the first narrative, or was to change focus and describe the nature of the change. I intended to introduce, in this interpretation, some phrases or terms that capture the emerging significant theme, using the interpretative frames as a tool to focus on the living, telling, and retelling of the learner-participant's lived experiences. I anticipated that this second narrative would flow between description and interpretation much more freely than the first narrative. I intended that the structure of the second conversation would be similar to the first, only differing in my prompt for the learner-participant to engage in a more strategic goal setting for the last two months of the semester.

I planned to schedule the third cycle of conversations during the month of February, after the end of the first semester. I intended to bring a third version of a narrative for each learner-participant, expecting to have gathered at least three more interactive writings, two more unit and one semester portfolios, and have available the telling and retelling from the previous conversation cycle. I expected that the narrative that the learner-participant and I would be reflecting on would be the next-to-final draft

of the story of success for the learner, building directly from the second narrative. Although similar in chronology to the first two conversations, I intended that the focus of this conversation would be slightly different. After listening to and responding to the narrative, I planned to invite the learner-participants to reflect on their stance shift over the semester and conjecture about what their experiences would look like in their next mathematics course. I believed that completing the story living, telling, and retelling cycle in this manner would emphasize the empowerment of each learner-participant through the inquiry process.

Construction of Research Texts

In narrative inquiry, analysis and interpretation of field texts is continuous, from the beginning of the inquiry until the termination. As was described above, data interpretation occurred while I was still in the process of collecting more data. An example is my authoring of learners' narratives as I prepared for each conversation, which interpreted the data I had collected to date. Because of the open-ended nature of inquiring into lived experience, specific methods of interpretation were difficult to articulate before I engaged in the interpretation. With the data collected from the learners', I intended to engage in interpretation by *listening* to the learners to recognize and use successful moments to point towards a theme of success for each learner.

The interpretation that I planned to undertake while the inquiry was in process was an interim level of interpreting the data. However, at the conclusion of the inquiry process I recognized the importance and responsibility I had as inquirer to make sense of

the living, telling, and retelling of the learners' stories of success. Clandinin and Connelly (2000) provide only general guidelines in relation to when interpretation in a narrative inquiry is undertaken. Their understanding is because of the particular nature of each narrative inquiry study, the inquirer is encouraged to spend time immersed in the data, reading, re-reading, and coding in an effort to establish a distinct approach that recognizes the uniqueness and complexity of the specific study. As I planned the way in which I would interpret the data, this did not provide enough guidance for me to conceptualize what my process of interpreting the data would look like. Even Craig's method of "telling stories" (1995) provided direction for interim interpretation, but little direction of interpretation of the data at the conclusion of the inquiry.

I had readied myself for the process of data interpretation in the reading that I had engaged in to find interpretative frames against which I could hold the data I collected. I planned to make use of these six interpretive frames that I analyzed and became familiar with, presented in Chapter 2. I had intended to use these frames as a guide for drawing out a significant theme from the narratives of the learners and the teacher's story. Although I did not anticipate that these frames would directly correspond to the experiences of the learner, I anticipated using them to begin and inform an interpretation of the data. I intended that the frames would help me do more than *see* the data, but that they would support me in *hearing* the learners and their success, to come to an understanding of what it means to be successful in Consumer Mathematics and how that success evolved.

In looking further for a method for interpreting the rich data I intended to collect, I read van Manen's *Researching Lived Experience* (1990). In *Researching Lived*

Experience, he described a phenomenological approach to studying lived experiences, suggesting three methods for drawing a theme from data. The first method is a *wholistic approach*, where the essence of a narrative is captured in a phrase that is formulated through reading the text as a whole entity (pp. 92-93). The second method is a *selective approach*, where key statements are highlighted that reveal the essence of the narrative (pp. 92-93). The third approach is a *detailed approach*, where the question of essence is held up to each sentence in the narrative. I was prepared to select among these data interpretation methods to support my sense-making of the data.

From Intended to Actual

In the past three chapters, I have described the groundwork for the inquiry that was to begin in September 2002. In my experiences teaching Consumer Mathematics in previous years, I had wondered what the uniqueness of learners' success in Consumer Mathematics was and how it could be described to a broader audience. I also wondered how the learners' success could be malleable as they experienced success. In reflecting on my practice, I had noticed two factors that fostered success – being in pedagogical relationship with the learners, and inviting learners to engage in *doing* mathematics. What would be the nature of success for these learners and how would that success evolve over the semester? I frame the study with narrative inquiry as a methodology because it respects the importance of being in pedagogical relationship with learners.

With my planning in place, I entered the classroom in the fall of 2002. I was quickly immersed in the challenges and rewards of teaching Consumer Mathematics within a pedagogical relationship with the learners. Even when there were few words spoken, I listened to the learners and the words they said, both as a teacher and in inquirer. The rest of this document is an account of my quest – to come to understand the nature and evolution of success of learners in Senior 2 Consumer Mathematics.

Chapter 4

From Inside a Consumer Mathematics Classroom

The purpose of this inquiry is to come to an understanding of how the learner-participants came to be successful in Consumer Mathematics. In order to understand their success, I believe we must listen carefully to the students to hear their moments of success. The pedagogical relationship I forge with each learner contributes to my ability to listen authentically to her/him. This listening can be viewed as *situated* listening, situated within the wholeness of the individual as well as how the individual interacts with her/his context. The moments of learner success retold in this document occurred within a specific classroom, and must be heard within that context. I believe that the teacher's story, an autobiographical account highlighting my lived experiences, depicts well the experiences in the Consumer Mathematics classroom.

The teacher's story forms an interim research text (Clandinin & Connelly, 2000) that builds a bridge between data collection and data interpretation. The teacher's story was constructed from primary data in the form of field notes. Rather than being a piece of data interpretation, it became another piece of data that highlighted and summarized my lived experiences as the teacher in the classroom. This is consonant with Clandinin and Connelly's conception of retelling. My experiences were lived in the classroom, told in the field notes, and retold in the teacher's story. As I turn to interpreting this story, another layer of the inquiry process is enacted, bringing meaning and understanding to

my lived experiences. The teacher's story is part of the parallel accounts method (Craig, 2000), where both teacher and learners write narratives of their lived experiences.

Within the parallel accounts method, the teacher's story is an opportunity for the audience to hear my voice, as the teacher. The specific inquiry question, posed at the outset of this inquiry, focuses on the evolution of success of learners in Consumer Mathematics. Although this inquiry's question elevates the learners' voices in understanding success in Consumer Mathematics, it is important to consider my experiences as I lived in pedagogical relationship with the learners. I also believe it is necessary to the situating and understanding of the learners' success that the audience comes to understand the intentions of fostering success as they were enacted in the classroom. Interpreting the teacher's story will provide an opportunity for the audience to come to see and hear the classroom context in which learners experienced success.

Beginning with the teacher's story does not prioritize the teacher's voice in this inquiry. Rather, it provides an opportunity for the audience to recognize the context of successful moments that the Consumer Mathematics students experienced, as phenomena located within temporal, situational, and interaction dimensions of inquiry (Clandinin and Connelly, 2000, p. 50). The purpose of this chapter is to illuminate my voice, to find meaning in and interpret the teacher's story, and to introduce the audience to the pedagogical context in which this inquiry was carried out. It will begin by describing the writing and interpretative frame of the teacher's story, drawing and explicating a significant theme from the data, and then situating the teacher's story within the context of the inquiry. The teacher's story can be found in Appendix C.

Introducing the Teacher's Story

The ensuing interpretation of the autobiographical narrative will focus on the teacher's story, my story of living with, teaching, and learning from the class that is the focus of this inquiry. In order to provide further commentary on the story and to present a theme that emerges, I think it is important to consider how the teacher's story was constructed. Daily field notes contained an initial telling of my lived experiences. They were my opportunity to reflect on each class and write about any details of the day that came to mind, including content that was addressed, specific classroom activities, description of classroom routines, descriptions of individual students, observations of interactions between students, interactions between me (teacher) and students, role of a paraprofessional in the classroom, classroom management, and student cognition.

After the semester concluded, I authored the teacher's story. For each week in the fall, I used the following process: read through the field notes, coded major ideas, compiled significant moments for the week, and wrote a summary. Even though there is still some ambiguity in how I selected moments, even as I explain the process, I felt that it was important to come to the research text with an openness to encounter any important moments or significant ideas. I continued with this process, writing about the first two months of the course, until the inquiry was presented to the students. This bifurcation in classroom focus, from a pedagogic context to a pedagogic and inquiry context, indicated the shift from teacher's story to teacher-inquirer's story. The teacher's story became a re-telling of the lived experiences of my teaching.

However, simply authoring an autobiographical account does not necessarily hold significant value. It is in the analysis and understanding of the events that were recorded and how those events create a coherent narrative that I (and the audience) can learn from reflecting on my actions and beliefs. One method of conducting this analysis is to draw a significant theme from the writing (which is illuminative, explicative, interpretive, and effective). Van Manen (1990), suggests three methods of drawing a theme from lived experiences: a *wholistic approach*, a *selective approach*, and a *detailed approach*. I chose to use a wholistic approach, reading, re-reading, and coding (by colour coding similar events in the margin of the text) the teacher's story to find a unifying theme.

Drawing out and articulating a theme in the teacher's story was a process filled with deliberations. I found that there were several significant ideas emerging and it became difficult to integrate these ideas into a common theme or a single statement of importance. This is consonant with van Manen's conception that "a phenomenological theme is much less a singular statement than a fuller description of the structure of a lived experience" (2000, p. 92). As I began to integrate several ideas, I believe that the theme that emerged from the teacher's story is a significant theme. I also believe that this theme will guide a process in which meaning of the narrative can be brought forward and discussed. The remainder of this chapter will explore the theme that emerged as I analyzed the teacher's story and then situate it within the inquiry context.

Interpreting the Teacher's Story

In my analysis of the teacher's story, I noticed that there were recurring events that I recorded or recurring thoughts that had surfaced in the story. As I deliberated how all these events and thoughts could be integrated, I began to notice that there was something influencing all the things I did, said, and thought as a teacher. I began to inquire into those factors and to consider what factors affected the events and thoughts recorded by asking of the narrative text questions of purpose. Those factors are the intentions that I hold for each situation in my practice and each thought about my practice. From the idea of intentions, a unifying and significant theme began to emerge, that *there were **tensions** in my pedagogic **intentions** observable in my lived experiences.*

My intentions, recorded in the teacher's story, can be characterized as being thoughtful, deliberate, focused, planned, and reflected upon. However, as those intentions were lived out in the classroom with students, certain tensions were revealed. Bullough and Baughman (1997) support the notion that intentions are part of our beliefs about teaching and learning. They came to see through their observations of teacher education that beliefs shape practice, and went as far as to state that, "just as teachers hold beliefs, beliefs hold teachers" (p. 69). Thus, my intentions that became apparent in the teacher's story are interconnected with my beliefs and they shape my practice and my thinking about my practice. But what did it mean, if there were tensions within my intentions in the classroom? Were there competing beliefs that caused the tensions?

Teaching and learning are complex acts, so the intentions that I demonstrated in the writing of my narrative are complex and multifaceted. One might consider that a

teacher should or would have intentions that are closely interrelated and compatible. But teaching is not a solitary act; rather, it is lived out in a classroom with students who hold their own intentions. At times the students' intentions may be consonant with the teacher's intentions, at other times students' intentions and teacher's intentions may be dichotomous. There are four recurring areas, success, active learning, addressing content, and teacher learning, where tension in intentions is evident within the teacher's story. My purpose is to bring forward examples of these tensions and to come to understand the interplay of my intentions in this Consumer Mathematics classroom.

Success

One of the intentions that I had for my students was that they would be successful in Consumer Mathematics. Many students selected Consumer Mathematics as their mathematics course because they had previously been unsuccessful in mathematics class. The curriculum for the course supports my belief and intention. It would be advantageous to succinctly define success, but my understanding of success for these students is multifaceted and is continually being refined through the retelling of their stories. However, success could be connected to educational aims. Three educational aims in schooling can be identified as: socialization, academic development, and personal development. The two aims, which I consider important, are the aims that focus on academic and personal development.

Within this intention of supporting student success there is a tension that is clearly displayed. One struggle I had throughout the course was pacing, especially providing

appropriate time to complete assignments or activities. I recorded a moment in the teacher's story where struggling students did not necessarily have enough time to complete an assignment, yet other students completed it quickly (Appendix C, Week 7). Many of the latter students were individuals who had selected the course because they did not want to think or complete homework, but wanted the "easy" math credit. So, the struggle with pacing soon pointed toward another concern, the degree of rigour that I wanted to provide in the activities. The tension was to provide enough rigour to challenge all the students in the class to think mathematically, yet ensure the material was within reach of students for whom the course was intended.

This tension could be viewed as a simple classroom and time-management issue, but I believe that it has more significance. A tension between *success* and *rigour* developed during the implementation of the course. I believe this leads directly to school-wide, or systemic, issues that evolve in this tension between intentions. It raises the questions: what knowledge should students be taught in schools? Does that knowledge have a high degree of cultural capital? Is it available to all students, or does it promote hegemony? I think this is probably one of the elements of streaming that critical pedagogues (Kozol, 1997; McLaren, 1989; Willis, 1977) are concerned about when different mathematics courses are taught to different students. Although they echo McLaren's (1994) concern of teaching knowledge that has little economic value, there are also students who make decisions to take this course because they see it as an "easy way out" in a system that they do not feel they are a match for. From my experiences, I noticed that both rigour and success need to be defined in different ways for students who

take the course because they struggle with learning mathematics and students who take the course for an "easy" credit. This creates tension for both the teacher and learners.

Active Learning

Another intention I had was for students to be actively involved in their learning of mathematics. This intention comes from my constructivist approach to teaching and learning. This includes students building on their experiences (Pugalee, 2001; Ward, 2001). Providing opportunities for students to build on their experiences is complex (although an example with a student is described in the teacher's story (Appendix C, Week 2)), but active learning also involves students making a decision to move beyond being passive listeners. In other words, active learning means that learners are engaged in activities they are invited to participate in (whether it is taking notes, practicing questions, or doing mathematics in a problem-based or inquiry context).

A recurring situation in the teacher's story was my frustration and interactions with a certain group of students. These students can be labelled as disrupters and non-implementers (Appendix C, Weeks 3, 4, 5, & 9). *Non-implementers* are individuals who make conscious decisions not be involved in the activities that they are invited to engage in. Sometimes their stance might be to sit there and do nothing or to take a short nap or to doodle on the paper in front of them. *Disrupters* are often non-implementers, but they are more vocal about their non-participatory status. They are often loud and influence other students around them to not participate.

My ongoing frustration with these students demonstrated my intention that they should be actively involved in their learning. Although their behaviour was a problem, it was their unwillingness to engage in any activity or assignment to learn mathematics that prompted my frustration. I noted in the teacher's story that these students received much of my attention (to the detriment of quieter, struggling students) because I was constantly redirecting them (Appendix C, Weeks 4 & 6). Although my intentions are clear from the narrative of the teacher's story, the intentions were often more implicitly communicated to the students. In one after-school conversation with a student, I did explain my belief that learning mathematics comes from being actively involved (Appendix C, Week 3).

My intention was that students should be actively engaged in learning mathematics. The students indicated intentions that were a contrast to my intentions. In comparing these intentions, consider what I wrote in Week 4 of the teacher's story:

> It did not seem to matter whether the students were working on textbook assignments or the Pay Day Project, though, their level of engagement was so low. I was concerned, in my reflections, that I had missed the intentions of my students. It was not a matter, though, of missing intentions, but mismatched intentions between me and many of the students in the class. Many of the disrupters and non-implementers were there to do nothing and get a credit. But my intention was for them to be thoughtful about the mathematical ideas that they were interacting with in class. It was very discouraging for me.

The teacher's story is written from my perspective about my experiences, and does not contain directly the intentions of the students. Romagnano (1994) and Houssart both recognized a mismatch between teacher beliefs and student beliefs about mathematics and learning mathematics as a factor in resistant students. These two examples could help to explain the actions of the disrupters and non-implementers in my class. Some of the students did come to the course expecting to do very little and get a credit in the course. There certainly was a mismatch of intentions.

However, I am also struck by Meier's (1995) understanding of the cause of resistance as students' lack of awareness of the aim of education, not perceiving any particular gain from being educated. Perhaps this could also inform my understanding of the resistance of the students – that they really did not see the benefit, because of their past experiences in mathematics classes and their relationship to school (as an institution), of learning mathematics or even learning in school in general (which causes us to return to the concerns and issues of whole-school pedagogy).

Addressing Content

Another strand of events recorded in the teacher's story demonstrates my intention of addressing content by inviting students to learn mathematics actively. On two occasions I discussed the occurrence of providing notes/examples for the students and then assigning practice questions from the textbook for the students to work on. The first context was learning to read and complete time cards (Appendix C, Week 4). The second context was learning to calculate wage increases (Appendix C, Week 6). In both situations, I described the content the students were learning as skills they were acquiring and practicing. My reflection on the planning and implementation of the plans was one of unease, demonstrated when I wrote, "except for the Pay Day Project, the students had only opportunities to see, learn, and practice mathematical skills this week. It bothered me, but I also knew that the students needed to develop some skills, which means practice." My intention in this course was that students would be learning mathematics actively, by *doing mathematics* (Davis, 1986). However, I also realized that as much as I

felt the course should be process-based (Bempechat, 1998; Costa & Liebmann, 1997a; NCTM, 2000), there were certain skills that students needed to develop. This tension between process learning and content learning was apparent in my narrative.

There was also another element to my dissatisfaction of using textbook assignments. What preceded the skills-based textbook assignments in the lessons would be notes and several examples of the types of questions the students would be completing during the textbook assignment. As I wrote the notes on an overhead, the expectation for the students was to copy down the notes and participate in constructing solutions to the examples. The tension in intentions was evident again in the teacher's story. As dissatisfied as I was with the idea that I was encouraging passive learning through note-taking, I found that note-taking times were the moments when the largest group of students were on-task (Appendix C, Week 5). A tension existed for me because I believed that actually doing something (a beginning stance in active learning) helped students learn more effectively than taking the stance of a non-implementer or distracter. But in the situation, I was searching for ways that would foster meaningful learning.

This also demonstrates a tension between my intentions and the students' expectations of a mathematics classroom. I believe that it is appropriate to assume that many of these students had experienced traditional mathematics classrooms (and perhaps in other courses) in the past. So, the students were well aware and often acted within a didactic contract (Appendix C, Week 6; see Brousseau in Herbst & Kilpatrick, 1999). The didactic contract in a traditional classroom is one where the teacher is expected to explain clearly and explicitly the skills that are to be mastered, and then the students practice those skills. Again, this is a very passive approach to knowledge acquisition

(students' expectations) compared to an active approach to knowledge construction (my intention). These intentions exist in tension.

A tension in intentions also exists in the educational aims I hold for learning in my classroom. If I consider the two educational aims that I believe are important, academic and personal development, there is a stronger focus on personal development. I believe an aim of personal development can be understood through Noddings' (1995) sense of education and that this aim should guide all other aims, including intellectual development. So, the aim of personal development becomes clear in the community building and the forging of pedagogical relationships in the teacher's story. The content (which would be an academic aim) provides a loose structure in re-telling the story and is certainly used as a vehicle for implementing the ideals of personal development. Because I have two strong educational aims influencing my intentions, there is sometimes a tension in the aims. Even though these educational aims themselves exist in tension, I still maintain that some of the tensions can be minimized. An example from the teacher's story is using the content of the Manitoba Labour Board as a vehicle for interacting with small groups of students (Appendix C, Week 2). I also believe that by implementing portfolios as an end-of-unit assessment piece, the tensions between the two educational aims are reduced because portfolios allow for students to consider their learning and become metacognitively aware. The portfolios are also an opportunity to address the aim of personal development.

Teacher Learning

The preceding intentions have all been directed toward students, student learning or sponsoring student learning. Within my class, however, I did have an intention for myself, as the teacher, which is observable within the teacher's story. My intention was that as I taught these students I would learn more about how to teach and how students learned. This intention was fulfilled in two ways, by listening to students and through my own reflection on each day's experiences.

I found several effective ways to listen to my students and learn from those interactions during our semester. In the teacher's story, I specifically discuss the interactive writing, portfolios, and in-class conversations (about the students as students, learners, and individuals). Even though the students and I engaged in much of this discourse as a means of developing a pedagogical relationship, some authors also believe that this listening can increase the effectiveness of teaching (Henderson, 1992; McCaslin & Good, 1996). In fact, using van Manen's three levels of interpretation (1977), it could be argued that teachers cannot move from a practical level of reflection to interpretive and critical levels of reflection without considering and listening to the voice of students. My professional learning also occurred through the deliberate reflection that I engaged in through writing field notes after class each day. Although the learning that I engaged in during this reflection is less apparent in the teacher's story, there are comments that point towards using the field notes as an opportunity to think about my teaching and the students' learning. I considered various situations and why they were effective or how to improve, such as the use of notes and textbook questions (Appendix C, Week 4),

effective learning activities (Appendix C, Week 7), and curricular improvements (Appendix C, Week 9).

My intention was to learn more about effective teaching and learning, primarily through the daily field notes and reflections they contained. It was the first time in my career that I had formally written out reflections. I found that tensions existed within this process. It was a tension between feeling efficacious and learning more about teaching and learning. I felt so strongly about both of these processes that they were both teacher behaviours that I prioritized. What I found as I wrote my field notes each day was that it was a forum where I felt obligated to consider all parts of my practice. Writing daily about the non-implementers and disrupters was very difficult and brought the two intentions into tension. This tension becomes apparent in the teacher's story as I discuss my feelings of frustration (Appendix C, Weeks 1, 3-5, 7-9). The danger with the constant consideration of trying to improve (without necessarily acknowledging the moments that are successful) is that the reflections began to feel overwhelming and disparaging. Without encouragement from other sources (or the need to complete field notes for this inquiry), this element of professional growth would diminish in its effectiveness.

Teacher's Story as Learning Through Inquiry

As I analyzed the teacher's story, I recognized many of my intentions in the narrative. Those intentions were useful in considering the narrative as a coherent whole. Some of the intentions were directed towards students, such as intentions for students to

succeed, for students to actively learn mathematics, and for students to develop metacognitive awareness. Some of the intentions were joint teacher and student intentions, such as intentions for forming pedagogical relationships, for community building to occur and affect learning, and for effective teaching and learning of mathematics content. One intention, focusing on me (the teacher), was an intention to learn more about teaching and learning. However, as I explored these intentions, it became apparent that there was a unifying theme among even those intentions. The theme was that *there were **tensions** in my pedagogic **intentions** observable in my lived experiences*. So although I held these pedagogic intentions, observing how they influenced my teaching and learning and the students' learning brought to light some tensions that existed.

Part of the journey in this inquiry for me was to be a learner, alongside the students in my classroom. I believe this stance to be an integral part of the inquiry and personal journey of inquiring into teaching and learning. Revealing and discussing the tensions that were apparent in my pedagogic intentions has helped me make sense of my lived experiences in the classroom in four ways. First, it has helped me notice, consider, and articulate my intentions. Although many of my intentions were explicit, drawing out the theme helped me to notice which intentions I enacted more consistently and for whom (students or teacher) I had developed the intentions. Second, it has guided me to notice that my intentions are quite consonant with my beliefs and that my beliefs guide my intentions as I make pedagogic decisions and interact with my students. Third, even though my intentions correspond to my beliefs there are still tensions in intentions that were apparent in my lived experiences. This idea was not apparent to me as I began to

consider my intentions within the teacher's story, but became evident as I lived with and interacted with the learners in my classroom. Fourth, considering the tensions in intentions cause me to be more critical of my practice. As I think about my current practice, acknowledging and analyzing the tensions in intentions in this Consumer Mathematics class has helped me consider tensions I am experiencing now and why they are occurring.

I would like to return to the idea of drawing a significant theme from data. I believe that the theme of *tensions within my pedagogic intentions* is a significant theme for the teacher's story. The theme was *illuminative* because it highlighted several significant moments and also brought to the interpretation events that recurred throughout the narrative. It also helps bring to light the daily experiences in teaching Consumer Mathematics, providing a context in which the rest of the interpretation of data in this inquiry can be situated. The theme was *explicative* because it drew the events of the teacher's story together within a single structure. Connecting the events within a single structure allowed me to bring meaning to the events and understand why the event occurred. Thus, the theme was *interpretive*. Finally, the theme was *effective* because it drew out a message of meaning from the narrative, which used specific examples that could help me and the audience understand my lived experiences in this Consumer Mathematics classroom. I believe this theme is consistent with my lived experiences.

Although the intent in interpreting interim research texts is to bring meaning to the current inquiry, coming to understand the teacher's story served several other important purposes. In the inquiry design, the specific method I planned to employ was "parallel accounts" (Craig, 2000), which was a specific method of narrative inquiry that

provided opportunities for both the teacher's and the learners' voices to be heard. The teacher's story amplifies the voice of the teacher from inside the classroom, and the interpretation of this retelling brings the teacher's voice into the foreground in a study that was intended to be practitioner research. It is in listening to the voice of the teacher that we can begin to understand integral aspects of her decision making that fostered the success of these Consumer Mathematics learners. The theme of the teacher's story, *tensions in pedagogic intentions*, is not only effective in making sense of the teacher's lived experiences, but the examples used to illuminate the theme provide a view of what the daily classroom experiences were like. However, as the teacher's story and interpretation provides a framing and view of what daily classroom lived experiences were like, it will fade into the background for the remainder of this document. Although the teacher remains an integral part of the learners' stories of success, it is the success of the learners that we want to hear as we come to understand what it means to be successful in Senior 2 Consumer Mathematics.

Chapter 5

Images of Data

The narrative of the teacher's story faded into the background of the telling of this inquiry when the students were invited to engage in the inquiry as participants. As we proceed through the next chapters, there is less privilege given to the teacher's voice as my voice as the inquirer is brought to light. I am not attempting to separate the voice of teacher and inquirer as I describe my lived experiences and what I learned by listening to my students. However, I believe it is necessary to privilege different voices to make meaning of the data and to demonstrate the complexity and benefits of studying teaching and learning from inside the classroom. In order to guide this meaning-making process, I have a responsibility as an inquirer in the classroom to engage in *wakefulness* (Clandinin and Connelly, 2000), where the inquirer is aware of the inquiry context and uses data as a means of slipping "out of intimacy" (p. 82) in the inquiry context. In this study, and for myself as inquirer, that signifies a stepping aside from the pedagogical relationship to view the learners, our relations, our lived experiences, and myself in a manner that provides opportunities for analysis and interpretation.

This chapter will present pieces of learner-participant and teacher-inquirer data. The ordering of the presentation of data occurs in the sequence the data was collected, although the data collection process was cyclical. Field notes were a constant source of teacher-data throughout the semester, while interactive writing and portfolios were a constant source of learner-data throughout the semester. Learner narratives and our three

cycles of conversations focused on the first three sources of data. I have three purposes in presenting this data, without engaging in interpretation. First, it serves to familiarize the audience with the forms of data in the inquiry process as well as with the learners who participated in the inquiry. In later chapters, familiarity with the learner-participants and their data will support the understanding of complex ideas that arose from lived experiences in the classroom. Second, it provides the audience with an opportunity to experience hearing the absence of students' words in this inquiry, before we enter into an insightful interpretation of the meaning of this occurrence, which will take place in the subsequent chapter. Viewing this data will provide an opportunity to notice some of the limitations in the lack of student communication. Third, it provides the audience with a view of the data, as pieces in a showcase that can be appreciated but can also be thought provoking. As you interact with the data in this chapter, I hope you come to see the complexities of listening to absence and that it raises questions in your mind of significance to the inquiry and to the lived experiences of the learners and me.

Daily Field Notes and Weekly Reflections

Throughout the semester, I wrote daily field notes as a source of teacher-inquirer data. I wrote them every evening, recording the events of the class, usually in chronological order, including any phenomena that were significant to me. Included in the field notes were descriptions of conversations that I had with students or observations of students. (See Chapter 4 for more details.) As an inquirer, I found these daily field

notes were not only a record of the daily events in class, but also an opportunity to reflect on the meaning of the events and consider how they would contribute to my understanding of success. These daily field notes represented the initial telling of the lived experiences in the classroom. Each day's entry was approximately two pages in length (about 700 words). For the first two months of the semester I also wrote weekly reflections at the end of each week. I took that opportunity to read through the week's daily field notes and reflect on those lived experiences as a coherent whole. This involved interim interpretation of the data as I considered events that were significant or illuminative. Over the first two months, I found that I was already doing much of this primary interpretation in the daily field notes and decided to discontinue the weekly reflections because of their lack of effectiveness.

One interaction with Nadine that I recorded in my field notes became an important successful moment in Nadine's first narrative. Nadine arrived in our class about a month after school started, because she had moved to Manitoba from another province. In order to catch up on the topics she missed in September, she worked through a number of textbook assignments independently. Here is my recollection, in daily field notes, of an interaction with helping Nadine on one of the assignments.

> I arrived at school a little earlier today, and when I got to my room at the beginning of period 4, it was empty [usually another teacher was teaching in the room]. I started working at my desk and Nadine came in. She had been looking for me – she had had some trouble with a wages & salaries assignment on the weekend. It was the pay raise assignment – and the trouble came with working with percents. Converting a percent to a decimal value was no problem, and multiplying a value by a percent was okay. She did a few questions where she needed to figure out the dollar amount of the raise and new wage for a specific percent increase. Then she noticed the textbook was multiplying by 1.04 (we had been doing it in two steps). She inquired about it and I went through a little activity of multiplying by 100% and 4% and adding, with a couple of quick examples. She said that the number getting larger "didn't make sense". So, I

> provided a couple of examples for her to consider with percents under and over 100 and what 100% of a value means. She would not leave the idea alone until she said "Okay, that makes sense". She actually used the idea of "makes sense" a few times that afternoon. Then we looked at the other type of question, where the dollar value of the raise is given and you are asked to find the percent increase.

Notice Nadine's declaration when she felt comfortable with completing pay raise questions, that it "makes sense". She was pointing towards a cognitive process. However, absent in her declaration was how the questions made sense to her and why it was important that the questions make sense. A gap in the explication of her cognition, providing an explanation and interpretation of what made sense, existed in her response to being able to complete the questions.

Another absence can be seen in what she imputed was successful in the learning situation. Her declaration of "that makes sense" pointed towards the idea or question making sense (according to Weiner (1972), an attribution of success to an external, stable locus of control), which created a level of comfort for Nadine in completing the rest of the assignment. What Nadine does not say is that she understood the idea or that she knew how to complete the questions. Both of the absences in Nadine's statement would have effects on how she learned mathematics and her approach to learning mathematics. Being unaware of her own cognition would present difficulties in Nadine being analytical about her thinking in different mathematical contexts. As an inquirer, the absence of explication in Nadine's declaration of the idea making sense raised questions in my mind of what Nadine focused on learning in class (the ideas or learning about herself, her cognition, and her learning) and what she meant by the phrase "makes sense".

The lack of saying important ideas to me was not only absent in Nadine's words, as I recorded other events in my daily field notes throughout the rest of the semester. The

last unit in the course was Statistics and Probability. During this unit, students spent two consecutive days learning about and applying ratio-based reasoning in a statistical setting. In my daily field notes, I recorded interactions over the two days that I had with Susanne. The two interactions were similar and caused me to consider them more carefully. On the first day, during a capture-tag-recapture assignment, I wrote:

> I stopped to see if Susanne needed some help. She was starting the textbook questions, and I'm not sure if she had done the worksheet or not. At the time, I thought she had, but then just something Andrea mentioned afterwards made me think she hadn't. … Anyway, Susanne wasn't too sure how to set up the question. It just took a little prompting and she set the ratios up properly. Then I asked her if she was okay with the cross multiplying (because she had told me that's what she needed to do next) and she went through the steps orally for me.

The next day, I invited the students to engage in an exploration using a related concept to capture-tap recapture sampling. I recorded a description of setting up the activity and my interaction with Susanne in my daily field notes.

> Anyway, I had the students turn to the page in their textbooks and I briefly went through what they needed to do – showing them the different pages they needed to fill out and the coloured cards. I told them I wasn't going to explain many of the instructions, but that they could read it from the textbook. I let them get at the activity in pairs (instead of the groups of four that the textbook suggested).
>
> I filtered around the room to make sure students got started right away. As I walked around, there were at least three pairs that had no clue how to get started. The instructions were very well laid out in the textbook, I can only imagine that they didn't bother to read any of it, but rather asked me to mediate the instructions. That bothers me. And, it might be some indication of that received knower stance. Okay, that's not working as well as I thought it might. The textbook could be seen as an outside source of knowledge. Anyway, Andrea & Susanne, Erin & Cynthia, and another pair had no clue how to get started, so I started them off.

The gap in Susanne's communication is more difficult to notice than Nadine's absence of words. In both assignments, Susanne struggled to begin the assignment on her own. Instead of asking for help, she remained disengaged until the instructions were provided for her in a one-on-one context. Although Susanne is willing to interact with me, a space

in her communication exists in her lack of willingness to ask for help and inability to say what she does not know how to do or what she does not understand. Although this is not necessarily a clear example of gaps in words, it is an important example to see and consider as we notice different kinds of absences in the words students spoke.

As a teacher in this class, not only was I interested in individual learners, but I also thought about the class as a whole. Many of my daily reflections focused on individual learners and particular contexts, but the weekly reflections were an opportunity to think about the class in more general terms. Consider what I wrote at the end of the fourth week of classes.

> I just finished looking through the test reflection – which I respond to, so it is interactive writing with the students. I gave them the question "Tell me about the hardest question you did well on." and at the time I gave it to them, I realized right away that it was probably the wrong prompt to give this time and I didn't think I would learn much about the students (or the students would benefit from thinking about it). But, as I look through them, there is a good start. Hard = longest. Not hard = common sense. Couldn't remember, but then did. Studying = everything's easy. Not hard, not great mark = I rushed. I feel like there is so much to unpack here – even though most of them only wrote one sentence. So what I decided to do was ask each of them a more personal, directive prompt and on Monday I'm going to have them write two to three more sentences. It will help me and them unpack some of the words they used and it will help them direct their thinking a little more.

This reflection was my reaction to the first test reflection of the year. As I considered the class's response as a whole, I began to develop some equivalences in the writing. But the absence of students' words becomes more apparent (but certainly not obvious) in the few words they authored, and the lack of analytical thought in terms of metalearning (thinking about their learning) and metacognition. Although the students had written something in response to the prompt (which provided ideas for me to think about), there was much that they had not said. As a teacher, my response was to provide a further personal prompt to

clarify, but many of the students' second responses still contained large gaps in their thinking and writing.

The absence of students' words was difficult to identify in the daily field notes and weekly reflections. I did not write explicitly about these absences, so they needed to be identified in what I did not author. As you will come to notice, in seeing the words of students in a variety of data types in this chapter, the absence of words was a common occurrence in much of the data that I collected from the learner-participants. This led me to wonder why I had not recorded that more explicitly in my daily field notes. One explanation could be related to the focus of the inquiry itself. Although I attempted to write indiscriminately about the events of the class, it is also important to remember that the focus of this inquiry is on the success of learners, not the moments when they used few words to communicate their ideas or thoughts. Another explanation is that I did not notice the students' spaces between words at the time I was collecting the data and living with the students in the pedagogical context. Rather, I looked at what was there and attempted to respond to the things that were present in the text or interactions. It was only in an inquirer stance, as I was further removed from the pedagogical relationship, that I was able to notice the absence of words. It was challenging to see the absence of words, a challenge that arose as I collected, read, and interpreted other forms of data throughout the inquiry.

Interactive Writing

Students engaged in interactive writing throughout the entire semester, completing the writing during class time. The interactive writing combined two different elements in the course, journal writing and reflections on tests. The eleven journal prompts pointed towards issues of studenting (how the students enacted a student-role in the course, for example, goal setting), the nature of mathematics, and describing mathematical thinking. The six test reflection prompts pointed towards preparation for tests or describing mathematical thinking for a specific test question. (See Appendix A for the interactive writing prompts.) The interactive writing became an important component of the data collection because students felt it was a safe process where they could share their thoughts about mathematics, learning, and thinking in Consumer Mathematics. As a data collection device, the interactive writing was beneficial because it captured the silence of students in what they wrote (and did not write) and it was a way in which I could grasp the minds (van Manen, 1977) of the students.

In Whitney's fourth journal of the year, she was asked to describe how the Pythagorean Theorem came to be. I had provided the class with some interesting possibilities to consider as they sculpted their story. Whitney wrote:

> I think that $a^2 + b^2 = c^2$ or Pythagorean Theorum was really invented by one of Pythagoras' followers. I think that with all the teaching Pythagoras' had presented to his followers, it gave them a lot of knowledge, to use in everyday life. Since it was a long time ago, a lot of men spent there time building and drawing blue prints. And one of them, may have come across this formula when drawing a right angle triangle. So he had the formula and he didn't know what it should be called. But as a tribute to his mentor Pythagoras, he named it the Pythagorean Theorum, because the basis of his learning was taught to him by Pythagoras (?) (I dunno)

Notice the position of Whitney towards the dissemination of mathematical knowledge, that knowledge is *presented* and *given*, as she wrote about the interrelatedness of Pythagoras, his followers and mathematical knowledge. Perhaps this points towards her understanding of how she learns mathematics. Even though Whitney provides a situation, "drawing a right angle triangle", to describe how Pythagoras' follower had "come across this formula", she left a large gap in her explanation of the creation of the Pythagorean Theorem. This gap is even more apparent in her final comment, "I dunno". This gap demonstrates the kind of data that students provided, saying just a little and leaving many things unsaid.

As an inquirer, I was left asking questions about what Whitney had written: what did Whitney want to communicate through her final comment? What could I have learned about Whitney as a mathematics learner if there was a more thorough explanation? This gap in Whitney's writing also affected her as a mathematics learner, creating a level of frustration for me in what was not present in the words for Whitney as a mathematics learner. Her distrust of her imagination or thoughts about the nature of mathematics and interest in having the *correct* answer told to her, limited her opportunities to personally and interpersonally construct mathematical knowledge.

Daniel's response to the same journal prompt differed in length, demonstrating a similar space between words that created complications in my sense-making of the data. He stated, "Not to sure where the theory came together." Even with further encouragement, he did not provide a longer response. Although Daniel's words communicated that he did not have *the* answer to describe the origin of the Pythagorean Theorem, using his journal as a source of data was extremely limiting in what he did not

write because he said so little. It also signified a limitation in Daniel's mathematical learning, as he did not engage in taking an authorial stance in order to engage in some of the learning opportunities.

Daniel also responded to a variety of test reflection prompts. Earlier in the semester, in response to the test 1 reflection prompt "Tell me about the hardest question you did well on.", our interactive writing consisted of a number of exchanges (*D:* represents Daniel's writing; *J:* represents my writing):

> D: Number six, found it difficult but remember basic stuff to finish it.
> J: Dan, That was one type of question we worked on together! How did you remember how to do it? Did it help completing the assignment from p. 26 again?
> D: It did help on the assignment, but don't know how I remembered it.
> J: I am glad to hear that giving the assignment another try was helpful. I am always available after school if you have a few questions to work on. Mrs. McFeetors

I was inviting Daniel to engage in thinking about his mathematical thinking and learning. Although it might seem that there was a mismatch in questions and response, I purposefully crafted prompts that allowed students to choose what they felt was necessary to tell me to affect their learning and our pedagogical relationship. Here, Daniel made a decision to write in general about technical issues, rather than describing his thinking. He points towards *remembering* in order to complete a difficult test question, using the word somewhat strategically. However, even after I prompted further thought about the cognitive process of remembering, Daniel offered no further explanation. An absence of words can be seen in Daniel's writing. As an inquirer, a limitation existed in what I could take from Daniel's words to make sense of his writing and cognition. I wondered why Daniel had not said more about remembering, and posed questions such as: did Daniel have something to say about remembering, but did not

know how to say it? Was there a lack of critical and metacognitive thinking that Daniel did not engage in? If so, an inability to express his metacognitive thinking would not support a successful stance.

As I used the data from interactive writings to "slip out of intimacy" (Clandinin & Connelly, 2000, p. 82) of the pedagogical relationship, I came to see the spaces between the words that students like Daniel and Whitney were authoring. Seeing these gaps came as I began interpreting the data. The absence of words occurred within a variety of contexts, rather than with specific types of interactive writing prompts, demonstrating a difficulty for students to take an authorial stance and support their words or ideas in (m)any contexts. The difficulty that the students were experiencing was not only affecting their mathematical learning, but it also created difficulties in collecting data that would be useful in thinking about and listening to students in order to make sense of their success. As I considered the writing contexts and the students' writing, the absence of words in describing specifically or thinking critically about mathematics and learning was becoming visible to me. Although the next chapter will explore the meaning of this absence, there needs to be a recognition of the frustration of collecting data that was so limited.

Portfolios

In the unit and semester portfolios, students reflected on their learning and thinking in specific and general ways through selection of and reflection on items they

chose to include. After the first portfolios were submitted, I decided to provide specific instructions for writing the item reflections, while still maintaining enough space for learners to write what they believed was important for me to hear. (See Appendix B for more detailed guidelines.) I collected portfolios for the following units: Wages and Salaries, Trigonometry, Spatial Geometry, and Consumer Decisions & Geometry. The last two units of the year did not have portfolios because of their brevity and proximity to the end of semester and semester portfolio. The semester portfolio was an opportunity for students to reflect on the semester as a whole, following similar guidelines as the unit portfolios (with the except of including six items of the learners' choice). Similar to interactive writing, portfolios were a source of data that allowed me to grasp the minds of the students, and consider the students' noticing and articulating of their learning.

The overview reflections were a piece that students could choose what they felt was important to say to me and to themselves. In Karl's first overview reflection for Wages and Salaries, he stated:

> Overall evaluation/overview reflection
> My overview of this unite was that it was useful to help me in my future job/jobs.
> This unite was not very difficult for me to do because I studied it every day.
> I think that overall I did good on this unite my test scores were up there and I did well on all other assignments to.

Even though Karl was encouraged to write about his learning in the unit and how that learning occurred, he decided to briefly define how he was successful, providing minimum thought and writing marginally within the expectations for the reflections. This definition of success was based primarily on receiving marks, an external indicator of progress, yet Karl relied on me, as teacher, to define his successful moments rather than generating his own internally-defined criteria for success in mathematics class. This

reliance on the teacher would not contribute to Karl's meaningful learning about himself as a student and learner. He does point towards the studying that he did daily, but does not describe the process or what necessarily contributed to his good marks. In this absence of words, it was difficult to see what Karl believed was valuable in his studying process and what Karl believed was the nature of mathematics.

As Karl pointed out at the beginning of the overview reflection, his ease with the unit's content came from his daily study habits. Although Karl began to engage in thought about the reason for his success, it still demonstrates report-based writing, rather than an exploration of the reasons for his success. This characterization of report-based writing comes from Karl's ability to make general statements, but lack of interpretation of his learning and cognitive processes. Observing some of Karl's item reflections in the same portfolio also provided evidence for this lack of emphasis on thoughtful reflection. For a spreadsheet assignment, he wrote, "This worksheet is about working with spreadsheets. It shows my ability to work very well with others. The process I used was using technology." Karl states that he believes mathematics class is about working, but left me wondering, as an inquirer, what else Karl believed mathematics class was about (if anything). The absence of reflective thought made understanding what Karl was thinking a frustrating process. As well, a lack of thoughtful reflection affected Karl as a mathematics learner – if he could not recognize retrospectively how success occurred, it would be difficult to cause success to occur again.

Roger's first portfolio contained all the necessary mathematical task items, with brief reflections, but was missing an overview reflection. The following collection of

reflections came from his thoughts on including specific items, with the type of item following in parentheses.

Item 1: This project I learned how to make my communication skilled strong because we had to go in front of the class. (Manitoba Labour Board group presentation/poster)

Item 2: This assignment made me you's my technology skill on the computer. (Spreadsheet assignment)

Item 3: This test was one of my best and I thought it went well and I had a lot of fun working on it. (Test 1)

Item 4: This assignment impoved my learning by make me have to work had and not loose focus because there was so many question. (Gross pay textbook assignment)

Item 5: I project made me learn more about the technology of the computer because we had to put so many foomla in. (Spreadsheet assignment)

Test 2: This test improved my learning by make me have to study hard for next test.

Roger, I came to recognize during the semester, put little effort and thought into what he wrote. The item reflections are brief and at best contain very general and broad statements. For example, notice in Item 4, how Roger attributes his studenting habits to learning rather than describing his cognitive processes. This made it difficult to listen to his cognitive processes and left me to wonder if his brevity in reflecting on his learning and mathematical thinking was affected by his lack of ability in authoring statements about his thinking or whether it was affected by his lack of power to affect his learning.

One issue to consider with the portfolios is the proportion with which the students in the class completed their portfolios. The first unit, Wages and Salaries, was the only unit in which all the students handed in a portfolio, and that was due to the proximity of marks being reported on the first report card. For subsequent units, many of the students

often did not hand in a portfolio. And, as we saw in Roger's example, integral parts of the portfolio were often missing, or quickly written with little thought. At the end of the semester, all but one student handed in a final portfolio. This highlighted another challenge of collecting data from learner-participants, in that many times students did not generate the data when invited to do so. It affected my flow of data pieces and the students' learning. Lack of completion of a portfolio demonstrated not only a loss of marks (which concerned the students), but to me demonstrated a missed opportunity to be thoughtful about their learning, studenting, and themselves. This looking back could have contributed to their emerging success as mathematics learners.

Noticing the gaps in the students' writing (and thinking) came primarily from the overview and item reflections in the portfolios. Although they functioned in a similar data-manner as interactive writing, I had intended for portfolios to contain a more direct focus on student learning as a process. The students had greater control over the decision-making of what they would include in the portfolios, which I believe contributed to the limited communication. While some students, like Karl, pointed towards important learning and metacognitive ideas in their writing, explication and interpretation of the claims was lacking. It would have been in the students' descriptions that I could have understood the students' thinking and success more effectively. However, as an inquirer, I still recognized the benefit of listening to the students through the complexity of issues surrounding their absence of words.

Student Narratives

At three different points during the semester, I sat down with the data I had collected in the form of field notes, interactive writing, portfolios, and conversation transcripts to begin an initial interpretation of the data. This coincides with Clandinin and Connelly's (2000) conception that interpretation of data is an ongoing process throughout the inquiry. With the data, and some of my thoughts that emerged from reading and examining the data, I authored a narrative for each of the learners. Each narrative focused on the successes of a learner that I had noticed up until that time in the semester and formed the narrative of a learner. As outlined in Chapter 3, I had made some preliminary decisions on how I would author the narratives. As I sat down to author the narratives, I found the decisions I had made before the start of the inquiry to be broad, and not necessarily a process that fit with the pedagogical relationship I had forged with each learner. Consequently, I re-formed the narratives so that they would highlight the successful moments that I had observed.

The first narrative was two to three paragraphs in length, each paragraph highlighting a moment of success, posing questions of interest for both the student and me. The writing flowed between the telling of the moments and interpreting the moments much more freely than I had anticipated. As well, after each narrative was authored, I created a list of prompts for each paragraph as a starting place for the conversations. The second narrative was three to four paragraphs in length, the first paragraph stating a theme of success, the middle paragraphs illuminating specific instances to support the theme, and the last paragraph considering how students could

build on their current successes for the remainder of the semester. The third narrative ranged from four to eight paragraphs in length. I had refined the theme for the story of the learner's success (for some students building on the theme from the second narrative, for others drawing out a new theme in light of more data) and again used specific examples throughout as a way for the learners and I to come to understand their success. The final paragraph pointed towards their learning and success in future mathematics classes. (See Appendix D for one complete set of narratives, as an example.)

The process I used in writing the narratives was similar for all three narrative accounts. I would read carefully through all of the learner-participant data, including interactive writings and portfolios, making brief notes on what I read and beginning to think about the meaning of the moments. Although I was attempting to get a general sense of the data, I was already looking for exemplars to use in the narratives as I examined the data. I would then move to the field notes, searching on my computer for each day that I had mentioned that particular learner and made brief notes on those lived experiences. Nearing the end of this process was when I would often start sketching out some ideas for the theme of the success I had noticed, finding how some of the salient examples that seemed to be significant would form a more coherent whole. For the second and third narratives, I also spent considerable time with the transcripts from the previous conversation, making notes and considering the meaning of learners' comments. After sketching a brief outline of what I would write, I wrote the learners' narratives.

The second narrative I authored to share with Andrea focused on her use of words in the classroom. It shares, implicitly, the limitation of Andrea's stance in her journey as a mathematics learner and the effect of that on data collection and interpretation.

Andrea's Story: Using Words to Tell

We take lots of opportunities to interact, or talk with each other, in our math class. There are different reasons why we talk to each other, but interacting with each other means we need to use words to communicate. Our words help us tell each other what we don't understand and that we need some help, what we do understand, and how to do certain questions. One of the ways that you have been successful in math class up till now was to listen carefully to the explanations that I give or your table partners give. When you didn't listen as well, like for similar triangles, practicing the questions was more difficult. But you find that when others tell you ideas, you know what to write down. In our last conversation, you demonstrated to me a couple of different ways that you use words to talk with others.

One strategy that helps you be successful, that you have continued to use, is asking classmates or me for help when you don't understand. In our last conversation, you mentioned several times that others help by telling you what to do when you are stuck. One day, you and Whitney were working on the painted cube question, trying to figure out how many sides were painted. You asked Whitney for help in describing which of the three sides of the cube should be painted. You used some of her words to answer the question. Another example is when we did scale factor and measurements with fractal cards. I noticed that you were asking another classmate for help because you had missed the first class. I'd like to hear more about the words you and your classmate said to each other that day. Listening to others' explanations made me wonder if their explanations help you do the question you are working on, or if listening to them helps you understand the math idea.

Another way I have noticed you use words is to answer questions in class. You are often willing to volunteer answers in class when we are going over an assignment. Most of the time, it happens after you and I have had an opportunity to work on some questions together. One example is looking at food labels and working with the recommended daily intake. You explained really well to the class that you would need to eat 10 servings of cereal to receive the recommended daily intake of a vitamin because there is 10% of it in one serving. Another example was the definition of perimeter, when you told the class perimeter is just the distance around. When you answered in class, I used your words to make the notes for the rest of the class. I'm wondering if these are examples, for you, of times when you had a good math idea that you thought others should hear as well. It also makes me wonder whether putting the math ideas in your own words is what makes the ideas important to share.

I would like to think more about how explaining things in your own words could help you be more successful in math class. When I think about explaining things, it means more than just telling me your thinking when you are confused and want some help. And, it means something more than resaying other people's words. I know that you do some good thinking in math class, Andrea, and it makes me wonder if you could use your words to tell me when you are doing some good thinking. I wonder what value there would be for you to tell me some

> of the good thinking you've been doing in your portfolios. I'm wondering if noticing and explaining good thinking will help you be more successful in math class.

By this time in the semester, Andrea was beginning to use words in a variety of contexts for different purposes. The second paragraph points towards Andrea's use of words to tell others what she was doing incorrectly as a means of asking for help. What Andrea was not saying to others was what she could do or what she did understand. Rather, she left openings in her communication to engender others to *tell*, with her role then being to *listen* to others' words, instead of *authoring* her own words for mathematical ideas. This lack of authorship extends to the examples presented in the third paragraph, where Andrea was being vocal in whole class situations (a sign of growth for her from the beginning of the semester), but only to tell mathematical ideas that she believed were owned by the teacher.

Andrea's absence of words in her communication, however, made it difficult to ascertain why those absences existed or what they meant. Was it that Andrea did not have ideas to communicate? Was it that Andrea did not know how to communicate, or use words to tell her ideas, affect her self-identity, and affect her relationships with others? Was it that Andrea did not perceive value in her words or her ideas enough to share them with others? As an inquirer, I wanted to explore these questions but found it challenging with Andrea's incomplete use of words. Notice that the final paragraph in the narrative suggests to Andrea to do more than re-saying other's words as a way to build on her current successes. This prompt was meant to guide Andrea to talk about her use of words in mathematics class.

The manner in which Terri used words to share her thoughts with me also formed a segment of her first narrative that demonstrated a gap in communication. This paragraph focuses on Terri's writing in her first portfolio of the year.

> One of the big ideas that comes out of your wages and salaries portfolio is the idea of improving over a unit. You included two specific items that demonstrated improvement – the textbook assignment on calculating gross pay and then test 1 (which had similar questions). I think including those two pieces to show improvement is important, but I'd like to think more about what happens in between. It made me wonder about how you improved, what helped you get better. You mentioned on several item reflections that they demonstrated that you *understood* by the end of the unit. It also made me think about using the word *improving* instead of the word *learning*. I wonder if they mean the same thing, or if one happens first (and partially) and then the other. Or, perhaps it's about *just knowing* and then *understanding*. I'm not sure, and I'd like to hear what you think about it – the words improving and understanding are yours after all. I wonder if the same improvement happened in the trig unit, so that you understood trig by the end of the unit.

Terri had certainly noticed an improvement in her completion of questions in the Wages and Salaries unit. Although she attributed her success to *improving*, like Karl, a lack of explication in qualifying what it meant to improve and how she had improved over the unit demonstrated an absence of authorship, both of words and ideas. As an inquirer, I believed it was important to explore this aspect of the writing with Terri in our conversation. As I considered Terri's portfolio and authored this narrative, I also wondered if Terri was using *improving* and *understanding* as words to make distinctions in her mathematical learning. The limitation of the data did not allow me to notice whether Terri was being rigorous in her writing by attempting to make distinctions between cognitive processes. I wondered about Terri's intentionality in her writing because it was not clear from the words she did not write.

The purpose of the learners' narratives was to highlight successful moments and then to use a significant theme (particular to each learner) to draw those successful

moments together. With this focus, even as I had significant limitations in students' writing and interactions in class, seeing the limitations was a stance that I wanted to, at best, acknowledge with the students and move towards specific examples of success. However, this was a challenging process because of the little the students had said in their interactive writing and portfolios. Notice in Andrea's narrative that many of the successful moments that I highlighted focused on my observations or interactions with her in class. This came from the lack of interactive writings and portfolios Andrea handed in, which meant that I needed to rely on other forms of data to author a narrative. Although Terri had handed in more interactive writings and portfolios, I still faced a similar challenge as I saw the absence of words and ideas in her writing, places where she had used a word or phrase, but did not support or interpret it's use in the context of her learning or cognition. I developed a focus with the narratives on what the learners had said and invited them to say more about the examples – to fill in the absence of words and ideas that I had noticed in my data analysis and authoring of the narratives.

Conversations and Reflections

The narratives I authored for each learner formed the piece that the learners and I focused on during the three conversation times we had over the semester. The first conversation cycle took place during the day on November 6-8, 2002. I scheduled the students in 15-minute slots, with the actual conversations ranging from 10 to 20 minutes. Because the conversations were a new part of my instructional process, I invited the

whole class to participate and almost all of the students did for the first conversation (for conversation cycles two and three, primarily only the learner-participants attended, even though the invitation was again open to all). I used a small office at the school and tape-recorded all the conversations. I attempted to take notes during the conversation, but quickly abandoned that because it made the process feel inauthentic as a conversation space. At the beginning of the conversation, I provided the narrative to the student and I read it out loud to them a paragraph at a time. After I read each paragraph, I asked the learners to respond to any questions I had posed or to respond to the help I had solicited from them in understanding their story of success. Near the end of the conversation, I usually asked the learners if they had anything else to add to what we had talked about, and most declined. After the tape recorder was turned off, the students often breathed a little sigh of relief. I asked many about their expectations of the conversation and they indicated they had little idea how it would go; however, many of them responded favourably to the process.

The second conversation cycle occurred during January 8-13, with 30-minute conversation slots. The conversations ranged from 20 to 30 minutes in length. For the second conversation, I gave the learners their narrative the day before the conversation was to occur. I opened this conversation by asking the learners to describe their perception of the semester. We moved into the narratives, and this time I had the learners choose the paragraph they wished to start with (rather than reading to them) and asked them to describe some of the ideas that they found important in the paragraph. Similar to the first conversation, I had also prepared a list of prompts for each paragraph. We ended

the conversation by talking about what the last few weeks of the semester would look like for their learning in mathematics class along with their studying for the final exam.

The third conversation cycle occurred after the end of the semester, during February 25-March 5. The conversations were scheduled in class period slots, to provide ample time for the conversation. The conversations ranged in length from 30 to 50 minutes. Many of the students forgot about their conversation time, and I found that I needed to reschedule almost half of the conversations. Again, I provided the narrative to the students a day before the conversation was scheduled to occur, and read the narrative, paragraph by paragraph to the learners during the conversation. I began the conversation by having the learners describe, retrospectively, their semester in mathematics class including their learning and success. After moving through the narrative (similar process to previous conversations), I concluded the conversation by engaging the learners in a dialogue about what their next mathematics course would look like and how they would continue to build on the success we had noticed together.

[Note: There will be multiple excerpts in this document from the conversations between the learner-participants and me. The following codes have been used:

J:	The speaker is Janelle, the teacher. All other capital letters are the first initial of the learner-participants' names.
{}	Transcriber's comment on unspoken sound from speaker.
***	Inaudible or unclear words on the tape.
[]	Interjection by the other speaker in the conversation.

These codes are used consistently through the rest of the document.]

In the first conversation Lindsey and I had, we talked about asking for help as one of Lindsey's successes. It was not a strategy Lindsey had used from the beginning of the semester, so we talked about what it means to ask others (peers and teacher) for help.

J: Does having a learning partner like Whitney or Andrea or Erin make it easier to ask for help?
L: Yes.
J: How come?
L: {pause} I don't know. Just because I like to ask kids my, my friends or something, first, before I ask the teacher. It kind of makes it easier on me.
***
...
J: Is it easier to ask a peer, like somebody sitting beside you, for help than the teacher?
L: Well, sometimes. Because, because they're right there and so your hand up and ask. But it's kind of better when you ask a teacher because they know. Like, exactly what you're talking about and stuff.
...
J: Can you describe that a little more?
L: Umm. {pause} 'Cause I'll ask Erin for help and she'll give me the help I need.

Lindsey's initial response to my question about having a learning partner was quite limited, but as I prompted further she provides little explanation about the benefits of asking a table partner till she trails off into inaudible speech. There is an absence of not only words, but ideas as Lindsey talks about asking others for help. At first, she indicates a preference for asking her peers and a few moments later, a preference for asking the teacher. As an inquirer, I wondered if Lindsey privileged one form of help over another, and the reason why she might do that. Although Lindsey was exploring different options to receive help from others, her view of help, as a mathematics learner, demonstrated wanting to be told the answer, rather than entering into a conversation of mutuality with another. This absence of learning-intention had an impact on the way Lindsey learned. It was difficult to listen to Lindsey in the absence of many words, but it was just as difficult

to notice the absence of her words. It was not until the third conversation that I felt Lindsey began answering questions with more than just affirmative responses.

Asking for help was something that had become important to Lindsey during the beginning of the semester. The conversations with learners often turned to issues of mathematics learning and studenting that were of importance to them. I noticed what issues were of concern to learners as I interacted with them in the classroom. Just as I had noticed Lindsey's focus of asking for help, I had come to notice that Cynthia placed high value on marks in mathematics class. In fact, Cynthia had communicated directly to me several times in class that marks were something that were of value to her. I thought it was an important topic to pursue during our first conversation, so I asked Cynthia about what marks communicated about her. Here is an excerpt from our conversation:

J: What do you think marks tell you about yourself?
C: Well, because ***, it's, they're very, they're very, they're pressure.
J: Okay.
C: Yeah. 'Cause they say if you're smart and if you understand it and stuff. And it kind of dictates what people think about you. Kind of. [Okay.] Actually, 'cause if people, I always had my marks, and people, even my mom thinks, I'm because sometimes I'm not good, and then, well people will think bad about me. [Okay.] And that's pretty important.
J: Okay. That was kind of my next question. What do marks tell others about you. And you kind of answered that. What kind of specific other people would you think about besides mom and dad?
C: Umm, my friends. 'Cause, well they get really good marks all the time, and that's a lot of pressure, to try and be good and so my mom will be happy and my friends {pause} think good about me and stuff. It's important.
J: What do you think your marks tell me about you?
C: That I listen {little laugh} in class and try and stuff. 'Cause in lots of other classes, I try. It's just that I don't exactly understand and stuff. And then the teachers don't think that I'm trying or I don't do it. I try, it's just that I'm not good at math or the other classes.
J: Mm, hmm. So, for your friends, it shows them, again, what?
C: That I'm a good, I'm good at stuff. And I'm not dumb. {little laugh}
J: Okay. You're good at stuff like? Like school stuff? Like academic?
C: Yeah. Yeah.
J: And for me, it shows me that you listen and you try really hard.

C: Yep.
J: Neat. What is it about good marks that makes them desirable for you? That makes you want to get them?
C: {pause} Hmmm?
J: What is it about marks, good marks, that makes them desirable for you? Why would you want to get good marks?
C: Well, because it makes you feel good. [Okay.] And it makes other people think about you in a positive way. {pause} Yep.

As part of the data collection process surrounding the conversations, I would go home every evening and write about the conversation that had occurred during the day. It highlighted some of the moments that were most prominent in my memory, and as a way to reflect on what the learners had said to me. After Cynthia's conversation, I wrote:

> Cynthia was really nervous before I turned the tape on. … There were a few times where I think she might have forgotten that we were taping the conversation. (As a researcher (I think), I'm glad that I'm doing several cycles of conversations. The students will know what to expect next time and I think will be a little more comfortable. It might even flow better than this time. It also gives me an opportunity to try again and think about improving the way I ask questions, the way I listen to the students, and the way I direct the conversation.) Just once or twice she stumbled over her words and was really apologetic (at least in her face, if it doesn't show up on the tape in the form of words). She wanted to answer the questions correctly – give me the answers I was looking for and maybe even the answers that would help me. … The marks conversation really went well with Cynthia. … She was thoughtful about it, and came back lots to friends.

Cynthia actually said quite a bit about what marks indicated to others about her. As in many others pieces of data, the absence of words is more difficult to notice. Consider together Cynthia's phrases like "kind of", "yep", repeated ideas, and my observation of apologetic look. Parallel to her idea of marks being pressure, she indicated a similar belief about the conversations. They were a source of tension for her (she sometimes uttered the word "pressure" under her voice when she did not know how to respond to a question) and she wanted to answer the questions correctly, to give me the answers she thought I wanted. The absence of explanations, demonstrated through Cynthia's desire to

answer the questions correctly, made it difficult to ascertain what Cynthia believed about her mathematical learning and thinking. As an inquirer, this became a source of frustration, in that I believed that she was the author of the answers to the questions, not merely trying to guess what I might think. This also had implications for Cynthia's mathematical learning, in only being willing to accept ideas from an authority figure.

Even though I had added the conversations as an instructional process in the course and believed it was a valuable part of building a pedagogical relationship, it was during the conversations that I felt most like an inquirer as I probed and prompted the students to talk about their lived experiences and success in Consumer Mathematics. It gave me opportunities to ask clarifying questions about learners' limited responses, which was not available to me in interactive writings and portfolios. It was during these conversations that I was able to see and hear the difficulty students had in talking about their learning and their thinking. The absence of words was sometimes audible in the pauses and "I don't know's", but I was also challenged to see it in the tape transcripts and reflections that I wrote.

Seeing the Flow of Data with Erin

I would like to provide one more set of examples. These examples demonstrate the flow of data, as I collected it, wondered about it, began to interpret it, played it back to the student, and was in discourse with the learner about it. This example follows one

strand that I first noticed in one of my classroom interactions with Erin. In my November 26th field notes, I recorded:

> I was helping Erin and Karl at one point in the class. Erin was asking a question, and got a little frustrated when I backed up and started asking a few other questions. I think she felt like it had nothing to do with what she was doing. It did, but I guess she didn't quite see where I was going.

This interaction occurred as I responded to Erin's request for help in noticing a pattern with the number of ridges on a fractal card. Rather than providing an answer, I decided to ask guiding questions so Erin could engage in noticing the pattern herself. The next day in class, Erin and I wrote about the fractal cards in her eighth journal, where she began by saying,

> E: The patterns were mathematical because you had to use math to figure out what exactly the pattern was.
> J: Erin, I like the idea of the patterns being the mathematical part. But, you also identified the finding of the patterns as being mathematical. Mrs. McFeetors

Erin engaged in communicating, within the specific example, what she believed mathematics was about, especially in the words *exactly* and *pattern*. She did not report our interaction, nor did she write anything about the thinking that she had engaged in or the pattern she had noticed the previous class. Her writing caused me to wonder what the absence of the contextualizing of the mathematical task was communicating to me. I struggled, as an inquirer, to come to understand how the mathematical task had affected Erin's view of learning mathematics. In the absence of more description, I was challenged to make meaning of what Erin had said.

Just over a month later, when I was preparing for the second cycle of conversations, that interaction with Erin surfaced as a significant moment of interaction

as well as a situation Erin and I could talk about to understand her success in mathematics class. As I began to interpret the interaction, I wrote in Erin's second narrative,

> Sometimes I have noticed that you would like me to just tell you how to do a question. I remember you demonstrating some frustration when working on fractal cards, the first time. When you called me over to help, I decided to guide you through the process instead of giving you the exact steps. I'm not sure how this fits in with you making your own tricks, and I'd like to hear more about it from you.

The previous paragraphs in Erin's narrative had focused on her metacognitive awareness when completing mathematics assignments that involved practicing questions to develop skills. She called this ability *making tricks* (see Appendix D for Erin's narratives). However, as this segment of narrative indicates, Erin demonstrated (but did not say) a desire to be *told* what to do in our interaction. Erin was unable to communicate verbally her frustration to me during our interaction in class, or why she was frustrated. As an inquirer, I felt analyzing this data was challenging, so I decided to ask Erin about it.

As I presented this piece of Erin's story to her during our conversation, our discourse about that situation was as follows,

J: What about answering questions about the fractal cards?
M: Hard.
J: Yeah?
M: Mm, hmm.
J: Tough questions?
M: Mm, hmm. ***
J: So, tell me about that idea of you getting a little frustrated when I don't tell you exactly what the steps are and you have to figure out some of the steps on your own.
M: I couldn't figure that stuff out. I didn't understand how you'd yet, like, you'd say "Well, stage 6, how do you get to stage 50, or something." I don't know. I don't know how to do that.
J: Okay. Umm, how does that fit in with making your own tricks? Is that a point where you decide? {pause}
M: I didn't understand ***
J: You didn't understand, so you couldn't. So to make your tricks, then, do you have to know a little bit about the topic first?

M: Mm, hmm.
...
J: Why do you get frustrated when I help you through a problem, rather than telling you the answer right away?
M: When I have a question? [Yeah.] {little laugh} 'Cause I've probably been working for a while and I'm frustrated with the question already.
J: Okay, so you really give it a try before you put up your hand or call me over?
M: Yep.
J: So at that point you want the exact steps to follow?
M: Yeah.
J: If I gave you the exact steps, and then you practiced a bunch more questions, would you think about figuring out your own trick?
M: {pause} If there was one, yeah. I try sometimes.

Even within the prompts, which were sometimes quite directive, Erin said very little about the source of her frustration. There were two distinct ways in which Erin's absence of words could be viewed in this transcript excerpt. First, notice that Erin often used the phrase "I don't know" in her response to my prompts and sometimes even after she had offered a response. It was frustrating to me as an inquirer that Erin's absence of words impeded the flow of discourse. Second, notice that when Erin was making a statement that was important or about her and her learning, she trailed off and spoke so quietly that it was almost inaudible. Inaudible moments occurred frequently in the conversations I had with Erin. As an inquirer, it was frustrating and difficult for me to learn about and understand Erin within those spaces between her words about herself, mathematics, and mathematics class. Her lack of vocalization was challenging, both in written words and verbally in conversations, throughout the inquiry.

The pieces of Erin's data that I have presented in this section demonstrate a flow and unity that occurred with many of the learners' lived experiences, the data collected, and the interim interpretation process I engaged in as I thought about the data. As I authored my field notes in the evening of the class when the students were exploring the

fractal cards, the quality of the interaction with Erin was something that I felt was important to look back on. Through the journal, the following day, I had opportunity to think further about what Erin was thinking mathematically about the fractal activity, even within her frustration. The absence of her words, both in our interaction and in the journal caused me to wonder about Erin's approach to learning mathematics. I considered both of these primary pieces of data as I attempted to create the second narrative; it was not an easy process to write about Erin's successful moments in mathematics class when the spaces between her words existed in many data pieces. With the little Erin did say, I was challenged to initiate a conversation and to come to understand what Erin believed about mathematics, mathematical thinking, learning, herself, and her success.

Seeing Absence in Student Words

Each of the examples that were presented in this chapter has some commonalities, within the variety of data types and the variety of ideas that the learners talked about in writing or conversations. In each, it can be seen that the learners did respond fully to the prompts that were posed for their consideration. They were not non-implementers in their stance, which is of importance to note. Each learner tried, some with more effort than others, to respond to the prompts in a genuine manner. However, their responses often contain less than more, characterized by *gaps in communication*, *absence of words*, or *space between the words* that were authored. These three phrases are meant to point

towards what the learners did not say in their words. There are two difficulties that arose because of the absence of words. The first difficulty was in noticing the space between the words. As I lived in pedagogical relationship with these students, I focused on what they did say and interacted with the words and ideas they did author. It was not until I had opportunities to distance myself and see the learners' products as data that I began to see the absence of words. In order for me to see the space, it required a retrospective look at the data.

The second difficulty was in listening to the students, despite the gaps that existed in their words and statements. To hear what the students were not saying to me was a challenge. In several of the examples, including Nadine, Daniel, and Terri, students used key words or phrases to describe an object about which they were talking. But their words ended with the usage of the word, rather than explicating why they were using it or what the word meant. Whitney and Erin had similar stances, except their initial statement was more general, and they did not provide clarification afterwards. Susanne, Andrea, and Lindsey were each in discourse about asking others for help and their use of words to affect their learning and relationships. There was absence of words demonstrated in the few ideas these students offered in their words as well as their stance that words and ideas should be given to them from a source of authority. Karl and Roger pointed towards metalearning and metacognition, respectively, in their dialogue, but made general statements about their learning and thinking that created spaces between many of their words and phrases. In each of these examples, even though the students did respond, their words left large gaps for me to hear what they were thinking and saying.

I view the absence of words in what the learners authored as creating two limitations. The first limitation existed within the classroom context. As mathematics learners, the students struggled to say things about their learning and about their thinking. I believe that this has implications for students' effective learning of mathematics. If teaching and learning is occurring in the classroom built on Dewey's (1938) conception of experience-based learning, two elements need to exist. The students first need to have an experience, and then make sense of that experience through reflection (which could occur when they explain their thinking and/or learning). As well, in order for students to improve their learning processes and improve at thinking mathematically, they need to be aware of and be able to say their thinking and learning. Their growth in learning and thinking will come as these processes become objects of their conscious thought. I believe that as we see and hear the stories of learners' emergence of success in Consumer Mathematics, we will come to better understand the necessity of learners to be able to say things about their learning and thinking.

The second limitation of students' absence of words existed within the inquiry context. As an inquirer, I had difficulty collecting data (students handing in written pieces) and listening to the students in the absence of words. This limited the kinds of data that I received and the sense-making that I could engage in with the data. Even though the learners were willing to engage in responding to prompts, their statements were so limiting that I was challenged as an inquirer to come to understand what the nature and evolution of success was for these learners. This highlighted for me the difficulty, yet necessity, of listening to these Consumer Mathematics students.

In this chapter, data has been presented from each of the learner-participants. I use the term *present* in a deliberate manner to refer to the way in which data was used by me and will be read by the audience in this chapter. As you think, once again, about the purposes of including these examples of learners' words, it was meant to familiarize the audience with not only the forms of data but with the learners and their words. You have had an opportunity to meet each of the learner-participants, and will have opportunities to think back on these examples to help you make sense of their stories of success in Consumer Mathematics. This chapter was not meant to provide answers or explanations for the statements the learners authored and the ideas and words they left unauthored in what they said to me. I anticipate that you have begun to form questions in your mind as to the meaning of this data and how it might speak to the success of the learner-participants.

Through the presentation of data, the audience has been given the opportunity to *see* some of the words of learners through the different data types that were collected to inform this inquiry. You also had an opportunity to *observe* the absence of words in what the learners wrote and in what the learners said. However, *seeing* and *observing* does not necessarily lead to understanding or making sense of what the learners said and did not say. In order to understand these gaps in communication, we must *listen* to the learners, not just see their words and see the absence of their words. As we begin, in the next chapter, a journey of *listening to* and *hearing* the learners, we will begin to understand that the absence of words is really *the presence of silence*.

Chapter 6

Can You Hear Them?

Hearing learners in the classroom is a complex endeavour. The complexity arises from the past experiences both teacher and students bring to the current context, the classroom milieu that exists, the system-wide context of schooling, the relationship of teacher and students to the content, and the interactions between teacher and students. Within these complexities, one might believe that hearing students requires two essential components. An audience, or a listener, would be one of those essential components. The teacher, who acts as a listener, creates opportunities in which she can hear the words a student expresses to her. Two specific examples of opportunities to hear the words a student expresses are interactive writings and portfolios. The second component would be the ability of the students to communicate to the teacher. They must be able to say words, to say them in a way that affects themselves and their audience, and relates to ideas both the teacher and student are interested in within the pedagogic context.

However, as I interacted with the learners in my Consumer Mathematics class and considered the literature related to fostering caring and pedagogical relationships in the classroom, I came to understand that it is not necessary for both components to be present in order for the teacher to hear her students. Rather, the teacher and each student must be living in pedagogical *relationship*. As well, listening within a pedagogical relationship moves beyond only hearing the words of students. Van Manen (1986) describes a pedagogical relationship as one where the teacher sees more than an outside observer

would see, noticing and valuing the cognitive processes, social interactions, personal development, and aspirations of the student. He states that a teacher who lives in pedagogical relationship with a student "cannot help but see the child as a whole human being involved in self-formative growth" (p. 17). This idea of seeing can also be extended to listening, where the teacher hears more than the words of the student, but hears the cognitive processes, social interactions, personal development, and aspirations of the student as well. This authentic listening is essential to *hearing students*, rather than merely hearing their words.

Authentic listening requires of the teacher a responsiveness and receptivity (Noddings, 1984). Receptivity also creates a context where the teacher puts aside her goals and aspirations for the student and listens unconditionally to the student. Being in pedagogical relationship does not assume that the student is a vocal member of the relationship, but simply that the student has entered into the pedagogical relationship. To assume otherwise would place unrealistic expectations on the student and her/his progress. To assume otherwise would mean that a teacher would not be able to cultivate a pedagogical relationship with students who are not vocal, verbal, or have otherwise not developed their own voice. But it is these students with little or no voice that need to be heard in order to gain voice. In other words, although at some point in the relationship the student must respond to the caring being enacted, it is the teacher who initiates the listening stance with her students and does not assume that the student comes to the relationship with self-communicative ability.

This chapter will introduce you, more thoroughly, to several students who participated in this inquiry. These students, through what they barely expressed or

perhaps by what they did not express, told me much about themselves as mathematics students. They are students who lived in silence in the mathematic classroom they inhabited. I began to recognize their silence in their lack of communication about their learning, their cognizing, and their individuality (their identity) in the classroom. While this was common to most of the students living in silence in the classroom, each of them did have unique characteristics in their communication and in their characterization of a student living in silence. It is a stance within which each of these students operated closer to the beginning of the semester and did not necessarily remain. Their movement away from silence made their silence more apparent to me. The purpose of this chapter is to provide an opportunity to *listen* carefully to what each student said so we can *hear* each one and come to understand how their beginning stance affected their view of the classroom, mathematics learning, and themselves as students, learners, and individuals.

Karl: Words have Little Worth in Affecting Relationships and Learning

Karl was a Senior 2 student who had decided to take Consumer Mathematics because, as he explained in his first journal, "the other two math courses would be way to hard." He chose a course that he felt he could succeed in, demonstrated by his mark-goal of high 80s which he also wrote about in his first journal. Karl was a very quiet, almost sullen, student in the classroom who rarely interacted with his table partner and/or other students in the classroom. He asked very few questions and volunteered very few answers in whole-class interactions. When directed to work on assignments or activities,

he would work quietly, diligently, and quickly on each task, often trying to be the first student in the class to complete the task. After he was done, he would put his head down on his table, instead of the more common choice of interacting with other students in the class about their activities outside of school.

Karl arrived one slot early for his first conversation. As we were waiting to see if the scheduled student would show up for that time slot, I attempted to engage Karl in conversation about other aspects of school. He answered with one or two word answers as he stared at the floor. Although an outside observe might view Karl's quiet and individual approach to learning and his unwillingness to communicate with peers and his teacher as silence, as his teacher I believe I had yet to see a strong characteristic of silence in his approach to mathematics class and mathematics learning. Rather than equating a quiet demeanour in the classroom and with others as silence, the silence of a student carries with it a more entrenched system of beliefs based on past experiences. It was not until our second conversation, that Karl demonstrated a clear example of an important element that characterizes silence in mathematics class.

During our second conversation, I asked Karl to explain the difference between different types of questions that he was encountering in mathematics class. One of those types of questions were journal questions. Consider the purpose Karl saw in writing journals in math class.

J: Have you ever done journal questions in math class before?
K: No.
J: What did you think of it at the beginning of the semester?
K: Why are we doing LA work in math class?
J: And what do you think now?
K: I'm still thinking that they're at least sticking with the topic.
J: Okay. Can you answer that question? Why are we doing LA work in math class?

K: I could, but I don't think it would be appropriate.
J: Give it a try.
K: Umm. I have to think of better words.
J: Okay.
K: {pause} 'Cause you need to use our time differently for different things.
J: Okay. Can you explain that a little bit?
K: No.
J: Give it a try.
K: I'd rather not.
J: Use our time differently for different things. Does that mean that you might think that the journals are a time-waster?
K: Yes.
J: Can you say a little more?
K: Well, I was at first guessing that you didn't have all the things ready for a certain subject. So, you go to a journal to use up time.

Karl saw journals as a means to fill up time in class when the teacher was unprepared. Because the process of writing journals in mathematics class was relatively new to Karl, and something that seemed out of place for a mathematics class, he had simply dismissed the task as something that needed to be completed in order to obtain the marks that were associated with his goal.

Listening closely to Karl, more than just seeing his words, clarifies a characteristic of students who operate within silence in the classroom. Karl was well aware of the process of interactive writing and had participated many times in the exchange. However, his statement that journals were implemented "to use up time" shows his perceived purpose of the journal. It also demonstrates that he did not view the interactive writings as an important communicative device between teacher and student in the course and did not see the worth of communicating with his teacher to affect the teacher-with-learner relationship. I believe Karl's belief that he would not affect the teacher-with-learner relationship through his words demonstrated an important characteristic of learning in silence. His silence came from his perception that what he

said would not affect what the teacher thought of him as a student, learner, or individual and it would not affect his relationship with her. Therefore, his stance was one of silence, as he provided journal responses out of obligation to the didactic contract. Consonant with one of Belenky et al.'s (1986) characteristics of silent knowers, Karl did not see words as being used to connect himself and his teacher in a meaningful way for him to succeed in mathematics class.

The journals that Karl wrote focused on the thinking, learning, or goal setting that the students were engaging in during the course. Karl's de-valuation of the interactive writing process also demonstrated his positioning in thinking about his own learning and studenting. He did not perceive value in writing about his progress in mathematics class, and did not believe his thoughts and words would affect his progress in mathematics class. To hold this belief demonstrated that Karl did not value communicating about his learning. As with Karl's belief that he would not affect the teacher-with-learner relationship, a lack of worth in communicating about his learning demonstrates silence in his communication with others about his learning. It would mean that in order for Karl to continue learning, he would exhibit a "dependence on external authority for direction" (Belenky et al., 1986, p. 24). This dependence and positioning with authority is one of the characteristics that Belenky et al. noticed in their silent knowers.

We can begin to see, through Karl's example, that silence is more deeply rooted than simply being quiet in the classroom context. It is more profound, as it strikes at the core of what it means to succeed and learn in social situations. Even through Karl's limited communication with me, I could hear his silence. More importantly, however, I began to hear Karl as a student and as a learner in mathematics class. His stance of

silence in the classroom was characterized by the de-valuation of communication to affect the teacher-with-student relationship and his own learning.

Andrea: Her Words and Ideas Hold Little Value

Andrea's external silence was similar to Karl's in the early weeks of the semester. Andrea was new to the city and to the school, so her interactions with students within the classroom were limited. She began the semester by leaving school partway through the first day because she felt overwhelmed by a large student body where she knew no one. She exhibited that same demeanour in the classroom. Even when I interacted with her, she spoke so softly that I would have to be in very close proximity to hear her. She rarely asked questions in class and did not take part in whole-class interactions. Because Andrea was behind in her high school credits, she had enrolled in a variety of Senior 2 and 3 courses, even though she was the same age as other Senior 4 students. She wrote in her first journal that she took Consumer Mathematics to be assured of a Senior 2 mathematics credit, because she believed that it was "easier than the other math courses."

Similar to Karl, Andrea's silence was not exhibited through her interactions in class but through the interactions she and I had in our conversations. Each of our conversations focused on a narrative that I authored about each learner's success in mathematics class to that date. Along with drawing out general themes, I often pointed to specific examples to illuminate the theme and had learners in the conversation point to further examples to indicate if the theme illuminated their lived experiences in a way

which they could understand and say back to me. For many learners, the specific examples were an effective starting place in the conversation because it was a discrete phenomenon that they could talk about. The degrees to which they could communicate about an educative phenomenon differed from learner to learner; but Andrea was unique. Often she could not remember the events that I wrote about or had a limited memory of examples she selected.

There were several instances where Andrea had difficulty recalling and describing retrospectively her lived experiences in the class. Many of the phenomena were associated with completing specific types of questions. In the first conversation, one of the examples was a time when she asked for help with similar triangles questions. Although she could relate the source of her problem (she had not listened in class the day we had completed examples for similar triangles), when I asked her to describe the steps in general she responded by saying "Oh, I don't remember how to do it." We worked through a specific question together, as Andrea stumbled through and later on stated that it was the first time she had seen a similar triangles question. In that same conversation, when looking back at the second test of the semester that she had written, she struggled to recall the types of questions along with the steps to complete them.

Andrea's inability to remember key moments remained unchanged during the second conversation. As an example of putting steps for problem solving in her own words, Andrea pointed towards the painted cube problem – a problem situation that she and Whitney and I had worked through together. Although she felt the example was important, the final solution was the only aspect of the problem she remembered, without any of the thinking and conversation that had led to that solution. This inability to

remember the details of a phenomenon that *Andrea* thought was a key moment differed from the examples that *I* had brought to the conversation. Later on in the conversation, I asked about the details of a fractal cards learning activity. Even prompted by the learning sheets Andrea struggled to recall and verbalize her interactions with her table partner. Unlike the previous examples, Andrea was not attempting to recall specific mathematical steps, but rather the act of learning with a peer in responding to my prompts about the fractal card activity. In contrast, near the end of the second conversation Andrea articulated her value of remembering when she stated that the purpose in studying for the final exam was "to see if I can still remember how to do the questions or not."

The most significant interaction between Andrea and me that demonstrated her inability to remember was in an extra conversation that we had. Andrea and Whitney, two days earlier, had been working on a perimeter and area inquiry, exploring rectangles with constant areas and differing perimeters. Whitney had left the table for a few moments and Andrea had described to me how the perimeter of a "2 by …" rectangle increased by two units every time she added a column of two blocks. It was an astute pattern-recognition moment in which Andrea was generalizing a pattern she noticed and saying the generalization to me. As I reflected on the day in my field notes, I noticed that it had been a significant moment of hearing Andrea's cognition and I wanted her to tell it to me one more time. We scheduled a conversation time, where she was going to explain her good thinking to another student who had been away that class. As we progressed through the conversation, it became apparent that Andrea did not remember seeing nor saying that generalized pattern. When I asked Andrea about that specific pattern, she demonstrated no recollection of her thinking.

I began to question why she could not remember the events that I brought to our conversations. At first I was concerned that I had added details to an interaction or her writing that had not occurred. I went back to my field notes and all of her writing to verify that events had happened as I reported them to her. I found that my descriptions were true to the lived experiences, and that I had presented phenomena consistently. However, I was still puzzled as to why Andrea could not remember saying things that I had clearly heard, especially in the example of the growing perimeter of the rectangles.

As I listened more closely to what Andrea had said in our conversations, I began to hear her silence. I recognized Andrea's silence in her inability to remember key moments. These key moments either contained important ideas that Andrea had thought or important words that Andrea had used to affect her interactions with her peers or me. One characteristic Belenky et al. had noticed in silent knowers was that they had "no awareness of mental acts" (1984, p. 25). Andrea's inability to remember did not come from her de-valuation of remembering as a skill to help her succeed in mathematics class, but it came from a de-valuation of her own words and ideas. She simply did not remember what she had thought or what she had said to others or me because she did not see her ideas and words as having worth. The inability of Andrea to remember demonstrated to me a characteristic of silence that was rooted in her de-valuation of her words and ideas.

Lindsey: That's Not My Idea

Lindsey was a Senior 2 student who chose to take Consumer Mathematics because she "felt that it would be best for me because I had a hard time last year. My goal in this course is to pass it!" as she reported in her first journal. Her difficulty in learning and understanding mathematical concepts was evident from the beginning of the year. She demonstrated poor multiplicative sense and had difficulty understanding and using ratio-based ideas in multiple contexts. She had a positive outlook and a bright smile when she came to class every day and worked diligently on the tasks assigned to the class. She interacted with all of her table partners, asking them for clarification as they worked on mathematical tasks.

As I began to construct Lindsey's first narrative, one important moment surfaced in my mind as I thought about what I had learned about Lindsey and how she was being successful in mathematics class. The first paragraph of her narrative describes the moment succinctly:

> At the beginning of the semester when I walked around during work time, you always indicated that everything was okay. You would smile a huge smile and keep going. So, I was interested to read in your wages portfolio overview that the beginning of the unit was a little hard. As a result, when you responded positively to my offer for help it was a key moment for me. And now, I've noticed that you will call me over when you need some help. It made me think about the courage it takes to ask a teacher for help. I'm wondering what makes it easier to ask a teacher for help. Does having a learning partner like Whitney or Andrea or Erin make it easier to ask for help?

As I recounted in the previous chapter, Lindsey mentioned that asking a teacher was better than a peer because teachers know exactly what a student needs help with. When I

asked her to tell me more about her interactions with Erin, a table partner, she mentioned, "I tell her and she'll remember something and she'll tell me and I'll remember."

Lindsey could tell me about her stance of silence in the classroom through her interactions with me, as her teacher, and with her table partners as she endeavoured to learn the mathematics in the course. Not only did the teacher know where her difficulty lay when she was asking a question and knew her as a student, but the teacher *knows*. She was indicating that the teacher is the individual in the classroom that knows the mathematical content and will explain clearly what it is so that she can do it. Lindsey viewed her role, as a student of mathematics, as doing the same thing exactly as the teacher had said, but not necessarily to know or to understand what she was doing. It becomes clearer in her languaging as she described working with Erin. Notice that after she or Erin *tells* the other what to do, the other student's responsibility is to *remember*. The mathematical idea resides within the person who is engaged in the telling while the other student just *remembers* it, rather than *knowing* or *understanding* it. The mathematical idea was Erin's, even after Erin explained it, rather than Lindsey constructing her own knowledge or understanding of the idea.

With Lindsey saying to me that she was willing to ask for help, and to ask for help from a variety of individuals, it did not seem apparent to me why she spent the first unit confused but still indicating she was doing fine. In her silence, I began to see learning mathematics was a difficult process for Lindsey, and asking a question might make it a process that was easier and would highlight her ability or lack of ability in learning mathematics. But learning mathematics was a difficult process because, to her, mathematics was some distinct body of knowledge that resided within someone else's, in

this context her teacher's, mind. And that body of knowledge was not for her to know or understand, but to listen to and hopefully say back to the teacher in the same way on an assignment or test. Lindsey exhibited another characteristic of silence in her belief that mathematical ideas were someone else's ideas, and not her own.

Belenky et al. (1986) and Baxter Magolda (1993) both describe knowers similar to Lindsey. Silent knowers, described by Belenky et al., are individuals who depend on the authority figure in the relationship as a source of knowledge and direction. In a classroom context, Andrea and Lindsey both relied on their teacher as a source of knowledge and for direction in their learning and studenting processes. Absolute knowers, described by Baxter Magolda, are individuals who believe that they need to obtain knowledge from the teacher. Both of these models assume that the students believe the teacher has knowledge that they need, that the role of the teacher is to give the knowledge to the students, and the knowledge becomes the students' knowledge as they "learn" it through direct modes of instruction. However, both Andrea and Lindsey did not believe that the knowledge was theirs to have or own, even after the mathematical ideas had been clearly explained or the mathematical skills had been clearly explained and practiced. The ownership of ideas, in fact, the idea itself, remained within the teacher and only for them to practice and say back in the same ways.

Erin: I Don't Know!

Erin was a Senior 3 student who found herself in a position of catching up with her Senior 2 mathematics credit because she had dropped out of school the year before. She knew several of the Senior 3 students in the class and was outgoing. She interacted with her table partners and often found other students to learn with as well. She was intent on staying in school and finishing her Senior 2 credits, so she took seriously doing well in the course and maintaining her attendance. This was evident in her focus and work habits in class, and her responsibility in completing assigned tasks. Although she stated in her first journal that, "I'm bad at math", throughout the semester Erin indicated to me an ability to think mathematically.

Erin demonstrated her stance of silence most clearly in conversations. Looking at Erin's first and second conversations indicated two distinct trends in her responses to my prompts. The first trend was to drop her vocal level to be inaudible whenever she was making a statement of significance about her learning in mathematics class. She also indicated frustration with the questions I was asking of her in her approach to answering the question, as well as blurting out near the end of the first conversation "I don't understand the question!" The second trend was her use of the statement "I don't know", which was most noticeable in the analysis of her transcripts. In the first conversation, she used the statement approximately twice every three minutes and in the second conversation, she was using the statement approximately once per minute. In the second conversation, she used the statement when responding to questions pertaining to: a request for further support of a general statement she made; analysis of work she had

completed in class; explaining her cognition for specific or general questions; describing her best practices for learning mathematics; and describing her lived experiences in the classroom and explaining the meaning of them. In all of these cases, the questions were inviting Erin to describe her learning and cognition in mathematics class.

Erin was not the only student repeatedly using the statement "I don't know" as a response in the conversation setting. Lindsey and Whitney also used the statement frequently in their conversations. As I listened to the silence of these three students, I came to recognize that they used the statement to communicate different stances. Erin used "I don't know" as a closing statement to concede to the authority, as a way of giving up. It followed after I had asked her to tell me about her learning and she was unsure of what to answer, in part because she was not sure what the "right" answer was. Lindsey would use "I don't know" in mathematically related situations, where she used it to indicate to me that she was shutting down and not willing to think about the mathematical steps. She also used it as a way to have the teacher then describe the steps to her. When she was unsure in a mathematical situation, but willing to try, she would move to a stance that demonstrated she was "mixed up." Whitney used "I don't know" to communicate a message different from Erin and Lindsey. Whitney would try extremely hard to answer the questions that I posed in the conversation. At the end of a particularly difficult response, she would end by stating "I don't know" as a way of not taking a definite stance or as a way to indicate that she was not the authority or originator of the idea she had just spoken. It was a question asking for confirmation from me.

Although the difference in usage appeared as I began to hear these students, there was a commonality to their use of the statement "I don't know." It was used in

addressing the authority figure in the room, the teacher, to defer to her knowledge and her direction of the conversation. After I completed transcribing Erin's second conversation, I noted, "She isn't very communicative. She wants me to tell her what the right answers are. And remember, she believes there is only one right answer to a problem." In their description of knowers, Belenky et al. (1986) describe the position of a knower with authority figures. Although the authors describe a dependence on authority and a silent knower's perception of "authorities as being all-powerful, if not overpowering" (p. 27), what they are pointing towards is the asymmetrical power relationship that exists between a knower and the authority figure. Each of these three students positioned themselves in a subordinate manner to me, believing that I was the final arbiter of knowledge about their cognition and learning, and about mathematics. Their stance of silence was characterized by this subordinate positioning with authority.

The use of the statement "I don't know" and trailing off at the end of important statements of learning and cognition also demonstrates a characteristic of silence that is complex to understand. When I speak of silence, and when Belenky et al. (1986) write about their silent knowers, it does not necessarily indicate a lack of communication – that the individuals do not say anything at all – but what they do not say with their words. Erin, Lindsey, and Whitney at many times in their conversations said very little. But as I listened to what they did say to me, I heard their silence in their hastiness to either state the one right answer, or to defer to the authority that might tell them what the answer was. Silence is heard in the words of these students, rather than in the quiet moments between words.

Whitney: Talking about Myself?

Senior 2 Pre-Calculus was a course that Whitney found very difficult. She made a choice at the end of her Senior 2 year to take Consumer Mathematics in order to complete a Senior 2 mathematics credit. She stood out as a different student from the rest of the individuals in the classroom. Although she shared with Erin and others a serious approach to obtaining a Senior 2 mathematics credit, her strategies for learning mathematics were much more complex than her classmates' strategies. Not only did she have these strategies at her disposal, but enacted them regularly to do well in the course. She interacted well with all of her table partners, and many of them considered her to understand the mathematics in the course well. She almost became a leader in the classroom. Rather than enrolling in an "easier" mathematics course and treating it merely as a credit, Whitney was sincere about her approach to learning mathematics. She would later describe this as a difference between a student and a learner.

In the conversations, Whitney was one of the participants that was most willing to be thoughtful about her responses to the paragraphs in the narrative and my prompts. She would often pause to consider a response that would be most appropriate and describe her thinking. Notice, below, the way she would respond to questions that focused on herself as a mathematics thinker, a mathematics learner, or a student of mathematics (italics are mine in the following excerpts). When I asked her to explain some of *her* thinking on a similar triangles question in the first conversation, part of her response included: "9 times 5 point 1, which is 45 point 9. And then *you* did that, would be equal to 7 point 2 times the other missing side, because they would also be cross multiplied." In the second

conversation, we dialogued about the difference between a student and a learner. I asked her to describe *her* movement between those two roles, she said,

> Umm. I think it's when it's, like, a bigger assignment. Like, if it's textbook work, it's kind of more bare minimum thing. Because textbook work's just kind of repetitive, practicing, like, regular stuff. But when it's more of an activity that *you* can do with a table partner, it's kind of {pause} I don't know, it's usually when *you* go back to being a learner. Because it has more to do with, like, the learning rather than the practicing.

Near the end of the second conversation, Whitney also responded to a prompt about how practicing helps *her* learn mathematics by saying,

> 'Cause it kind of sticks better. If *you* do it once, *you're* more likely to forget. Whereas if *you* do a whole page of assignments, umm, it just seems to stick better. Yeah. And going over notes {pause} helps a lot, too. Just that kind of stuff.

In each of these situations I had posed questions to Whitney about her thinking, her learning or her studenting in our class. Not only did I want to learn about each of the students as individual and learners, I also wanted to provide opportunities for them to talk about their lived experiences. However, as I posed specific questions to Whitney about herself, I found that she would sometimes begin her response by talking about herself using first-person pronouns and then move to second-person pronouns. In the above examples, when Whitney responded, rather than using the first-person pronoun, "I", she used the second-person pronoun, "you", even though she was talking about *her* thinking with similar triangles, *her* positioning as a student, *her* learning in mathematics class, and *her* way of learning mathematical skills through practice.

It might appear that Whitney could talk about her thinking, learning, and studenting, and in fact she did have some voice that existed in her dialogue about her success in Consumer Mathematics. But a characteristic of silence demonstrated in Whitney's responses is the inability to make self-referential statements. To make self-

referential statements requires of the individual an awareness of self-identity and perhaps the ability to shape that self-identity. Belenky et al. noticed that silent knowers had a difficult time describing themselves, and they held a "belief that source of self-knowledge is lodged in others – not in the self" (1986, p. 31). As Whitney and I dialogued about her thinking, learning, and studenting in mathematics class, she often merely confirmed the themes and examples that I had placed in her narrative of success. And even as she was guided to think about her thinking, learning, and studenting, she still expressed those thoughts in terms of other or all students, often not making self-referential statements.

Unheard Students

Karl, Andrea, Lindsey, Erin, and Whitney all positioned themselves in Consumer Mathematics as students who learned in silence. Although Belenky et al. (1986) described *silent* knowers within one grouping, on closer examination I believe that, based on past experiences, learners who live in silence can bifurcate into two different stances. As *silent* learners, they have not experienced learning in a pedagogical relationship with a teacher who listens intently to them. As *silenced* learners, teachers communicated to them that their words and ideas did not hold value within the learning environment the teacher controlled. Whether students like Karl, Andrea, Lindsey, Erin, and Whitney are *silent* or *silenced* learners is of no consequence to recognizing their initial stance, nor noticing and understanding their growth during the rest of the semester. Recognizing

their journey to silence would require a clear and detailed description of what had happened to the students in the past and to understand those educative experiences. The focus of this study, however, was to notice the becoming and growth of the students. This only requires an understanding of the initial stance of the students in order to notice whether they are no longer at that place and the ways in which they have engaged in becoming, to see the motion of their growth.

What does become important to understand, in either silenced or silent students, is that they have *not been heard.* Being unheard can lead learners to become *silent* because no authentic audience exists for them to communicate with about themselves and their learning. In other words, silent learners do not feel the necessity to communicate because they see no reason to say anything if no one is listening to them. When we look at the characteristics of the silence of learners in this inquiry, there are two characteristics that are present in *silent* learners. The idea that Karl did not perceive the worth of communication to affect the teacher-with-learner relationship and his own learning demonstrates a silence that is engendered by lack of a listening audience. The lack of self-referential statements and inability to notice and shape self-identity that was viewed in Whitney's responses also exhibits silence because she did not have an audience that would listen to her talk about herself and her learning and guide that development.

Being unheard can lead learners to become *silenced* because their ongoing interactions with authority indicate to them that what they say has little value and what the authority says is absolute. When we look at the characteristics of the silence of learners in this study, there are three characteristics that are present in *silenced* learners. The de-valuation of Andrea's own words and ideas can only be influenced by a

squelching of her voice in the classroom. Lindsey's perception that, even after learning some mathematics, the mathematical ideas were still her teacher's demonstrates a silence that is perpetuated by a teacher's stance that he/she controls the knowledge in the classroom and deems it necessary to give that knowledge to students. Erin's positioning of deferring to authority on questions about learning and thinking also shows her reliance on an authority figure to tell her what to believe and what the correct answer is, leaving little room for her voice to emerge.

The students in this study are not unlike many high school students. Many high school students pass through their buildings and graduate (or leave) without being *heard* by their teachers. Few high school students are heard by their teachers (Henderson, 1992; Dryden, 1995; McCaslin & Good, 1996). In the mathematics education literature, listening to students is claimed by writers who are only interested in understanding teacher development or generalizing about student cognition for discrete concepts or skills (Borasi, 1992; Davis, 1997; Pirie, 1996). I believe that authentic listening is missing from many systemic processes. Two examples illustrate this idea well. Imagine a teacher focusing on *hearing* what a student has learned during a unit, rather than noticing deficiencies in the student's skills. Rather than *assessing* student cognition and learning processes, teachers focus on *evaluating* learning products and the product of student cognition. Imagine a teacher, parent, and student sitting down together to *listen* to the student describe her/his learning and studenting in a course. Instead, a parent-teacher interview, even in the title, often excludes students from a process that could be used as an opportunity to listen to students. High school students, simply, are not being heard by their teachers.

Is listening to students the missing element in the reconceptualization of an effective school system, one where students are sponsored to become "competent, caring, loving, and lovable people" (Noddings, 1995, p. 366)? No, listening is not the point. The growing and becoming of each individual within the classroom must be the focus. The teacher grows as she listens to each learner. Each learner grows as he/she is listened to, and regarded as a human being. The stories of the learners in this account are rich in detail to make it apparent to readers that being listened to is vital to *becoming*. Listening to the whole student is vital in the daily classroom experiences and interactions between teacher and learner. Listening to the whole student (van Manen, 1986) is vital to the becoming of each learner in the classroom. Growing and becoming are fostered in authentic ways when a teacher *listens* to her learners.

The students in this inquiry had a unique experience – they interacted within a high school classroom where they were listened to by their teacher. And to be listened to intently, in an authentic way that is similar to Van Manen's seeing within a pedagogical relationship (1986), means that the students were *heard*. And not only were they heard as students in a Consumer Mathematics classroom, but they were heard as learners and as human beings, people who had valuable and interesting knowledge and understanding of their learning and what it means to be an individual in a Consumer Mathematics course. The story of this inquiry, of the lived experiences of the learners and me, is the effect of a teacher's careful listening to her learners to transform the professional life of the teacher and the lives of the learners. As the stories of the learners unfold, the evolution of success of these learners was not only *noticed* when their teacher heard each one of them, but their success was *affected* by the hearing.

Hearing Silence in Words

The idea of *hearing silence* seems, initially, paradoxical; however, the act of *hearing silence* becomes vital if hearing learners whose stance in the classroom is silence is instrumental to their growing and becoming. I believe we need to consider what it means to *hear silence in the words of learners*. When we first consider the phrase, it seems that *silence* cannot be *heard* in the words an individual says because of a common assumption that silence is when words are not said. In each of the learners' examples of writing or oral communication, we not only *saw* their silence in the previous chapter, but in this chapter we have been able to *hear* their silence. As well, what was demonstrated in this chapter was silence, not between their words, but in what they did say to me. To *hear* their silence means to come to an understanding of what their silence means and to identify and come to understand what characterizes their silence. As well, to *hear* silence means to have in view more than just the words of the learner, but to be *listening* to the whole human being as they say their words. This returns the discussion to van Manen's (1986) conceptualization of pedagogical thoughtfulness as a way of being with learners, a way of listening and seeing learners.

Silence is not about these learners saying *nothing*. They do say things, but what they say is limited and limiting. *Living in silence* is not the same as *living in muteness* – they are not equivalent. Muteness means not saying words. The learners in this inquiry were certainly not mute. Neither were Belenky et al's (1986) participants who told about their silence, from their *silent way of knowing*. Even in studying closely these participants presented in *Women's Ways of Knowing*, the reader comes to see that the

women Belenky et al. believed were silent were not mute. Take for instance the participant Cindy, whose data is used frequently in Chapter 1 of *Women's Ways of Knowing*. Not only did Cindy respond to the prompts posed to her in the interview, but it was in her responses to the prompts that Belenky et al. noticed her silence.

Silence is characterized, through the lived experiences of the learners in this inquiry, by five characteristics: (1) a student's belief that her/his words have little worth in affecting relationships and learning; (2) a student's de-valuation of her/his words and ideas, especially not to remember them; (3) that ideas cannot be authored and owned by the student – ideas are the authority figure's to have and to give (and this giving is a function of wielding the authority's power); (4) a student subordinating herself/himself to the authority in the context; and (5) an inability for the student to make self-referential statements. Although each of these characteristics are related to the way in which the students used words, it does not mean that they said nothing. Living in silence is a positioning with authority and a student's de-valuation of her/his ideas and words. The learners in this chapter used words, and saw words, as a subordinating act to authority and this is how their silence was demonstrated when they did use words.

Belenky et al. (1986) did not distinguish between *relative silence* and *absolute silence*. If we understand a *stance* as an individual's being and knowing (in this case, with silence), then *absolute* could refer to always acting (and reacting and interacting) within that stance. *Relative silence* could refer to the individual, at times, moving away from that stance as he/she acts within specific situations. A student living in a stance of absolute silence would always act within specific situations with one of the five characteristics of silence I described above. A student living in a stance of relative

silence would sometimes act within specific situations with one of the five characteristics, and at other times would demonstrate some voice. However, there are problematics with describing an individual as always all of something or not (part of the problem lies in the dichotomy; part also lies in the absolute language). As I considered what my learners had said to me, I recognized that their stance was never static. They were always in constant motion, always in the process of growing and becoming. Because of this, I came to see that making a distinction between stances of relative and absolute silence was not of importance to understanding the learners' beginning stance in the classroom. They demonstrated voicelessness, and this affected what they said, how they said it, who they said things to, and how they grew.

Impact of Silence on this Study

The act of listening to students who learn in silence in the classroom poses many challenges to an inquirer. In looking at learners' success, I necessarily needed to hear what was going on inside the mind of each learner. And to hear cognitive and affective processes associated with success meant that the learners needed to enter into dialogue with me through some form of communication. The ability to be communicative about cognitive and affective processes needed to be built on the learners' beliefs in the value of their words to affect the pedagogical relationship and their learning, beliefs that they had their own ideas that are worth sharing, beliefs that the teacher is not the final arbiter of knowledge about the students, a sense of self-identity, and ability to make self-

referential statements. However, as was demonstrated by Karl, Andrea, Lindsey, Erin, and Whitney, these were precisely the elements that characterized them as students learning in silence. It was challenging to hear them.

As researchers, Belenky et al. (1986) spent considerable effort in their research listening to the silence of their participants. They noticed many of the characteristics of silence and described those characteristics clearly. One of the metaphors they use to describe silence is *voicelessness* (pp. 24 & 30). In other words, individuals who live in silence do not have a voice – they do not recognize the need to have a voice, they do not focus on gaining a voice (because they do not see the value), and they do not use what little self-awareness they possess to communicate. Listening to the words of Karl, Andrea, Lindsey, Erin, and Whitney above, however, does not bring us to a definition of voice. It, instead, demonstrates the non-characteristics of voice through the silence of the learners. As we journey with these learners, and other learners in this inquiry, the concept of voice will develop as we notice and come to understand the emergence of voice for these Consumer Mathematics students.

The challenge in listening to students who learn in silence is not only the challenge of hearing them. In relation to this inquiry, my initial and ongoing noticing of success was a challenge. The students' voicelessness meant that they were not communicative about their success in class. For me, as the teacher, that meant listening closely to the few things they said to find moments of success hidden from the voice and view of the learners, and then saying those moments to them. Beyond communicating success, learning in silence meant that students were also not accustomed to noticing or defining when they were successful. They had been in a position, with mathematics and

mathematics teachers, that communicated to them their shortcomings in learning mathematics and thinking mathematically. They came to the class with a mindset that mathematics was difficult and not something that was to be understood by them. The students' focus on survival turned their attention to moments of not failing, rather than the more significant moments of success.

Although the challenge to hear students and to notice and articulate their success was a difficult endeavour, their silence formed a backdrop against which we (the students and I) could notice their success. Without the stark contrast of learning in silence, the emergence of voice might not have been heard. A counter-example would be the participants in Baxter Magolda's study (1993). In studying Baxter Magolda's data for absolute knowers, a reader readily notices that the college students in the study were aware, thoughtful, and articulate about their learning stance and relationships with others. Although Baxter Magolda considers the development of voice as an underlying story line, the development of voice of her participants is not remarkable because they began in a place where they could already make judgments and communicate about themselves. In contrast, the learners in this inquiry were able to make the emergence of their voice heard because of their initial positioning in the classroom.

As I noticed the learners' silence, I considered the impact of their non-communicative stance in the classroom. It meant, for me, that I needed to initiate the emergence of voice by listening to my learners. Both Belenky et al. (1986) and Freire (2000) emphasize the importance of listening to individuals who live in silence. Belenky et al. point towards the silence of learners as "failure of the community to receive all of those entrusted into its care" (1986, p. 34). So if I, as teacher, was to foster the

emergence of voice for each of my learners, I needed to authentically listen to each one within the pedagogical relationship I forged. Freire recognizes that for liberation of the oppressed to occur, "it is necessary to trust in the oppressed and in their ability to reason. Whoever lacks this trust will fail to initiate (or will abandon) dialogue, reflection, and communication" (2000, p. 66). Again, Freire points towards the receiving of students, through listening intently to each one as a whole human being, as fostering liberation – and within the liberation voice can emerge. So, it was of significance for me, while teaching these learners, that I took opportunities to hear the learners in order to think with them about their success and notice the evolution of their success throughout the course. As we notice these learners' journeys, my intention is to tell the stories of their emergence of voice, set against the backdrop of silence.

Chapter 7

Learner Success ... In Their Own Words

The inquiry question that I posed at the outset of this study can be seen as having two elements – exploring the idea of the *nature* of success of learners in Senior 2 Consumer Mathematics and how that success *evolves* over a semester. This chapter will focus on the former part of the inquiry question. A stance of silence does not demonstrate the success of learners within a classroom, and specifically, the learners in this inquiry. Silence diminishes the capacity for students to learn, limiting the quality of learning in which students can engage. However, as I intimated in the closing words of the previous chapter, the learners in this study did not remain engaged in silence. They succeeded in multiple ways, but most significantly by moving away from their stance of silence. Success for these learners was a complicated endeavour, not always easily visible, but certainly meaningful to each learner as I noticed their growth during the semester. Success for these learners was also a complex endeavour, not of a solitary nature, because each learner experienced different kinds of success at different moments during the semester.

Several methods could be used to notice that the learners moved beyond a stance of silence in the classroom. Although I will point towards specific instances when a learner represented an absence of one of the five characteristics of silence that I described in Chapter 6, my intent is to present data in this chapter that demonstrates a movement away from silence. And it is because of the silence that we will be able to see the

moments of emergence that were observable. This chapter will use specific instances to demonstrate that the stance of silence in the classroom was not a consistent stance, and that in fact, learners moved away from that stance in some of their writing and conversations. Noticing movement is a difficult endeavour, and this chapter will highlight a key moment from each learner taking, in essence, a snapshot of moments of success. Before we can understand how students emerge from silence and what it means to do so, we will need to observe the success of the students in the Consumer Mathematics class. Therefore, this chapter will look at the nature of success of learners, both *in* the learners' terms and *on* the learners' terms. This means turning to the learners' words, especially what they spoke in conversations.

The conversations provide an opportunity for us to see and hear the success in the learners' words (*in* their terms) and in ways that they were comfortable saying and believed were worth saying (*on* their terms). The learners' telling of their success is an important element of storytelling that needs to be shared within the context of this inquiry, both for methodological reasons and for the power of their words to communicate their success. The viewpoint of the learners is privileged in this chapter as data is *presented*; a more literal interpretation will be used to situate the lived experiences. (As the viewpoint of the inquirer is privileged in subsequent chapters, a more insightful interpretation of success will be articulated that is coherent and makes meaning of the learners' lived experiences.) In considering what the learners said in the conversations, I began to notice the significance of the confidence that some learners were building and the words and ideas that learners were beginning to say as they

emerged from their silence. This chapter will explore those two ideas that were brought into view by listening to the learners.

Confidence in Self and Context

The learners' building of confidence was a success that was evident in the narratives and in conversation with the learners. For many of the learners, building confidence was something that occurred while they were engaging in other successes, becoming part of the background in their story of success. For others, building confidence was more central to their success and it was from that confidence that other kinds of success evolved. There are many things that students can become confident about, or place their confidence in, that illustrates their success in mathematics class. *Self-confidence* is a common type of confidence that comes to mind when the discussion of confidence arises. By listening to Susanne's words, we will be able to see what self-confidence looks like as an element of success in Consumer Mathematics class. Another type of confidence is *confidence in one's context* – confidence in the people whom one interacts with and confidence in the subject matter. Andrea will help us come to understand what it means to have confidence in the people in her context and to develop some confidence with the mathematical ideas she was learning in class.

Susanne: Confidence in Self

Susanne was a Senior 3 student who was taking Consumer Mathematics 20S for the second time. She had difficulty in the course the previous year, in part because she had not attended class regularly. In our first conversation, Susanne told me that she had made a decision at the beginning of the semester to do well in the course. She stated:

> Just because, like, this is my second time taking grade 10 math. I just felt like I could for sure, like I had the ability to do better. And so, just to be showing the teacher that I do care, I think can go a long way. I do care, too, and I want to do good. And I know that by doing math, is just by, yeah, being responsible and getting the work done. … 'cause other years before, like, I don't like math at all and I just completely given up. But now that I have had retake it again, I thought that I should, like, try and learn all that I can do it.

At the beginning of the semester, Susanne's confidence in herself to do well and to learn mathematics was limited. She associated passing the course with brute force, doing whatever she could, non-strategically, to pass the course through her general approach of responsibility and doing work.

In our third conversation, I provided an opportunity for Susanne to take a retrospective look at her semester and describe to me how she saw herself learning in Consumer Mathematics 20S. As we were concluding the final conversation, I asked her what advice she would give future Senior 2 Consumer Mathematics students and how she left the course a little different.

> J: Would you be able to give them some advice?
> S: Umm. {pause} Not to worry about the other kids in the class. Because you're here for you. You're not here for the other students. And to realize that you need this and why you need it. And, like, you're eventually going to want it some day. [Mm, hmm.] So, it's better for you in the long run. And, just, like, the homework. Like, if you listen in class and you do work. And you make sure you understand it. If you have homework, it won't be so hard to do the homework. Because you'll understand it. It won't take as long.

You won't get so stressed out about it. [Mm, hmm.] Just that it's easier if you go for it.

J: Good. So, last question here. Tell me one thing about you as a student, that you're thinking about differently after having taken Consumer 20S.

S: {pause} Umm. Like how I'm a different student?

J: Yeah.

S: I'm a different student because I know now that I can do it. And so I feel more confident going into my classes. And, I want to do it. I want to understand it. I want to get it done, you know? [Mm, hmm.] I want to do it better.

Although Susanne still pointed towards hard work as an attribution of success, she began to talk more about understanding the mathematics. She describes this understanding as a way of developing confidence so that she could complete homework and see it as a task that was not onerous, but within her range. And for Susanne, completing homework is still much of what mathematics class is about and is an indication of success. Right at the end of the conversation, she pointed specifically to her growing self-confidence in mathematics class. I believe this statement about self-confidence is a powerful final statement to make about her lived experiences. We can only speculate how Susanne's confidence in herself will affect her learning in mathematics classes in the future.

One of the elements of Susanne's success during the semester was her growing self-confidence. These two excerpts demonstrate a shift in stance for Susanne. By the end of the semester, Susanne demonstrated a movement away from a stance of silence as she became more aware of herself and her learning in mathematics class. She could, in general, talk about her ability and her confidence in mathematics class, and notice when she understood mathematical ideas. Making self-referential statements about understanding and self-confidence are not statements that a student who is engaged in silence would make, either to herself or to her teacher. Susanne's ability to carry through

in her decision to do well and show herself and others that she cared about mathematics class is demonstrated in her growing self-confidence.

Andrea: Confidence in Context

We had an opportunity to meet Andrea already, as the student who believed her words and ideas held little value. This initial stance of silence indicates a very low level of confidence, in herself and in her context for supporting her mathematical learning. She demonstrated this low level of confidence in her silence by not being able to remember ideas she had constructed and things she had said. As the semester progressed, Andrea changed her stance in many ways, and came to be successful in the class. One of the elements of her success was her emerging confidence. In our second conversation, Andrea and I talked indirectly about the confidence she was building in her context.

Andrea often relied on asking others for help in order to learn how to do specific mathematical skills. Sometimes she would ask me, but many times she would ask her table partners when she encountered difficulty with specific questions. Andrea described three of her table partners to me, and the uniqueness of learning with each.

J: The first paragraph lays out a theme for your story, what your story in math class is all about. Do you think you could tell me about that paragraph? Or can you say that theme, or that big idea, of your story in your own words?

A: {pause} That when {pause} the person that you work with at the same table, you interact, you get to know them [Mm, hmm.], right? And you find what it's like to work with them because everybody's different. [Okay.] So, that's what you teach from and ** when you teach somebody, you do the same things.

J: Okay, so you said that you have different ways of working with different people. So, you've had a couple of different table partners. Do you think you can tell me about the difference between working with those table partners?

A: Well, with {pause} Lindsey, she didn't really understand much. So, I had to do all the work. And, when I didn't understand something I had to rely on somebody else, I couldn't rely on her. [Okay.] And Whitney, you could rely on her because she could understand. And Susanne, well, we're both kind of the same. So we would {little laugh} try to figure it out both our **. If we didn't understand something, we'd just ask Whitney.

In Andrea's response to the initial prompt about the narrative's theme, she demonstrates the importance of forming confidence in the peers with whom she is learning. Not only did she make this general claim, but supported it with a specific instance by demonstrating her knowledge of the individuals she had sat with during the semester. There is a different level of confidence that she honed with Lindsey (where she had opportunities to develop her own content confidence), with Whitney (where she could depend on Whitney to tell her), and with Susanne (where a mutuality of relationship existed). In each of the these learning relationships, Andrea felt safe to take risks in asking other for help which contributed to her confidence-building process.

Although Andrea was developing confidence in others, she was also developing a confidence in mathematics, another part of her context. As part of the geometry unit, students reviewed the concepts and formulas for perimeter and area. On the following day, they engaged in an inquiry that explored the relationship between perimeter and area. Andrea's silence was demonstrated in her inability to remember the moment of significant cognition during the inquiry. However, later in the second conversation, we had an opportunity to talk about the perimeter and area review, where she demonstrated a different learner-stance.

J: Okay. Is there a time, that you can remember, when you answered a question in class, or explained something to the class, that you didn't really check with somebody first?
A: {pause} Perimeter.
...

J: So that was your own idea?
A: Yeah.
J: And, it was kind of neat. I really liked using exactly what you said for the notes for everybody else. Did you notice that?
A: No. {laugh}
J: No? Do you think that's a pretty important thing?
A: {pause} Umm. Kind of, yeah.
J: Do you think that it shows one way that you're being successful in math class this year?
A: Yes.
J: How?
A: 'Cause it's, like, it really makes you feel confident. Like, other people are using how you describe stuff.

Andrea had encountered perimeter, as a concept and skill, in previous grades. In the dialogue preceding this excerpt, Andrea had explained to me how she had taken teachers' definitions from previous years and combined them into a definition that made sense to her. It was this definition (both of concept and method to calculate) that Andrea had volunteered in class. When I asked her about her success during the second conversation, Andrea pointed directly towards confidence. Although the confidence that she talks about is related more to confidence in herself, I believe that Andrea was also gaining confidence in mathematics, as a field of study that could be sensible/able for her.

Andrea's movement away from silence is evident in her confidence in her context – both individuals and content matter. In telling me about learning with and from her table partners, Andrea does more than just rank Whitney, Susanne, and Lindsey in perceived usefulness to her. Rather, she supports her ideas about the benefits of learning with each of these students, not searching for approval from me, but shaping ideas of her own about her learning. For Andrea, being able to say to the class her understanding and knowledge of perimeter was a way for her to notice her own development of confidence in the discipline of mathematics. Saying the idea, and then in retrospect telling me about

where the idea came from, demonstrated success because Andrea was moving away from a stance of silence. Confidence in her context provided opportunities for Andrea to say things about her thinking and learning, and it was the confidence that she pointed towards as part of her success.

Even though developing confidence was a success for Susanne and Andrea, it was only one of the elements of success that they experienced during our semester. As they refined their confidence in themselves and their context, they used this success as a means to build on other, more complex elements of success. For other learners in this inquiry as well, a shift away from silence necessitated a growth in confidence in themselves and their context. A growth in self-confidence allowed several of the learners to begin to view themselves as individuals who could be successful in mathematics class. Confidence in others in the classroom (including peers and me), forged an environment where learners could safely take risks. Because the purpose of the class in the students' minds was mathematics, confidence in the field of mathematics as a sensible/able endeavour was important for students to persist in their learning and successes. Listening to the learners and their growing confidence occurred as they began to say more complex things to me in their writing and conversations.

The Things Students Could Say

As the students moved away from a stance of silence, they began to say more things with more frequency and intention to themselves and to me. In seeing the words

of students, we will be able to notice fewer gaps and absences in what they said, and their communication will be characterized by supporting their initial claims through statements that point directly to themselves. When individuals make statements that refer to themselves, I have labelled them *self-referential* statements. Self-referential statements are made with a variety of purposes, both to shape the speaker and to inform the listening and attentive audience. When learners made comments about themselves, it was generally made about their individual identity. When learners made comments about their mathematical thinking, it was generally made about themselves as thinkers. When learners made comments about their learning, it was generally made about themselves as students and/or learners. Let us take the opportunity to see the self-referential words of some of the students, noticing the significance of their statements to their learning, their relationships with others, and their movement away from silence.

Saying Things about Myself

Nadine: It's about me!

Nadine was also a Senior 3 student who was also catching up on her mathematics credits. Moving from a different province partway through the semester, Nadine often had a unique view of our classroom, letting me know frequently that the way mathematics was taught and learned in Manitoba was quite different from the province she came from. She was quite willing to share her perceptions of the mathematics class outside of class time, often stopping by to tell me how she felt about a particular topic or activity that she had been engaged in during class recently. This openness was contrasted

in Chapter 5 by Nadine's lack of ability to explicate her own cognition. An example is her clear telling of frustration with a problem solving activity called "Crossing the River" during her initial engagement with the problem, yet her difficulty in explaining how she came to make sense of the problem afterwards.

In all the conversations, Nadine was quite open and willing to be in dialogue about her success. Rather than answering questions with single word answers or very short phrases, Nadine would try diligently to say more about her answer, supporting her claims sometimes with her thoughts and other times with specific examples. In Nadine's second narrative, her emerging theme of success was focused on how she used words to think and make sense of mathematical ideas. Here is what Nadine said about the theme:

J: You can scan [the narrative] a little if you want to take a minute.
N: Well, when I read it yesterday, I noticed a theme about thinking in words. Like, that's the main theme of my own story. I don't know. When it's all words, it kind of describes how I like started using the thinking in words and moved on from there. And I noticed it has the Crossing the River problem. [Mm, hmm.] And as it says, it says that it was a good example of me and Cynthia, or just me, or whoever, writing down, like, our own words and our own thinking. [Mm, hmm.] I figure, like, that's the main theme, I guess. Is me thinking in my own words during math class. Like, in math, generally it only has to do with numbers. [Mm, hmm.] But I mean, like, in equations they add words, or whatever, just like, the question. And, I take away the words you don't need. [Mm, hmm.] And so then, that's how I do my thinking. And I think that's generally the theme of my story.
J: Good. Is it a good theme?
N: Yes.
J: Yeah?
N: I like my theme! {laugh}
J: How come?
N: 'Cause it's about me. It's how I learn. It's not how, like, Cynthia, well, I don't know. Well, Cynthia does the same thing. But just as an example, it's me. It's not Cynthia. It's not you or whoever else. It's just me. It's just about me. It's not about whoever else there is, like this. Yeah!

Nadine demonstrated thoughtfulness about her theme, as she constructed it from her initial reading of the narrative. She found the theme to be consonant with her lived

experiences, but she also said more. More than highlighting her lived experiences, Nadine believed that her theme was important because it described her – it was not about other students in the class, but specifically and personally about her and her learning. Further in the conversation, Nadine gave a retrospective look at her themes for grade 7 and grade 8 mathematics class and how her theme had evolved over those two years.

By stating that the theme of the narrative was just about her, Nadine is making a self-referential statement. Although the self-referential statement could be viewed as pointing towards her learning, the significance of the statement is that Nadine is indicating an awareness of herself as a unique and particular individual (not just learner and student in the mathematics class) and is expressing that awareness. This demonstrates a shift away from silence in her ability to make self-referential statements to herself and to me. There is also significance in Nadine saying to me other themes from previous years of mathematics learning. Although I had specifically pointed towards her theme of success in the narrative, Nadine took the opportunity to author themes for junior high mathematics class. These self-referential statements were becoming a part of Nadine's awareness of herself and an important element of her success.

Daniel: This is who I am.

Daniel was a Senior 2 student who told me he had decided to take Consumer Mathematics because "I didn't catch on to some things like that and needed a bit [of] time too", in his first journal. Daniel found many of the underlying concepts of mathematics difficult to understand, evident to me throughout the semester. He would occasionally ask for help and even stayed after school a few times. Occasionally he would enter a

conversation with his table partner or classmates around him, but most often worked and learned on his own. In our conversations, he told me that he valued talking with others, listening to others, and considering carefully their ideas (but did not necessarily apply this to his learning of mathematics). He was a quiet student who experienced many personal successes on the football field. Even though in Senior 2, Daniel was on the starting line for the linemen on the school's football team. I was pleased to see Daniel's positive outlook in mathematics class, especially in his writing for test reflections, as he would look for the small, positive moments to write about to me.

While I was marking one of Daniel's assignments, I noticed that he had written out steps, in his own words, of how to complete gross pay with overtime questions. I focused on this moment in his first narrative and Daniel told me about the importance of putting ideas in his own words for him to learn (and that others could do the same, in their own words). It was in discourse about my noticing his writing steps out in words that I asked him the following question during our first conversation.

J: So do you think if I end up writing a story about you at the end of the semester about how you're good in math class, how you succeed as a math learner, do you think that this will be part of a story, either this specific example or the idea of putting things in your own words?
S: The idea of putting things in my own words.
J: Yeah?
S: Yeah.
J: How come?
S: Because it's like, um,
J: Go ahead.
S: Because it describes who I am and stuff. It's like, I know him for doing this, he explains it in his own words, and it's challenging to do that.

Although Daniel was picking between choices I had posed for an element of his story of success, the significance of the dialogue is found in Daniel's support for his choice. His support was a self-referential statement that pointed directly towards his identity in

mathematics class, as an individual and as a learner. Daniel, with a measure of self-awareness, indicates that he is a unique and particular individual because he explains things in his own words. The movement beyond silence is evident as Daniel supports his claim with a statement about himself. Although Daniel's success as a mathematics learner included an ability to put mathematical steps in his own words, Daniel was succeeding as an individual by shaping his identity through statements about himself.

Both Nadine and Daniel made significant statements about themselves, as individuals, learners, and students. These were self-referential statements, made *by* the learners *about* themselves. The statements were made to shape their identity and help the audience (in both cases, me) to come to understand and see them in a more complete way. In both of these examples, the self-referential statements are connected closely to the identity of the students. However, Nadine, Daniel, and many of their classmates made statements about themselves that related to their thinking and learning processes. While these were also self-referential statements, they were of a different nature.

Saying Things about My Thinking

Prompts that I authored for interactive writings and portfolios often asked learners to consider their mathematical thinking. Learners were encouraged to use specific examples to write about their thinking as a starting point, as a way to engage in metacognitive thought. Schoenfeld (1987) describes three different branches of metacognition: (1) thinking about one's own thinking; (2) self-regulation; and (3) beliefs and perceptions about the nature of mathematics. Most of the learners' writing focused

on either the first or the third elements. As students wrote about their thinking on specific questions, they were being invited to consider how and what they thought as they completed the question. As students wrote about their beliefs about mathematics, they were being invited to consider what the discipline of mathematics is and how it relates to them and their lives.

Erin: Thinking about my solution.

Erin, whom we met earlier in Chapter 6, was often thoughtful about the interactive writing entries that she authored. As part of journal 8, she was asked to describe her thinking for a specific question on a test. Erin wrote, "On the T-shirt question I just got all the prices and then compared them to see which one was lowest, it was a pretty easy question." Erin was just beginning to be explicit about some of her thinking, as we can see in her early attempts at being metacognitive. Of all of the students in the class, Erin demonstrated the most flexibility in her mathematical thinking, and it became part of her second narrative of success. We discussed journal 8 in our second conversation.

J: Can you point out to me some good thinking that you did there?
E: {pause} I'm just trying to remember.
J: Sure.
E: Okay. So, I figured out how much was getting paid. Right? [Mm, hmm.] About how much, over 3. I just made all different packages and then I found out which one was cheapest. All the different ways, like, sets. For, how many did she want?
J: I think 7.
E: Yeah. These are the ways for 7 t-shirts.
J: Okay. So how does that show good thinking?
E: 'Cause I ** {little laugh}
J: Okay. Writing all that stuff down. Do you think the thinking is in deciding between these last few prices? Or is the thinking in doing the calculations?
E: Thinking is in, hmm, probably in the last part.

J: In the last, in comparing the last prices?
E: Yeah. Well, no, that's not thinking. Well, yeah, probably figuring out the packages.
...
J: Was the math thinking in the adding up of the numbers?
E: {pause} I don't know. **
J: I don't know. I'm asking you! So, is that thinking when you're just using a calculator?
E: No.
J: No. So, the thinking was in finding the packages and then the rest was just?
E: calculator.
J: Just calculator stuff. ... Why did you choose that question, out of all of them?
E: {pause} I didn't get it at first. I couldn't get it at first, and then I thought about it. And then I did it. **
J: Good. Okay, so you didn't get it at first, you had to do some thinking [Mm, hmm.] and you got it all right. So, that showed that it was a question that you did some good thinking on.
E: Mm, hmm.

Erin's metacognitive abilities are just emerging; she still had difficulty in describing some of her thinking. However, she does demonstrate two of the elements of metacognition that Schoenfeld (1987) described, thinking about her thinking and expressing her beliefs about mathematics. Through a combination of her journal and conversation, we learn that Erin thought step-by-step through the question, including creating different packages of T-shirts systematically to compare the best price. Near the end of the conversation excerpt, Erin tells us that mathematical thinking is not the arithmetic that many of her classmates believed comprised mathematics; rather, she is expanding her view of mathematics to include logic and reasoning as component parts.

Erin's success existed on two different levels in this example. First, she exhibited strong mathematical thinking in her response to the test question by considering all the pricing details and using mathematics to support her decision-making. Creating a systematic way of comparing items and making a consumer decision using reasoning is

an important goal in Consumer Mathematics, and demonstrates the mathematical rigour that can be a part of the course. Second, Erin was beginning to engage in thinking about her thinking. In doing so, she was engaging in two kinds of metacognition and more importantly, making self-referential statements about her thinking. The nascent ability to make self-referential statements showed a movement away from silence in Erin's success in Consumer Mathematics.

Lindsey: Using my own steps and methods.

When we were introduced to Lindsey in Chapter 6, her stance of silence was illustrated in her belief that mathematical ideas were not her own. As the semester progressed, Lindsey and I were in discourse about two strategies that helped her get unstuck – asking others for help and looking back in her notes for examples with specific steps. We discussed how these strategies were helping her be successful in Consumer Mathematics. In her final portfolio, she wrote

> Some strategies that helped me this year in math is looking back on my notes and asking for help. I am going to keep on using these strategies because they are very helpful for me. I find that they are helpful because if I am stuck on a question then I just look back on some of the examples that we did then just follow the steps because it's very helpful.

Although I had noticed the strategies initially and asked Lindsey about them in our first two conversations, this definition of her success had become her own over the semester. She was able to look back, retrospectively, and tell me the ways she had been successful. Lindsey's communication about her thinking using the two strategies demonstrates Schoenfeld's (1987) second element of metacognition, self-regulation. In this example, Lindsey was describing the manner in which she completed questions that she perceived

to be problems. Describing how and when she decided to look back in her notes is an example of how Lindsey worked through problems in mathematics class.

In our final conversation, which occurred after the semester was over, we had an opportunity to talk about the different steps she had taken to be successful in mathematics class, including her two strategies. Notice what Lindsey said about using her own steps (developed from her two strategies) in relation to her beliefs about coming to know.

J: Was that a change for you this semester?
L: Yeah, because last year in math I, I was doing alright, but it was because like we had like, like other teachers in there to help you do it. You're kind of just like going with the step by step, not really giving you a chance to, you know, do it on your own and say, "What if I do this? Is that the same or whatever?" [Okay.] So it was basically be there, basically do the work for you, so.
J: So is it important then for you to have time to try it out on your own?
L: Yeah, 'cause then you actually know what you're doing.
J: Okay. Rather than a teacher tell you
L: Yeah.
J: or somebody else telling you?
L: Uh, huh.
...
J: Okay. So is that a difference between using that strategy to get unstuck rather than to remember or learn?
L: Umm. Well it's a little of both because I'd want to do it my way, you know, like so I understand exactly what I'm doing then you know it. If someone else is telling me and me not getting a little bit of, you know, what's going on, [Mm, hmm.] so I'd just remember my steps.
J: Okay. that's good. Okay. So do you think you used those two strategies to learn then?
L: Mm, hmm.

By the end of the semester, Lindsey had come to believe that it was important to construct steps for herself, because she would know how to do the steps, understand the steps, and remember the steps. She also noticed the limitations of the kind of help she had received in a previous mathematics course where she was not provided with opportunities to do and construct the steps on her own.

Lindsey had not moved far away from a stance of silence, but there was evidence that she was beginning to believe that she needed to construct the steps for completing mathematical questions. She is not clear as to whether those steps would be quite similar to the steps provided in examples, or if she meant that she needed to make sense of the steps she would use to complete questions. Rather than relying on the authority figure in the classroom as the source of knowledge, she moved away from that characteristic of silence and began to believe that she needed to construct her own knowledge and understanding. In explicating this belief to me, she made numerous self-referential statements about her thinking for completing questions. Being able to say the importance of her two strategies was a successful moment for Lindsey. But her self-referential statements also pointed towards the way in which she learned and remembered mathematical ideas, which extends beyond the notion of metacognition.

Saying Things about My Learning

When students wrote metacognitively, they were writing as thinkers within the classroom. Some of the self-referential statements students made were about themselves as thinkers, thinking and saying things about their thinking. However, metacognition did not encompass all of the things students wrote about themselves as members of a school community in their interactive writing. Some of the self-referential statements students made were about themselves as individuals, unique and particular. Two other stances that these individuals took within the classroom were as students and learners.

Metacognition, though, is limited in its definition and does not accurately represent the stances of students and learners within the classroom context.

No terms in the literature, that I have located, have been created to accurately describe when individuals think about their *studenting* and *learning* processes. When I use the term *studenting*, I am referring to ways in which individuals fulfill their stance as a student in the classroom. The stance of a student would include methods of studying and reviewing, responsibility in completing homework and handing in assignments, positioning with school as an institution, paying close attention to attendance and tardiness, and other such actions. When I allude to *learning* processes, I am referring to ways in which individuals fulfill their stance as a learner in the classroom. The stance of a learner would include the ways in which learners come to know and understand, their positioning with authority, their beliefs about the reception or construction of knowledge, and other related actions. Engaging in thinking about studenting and learning is a higher level of cognition that invites the individuals in a classroom to analyze and make meaning of the way in which they are students and learners in the classroom. This higher level of cognition is akin to the processes of thinking about thinking, thus the term *meta-* is an appropriate component of a term to describe thinking about studenting and learning. While no other term has been used to describe studenting and learning processes in general, I will use the term *learning* in a more broad and general way to encompass those processes.

Metalearning, then, is a term that could be used to describe when individuals within a classroom think about their studenting and learning processes. The reason for inviting individuals to engage in *metalearning* has six different purposes (although I do

not intend the list to be exhaustive). First, it brings *learning* into focus in the classroom setting, rather than focusing on specific content. This shifts the valuation of knowledge and understanding to encompass broader goals than merely learning specific mathematical outcomes. The second purpose is closely related, because metalearning seeks to address the "Student Goals" at the front of the curriculum document (METY, 2002). These are expectations, mandated by the government, of the kinds of learning that should be occurring in mathematics classrooms. Third, when individuals become analytic about their studenting and learning, they can learn how to get better at their studenting and learning processes. Not only are individuals encouraged to describe their studenting and learning processes, but also to consider how they might make those processes more effective for themselves. The development of these processes is critical to life-long learning.

Fourth, metalearning focuses on the studenting and learning processes of each individual in the classroom, allowing for differentiation of thinking and learning that is appropriate and effective for each individual. Individuals come to shape their identity as a learner and student by engaging in thinking about their learning and studenting. Fifth, if individuals are aware of how they learn, especially in different settings and with different foci (for example, conceptual understanding or skill development), they could improve their learning of specific subject content. Finally, metalearning also changes the didactic contract in the classroom and the asymmetrical power relationship inherent in many classrooms. The shift in power relations occurs within the context of metalearning because the learners are seen as experts at their own studenting and learning, and the teacher acts essentially as a guide to prompt thought of metalearning awareness and

growth of studenting and learning processes. The asymmetrical power relationship between students and teacher is minimized because the learners are the experts and the teacher is learning alongside her learners. Together, in mutuality, they are in discourse about each individual's learning and studenting.

Some similarities can be seen between *metacognition* and *metalearning*. Both occur on a higher level of cognition within the classroom, and invite individuals to be aware and analytical about the processes they engage in daily in the classroom. As individuals engage both in *metacognitive* and *metalearning* thought, they have opportunities to get better at related processes. Both are aimed at achieving broader learning and thinking goals in the classroom than merely specific subject content outcomes. However, an important distinction needs to be drawn between *metacognition* and *metalearning*. *Metalearning* cannot be a sub-element of metacognition because the purposes and stances that individuals address in *metacognition* and *metalearning* are quite different. Rather than merely considering cognitive processes, *metalearning* takes into account the individual's relationship with others and school as an institution. Returning to specific examples of students' words that are *metalearning* and self-referential in nature will clarify further the concept of *metalearning*.

Whitney: This is how I study successfully.

When Whitney was introduced in Chapter 6, although she had a difficult time talking about herself, she had a long list of study strategies that she enacted to succeed in Consumer Mathematics. In our first conversation, Whitney told me about those strategies and I came to see that what Whitney was describing was not necessarily a way to *learn*

mathematics, but methods that would help Whitney *study* and *remember* mathematical concepts and skills. When she encountered difficulty describing the difference between a *student* and a *learner*, we decided that it would be an ongoing space of discourse throughout the semester. We returned to the comparison of roles in our second conversation (a revisit of data from the previous chapter).

J: How do you make the decision from going to being a student to being a learner?
W: Umm. I think it's when it's, like, a bigger assignment. Like, if it's textbook work, it's kind of more bare minimum thing. Because textbook work's just kind of repetitive, practicing, like, regular stuff. [Okay.] But when it's more of an activity that you can do with a table partner, it's kind of {pause} I don't know, it's usually when you go back to being a learner. Because it has more to do with, like, the learning rather than the practicing.
J: Okay.
W: It's more new stuff. Or more important stuff, I guess.
J: Oh, Okay. [Mm, hmm.] So there's something different to having an activity to do – there's learning there. [Mm, hmm.] But with a textbook assignment?
W: Well, it's more stuff that you've already learned. And you're just going over.

Whitney describes well the difference between *studying* mathematics and *learning* mathematics within the roles of students and learners. For her, *learning* mathematics means acquiring new information – and later on in the conversation, she clearly described her received knower stance (Belenky et al., 1986) when she said that learning was occurring when the teacher told her the ideas. The remainder of the activities within the classroom, like completing textbook questions as Whitney points out, would be a function of being a student, thus being a *studenting* action.

Later on in the same conversation, Whitney and I returned to the idea of her flexibility and use of various study strategies that she was finding to be effective in Consumer Mathematics. One of the activities that Whitney had placed in her Consumer

Decisions Portfolio was a cell phone activity where students were comparing several different calling plans in two different ways. The following day, they had written a journal describing one of the decision-making processes in general. I believed that Whitney might be ready to add another effective strategy to help her *learn*, and I did not expect Whitney's response.

J: So there's two parts to what we did there, Whitney. You actually went through the activity and you went through making the decisions.
W: Mm, hmm.
J: And then what I had you do in journal 9 was think about some of the things you had done and some of the questions you had answered.
W: Mm, hmm.
J: Do you think that that's something that you could add to your study package – to do with even homework, like textbook questions?
W: To do?
J: To do this kind of journal stuff [Ooh.] with textbook questions.
W: Okay, okay, okay. Umm. I guess so.
J: Like, let's say you completed, actually, we can even think about this week. One day you had a textbook assignment where you had to fill out all the withdrawal slips, [Mm, hmm.] and deposit slips, and write cheques. [Mm, hmm.] So, at the end of class, do you think you could have done something like this, to explain some of the general steps or explain what you were doing in your textbook assignment that day?
W: Yeah. I guess so. I probably wouldn't use it, though. I don't think so. Because I know that's what I have to do – like writing it out. I don't know. I don't know if that would help me. [Okay.] But, yeah I guess so.
J: Would it be, would it depend on the topic?
W: {pause} Yeah. {pause} I guess, maybe, if I was asked to do it. Because I don't know if I would use that. I don't know.

Even though Whitney initially conceded to adding on to her strategies, as we view her whole response, she did not really agree with this addition. The "I don't know" statements are not an absence of words, like we saw in Erin's example, but rather Whitney beginning to take a position that did not necessarily meet with approval from an authority figure. Although I was surprised with Whitney's response, as I thought about it afterwards, I heard in her words a process of building confidence in her strategies and

confidence in herself to succeed with those strategies. She was not ready for a change. For Whitney, the biggest change was selecting a course that was within her range (as she described it) and that she could succeed in such a course. Even in the final conversation, Whitney did not locate a change within herself, but within her context.

Part of Whitney's success as a student in Consumer Mathematics was her consolidation of studenting strategies. She perhaps had not noticed movement within herself and with her stance, but I noticed that her consolidation was movement within a plateau where she was building confidence. In explicating her strategies and their usefulness to herself and to me, she was demonstrating a self-awareness that indicated a movement away from silence (although still an absence of self-referential statements). Her willingness to counter my interpretation of her lived experiences (in the final conversation, that she had not changed) and suggestions for improvement (adding on describing her thinking) demonstrated that Whitney was coming to see her ideas about her learning and studenting as valuable. Whitney illuminates the distinction between *studenting* and *learning*.

Terri: This is how I learn successfully.

Terri and Whitney approached this Consumer Mathematics class in much the same way. Terri had also taken Pre-Calculus Mathematics in Senior 2, failed, and was catching up on her mathematics credit by taking Consumer Mathematics 20S in her Senior 3 year. She was also quite serious about her learning and studenting within the course, working diligently in class (which also contributed to her interacting with only a few students, with on-task dialogues), and preparing for tests outside of class. She also

put considerable effort into her portfolios, writing reflections that helped her point towards what she was doing well, and usually completing the portfolio ahead of time. In our conversations, Terri often attempted to do more than agree or disagree with the idea in a prompt, but would go on to explain or say more about her initial reaction.

In Terri's first portfolio, for the Wages and Salaries unit, she had mentioned in several places *improving* during the unit. Although she noticed the improvement between different classroom tasks, she did not describe what happened while she was improving. So, it became an object of discourse in our first conversation.

J: Should we look back at that wages and salaries; do you want to talk about what improving means and how you do it?
T: I don't know. I think I just like understood the concept at first; it just took me awhile to catch on and …
J: Like steps?
T: Yeah. I think I was making mistakes somewhere, like on this one, I was doing something wrong.
J: Okay, this is page 26 I think.
T: Look at those with the rounding. {little pause} I did something wrong.
J: Yeah, it looks like the rounding. Those are the numbers I circled. That's a neat idea to think about, Terri. The idea that you understand the big idea about how to do it and then it's afterwards that we fill in some of those specific steps.
T: Going back and making it right and doing it **
J: Is that how you find you usually learn math? You first get the overall picture and then you fill in some of those little details. So how do those details get filled in?
T: Just by looking back on those mistakes and, like, seeing what I did wrong and trying again.

I learned a lot about how Terri learns by listening to her in this conversation. In telling me about how she learns the concepts first and catches on to the little details afterwards, she was engaging in *metalearning* thought – thinking about and then saying how she learns in mathematics class. Although she did not describe further the process of conceptual learning that she used, in our second conversation she provided two specific

examples of concepts and component skills. One of the examples related to the trigonometry unit, a unit that she found difficult. When I asked her about concepts and little details in the trigonometry unit, she responded by saying, "I don't know. The big idea is just trig. And then the little ones are all the different things to do." The second example was about perimeter and area, where she said the big idea for perimeter and area and then reported that the little details were the formulas that went along with perimeter and area. Making a general claim about her learning and then using specific examples to support the claim demonstrated to me that she was engaging in *metalearning*.

Even though I pointed to Terri's portfolio reflection as an example of a stance of silence, her explanations in the conversations, through general and specific statements, demonstrated a shift away from silence. In telling me about what it means for her to improve, she began to make self-referential statements about her learning in Consumer Mathematics. The idea of improving, which Terri equated with *understanding* by the end of a unit, demonstrated one of the ways in which she was successful during the semester.

Roger: The connection between active involvement and learning.

Roger was the personality in our classroom. He was a Senior 3 student also catching up on his Senior 2 mathematics credit, but did not have a studious approach like Whitney and Terri. He would often volunteer ideas or answers in class, but also spent time resting and did not always engage in activities consistently. He often placed emphasis on finding real world applications of the mathematical concepts he was learning. In effect, he exerted the minimal effort to maintain an acceptable standing in the course but also tried to be responsible in meeting the expectations of the course and

my expectations in the classroom. Roger was intriguing to have conversations with because he brought his personality to the conversations, acting almost like a celebrity being interviewed by the media. However, I found that Roger tried hard to respond to my prompts in conversations and often provided a quite detailed or lengthy response. His personality made him the most unique learner-participant in this study.

In our first conversation, Roger had described the connection or flow between his active involvement in class and his learning.

> J: I'm going to ask you one last question and then we'll finish up for today. If I end up writing [Yeah.] about how you succeed sometimes as a math learner in class, do you think that getting actively involved will be part of that story? {pause} Is that what helps you to be a successful math learner?
> R: Yes. {little pause} I think that would be part of the story because when you get involved in, when you get involved you get more into it, so it becomes more like a passion for doing it. So, when you have a passion, you want to do it. So, you want to be there. So, you want to learn.

Notice that Roger attributes his learning to active involvement, that getting involved comes before learning. When Roger and I looked back on the ordering in our second conversation, he added one more detail.

> J: Is there anything that you would change to that?
> R: {pause} You want to become more successful at it, maybe somewhere in there.
> J: Okay. Where would you add that?
> R: {pause}
> J: You want to become more successful.
> R: Which means you want to learn. And then to want to learn, you want to be more successful.

Thinking about his success was becoming a part of his discourse about mathematics class and his learning. However, as I thought further about the ordering of active involvement to learning with Roger's statement "When I don't know a question as well as I should know it, I should get more involved with it. I think.", I began to question whether the

order should be flipped around. I presented Roger with the reverse order and asked him about it in our final conversation.

R: Well, I think the best way to have success is learning and then knowing. [Okay.] Because, normally you don't know something, it kind of takes you away from actually wanting to be in there and not getting involved and active in class, [Mm, hmm.] but you're actually learning, you're actually getting it. It's clicking to you. [Mm, hmm.] It has more knowledge so you could apply it to anything you really know. [Mmm.] And working with Karl in the second activity was probably better because we're probably working more as we know what we're doing because we got the capture-tag-recapture [Okay.] ** and we applied it to what we were doing and we both got it, [mm, hmm] so it kind of helped us both to learn what we're doing by applying it to different projects and different magazines. But we both knew the basic knowledge about what we were doing [Mmm.] So I think it's being active, right? I think you should be ** learning and then being active. [Okay.] 'Cause when we're learning, you learn it first so you can be more actively doing what you learn.

...

R: I think, the original or the reversed? I want to say kind of the reversed. Like at first it was this, but then I think it was more like this, 'cause it's written, I can see it works better from the ways I've learned 'cause I do learn from the examples of what I see [Yeah.] and then I want to be there because I learn and when I know it. It's easy. [Yeah.] And then I just want to keep doing it. [Yeah.] So I think it's the reverse that suits me better.

J: Okay. Can you think of a specific time that would kind of follow along with this reverse sort of?

R: Ahh. That's a ** project [Okay.] because we worked with reflections [Mm, hmm.] and then we started working with partners, so I kind of wanted to be there. [Mm, hmm.] And then we were working on it and I was like, "This is pretty fun." [Yeah.] So I'd get it. So I wanted to do it. [Mm, hmm.] Then I wanted to make it perfect so ** passion. 'Cause I wanted every detail to be perfect, all the drawings and maybe get more involved into the project. [Okay.] 'Cause I wanted to make it the best project I could do. [Yeah.] And then be more involved.

Roger deliberated between both orders of learning and success. He came to believe that in order to be successful in Consumer Mathematics, he would need to learn a little bit first and then move towards more involvement. Perhaps Roger and I could have explored the possibility of this being a circular model, but I was also considering a starting place for Roger (and perhaps others) to begin to be successful in Consumer Mathematics.

Roger experienced success in several different ways during the semester, but in the above excerpts he demonstrated a specific kind of success. He is effectively engaging in thought and discourse about his own learning – the order in which his learning occurs and the best way for him to be successful. He moves between making general statements about the ordering of his learning and using two specific examples (with Karl and with the Quilt Project) to describe further his beliefs about his learning. Roger's explanations provide evidence that Roger was moving away from silence in the self-referential statements he was making about his learning. He considered carefully which order would better describe his successful learning stance before he decided that the reverse ordering was most accurate.

If we consider the examples that Whitney, Terri, and Roger provide in terms of their thinking and talking about their studenting and learning, we come to see what it means for Consumer Mathematics students to be engaged in a *metalearning* process. Different from thinking about cognitive processes, or the act of being *metacognitive*, engaging in *metalearning* meant that the students were thinking about their role as a student and/or learner in the classroom and how their actions in the classroom contributed to their role. Their actions in the classroom were specifically related to how they were learning and studenting, but also about their positioning with authority. More than that, Whitney, Terri, Roger, and their classmates considered how they were learning mathematics and how they could improve their learning processes within the classroom by exploring how they learned and by making self-referential statements to that effect.

Whitney was able to explain the difference between learning/studenting and being a learner/student, within her evolving position with authority (which we will see more

clearly in the next chapter). Both Terri and Roger were able to say general things about how they learned best, and then supported those claims with examples, rather than just being agreeable with authority. For these learners and others in the classroom, interactive writing, portfolios, and the conversations became opportunities where they could think about their studenting and learning and also say those thoughts to themselves and others. And it is in engaging in *metalearning* that the learners experienced success and demonstrated movement away from silence.

Together with students' statements about their metalearning, when students make statements about their metacognition and about themselves it makes apparent the variety of opportunities students use and the variety of ways in which students talk about themselves, or make self-referential statements. Talking about themselves through the use of self-referential statements is defined by their actions and relationships within the classroom setting. The construction and verbalizing of self-referential statements is an indication of both the students' movement away from silence and a way in which students can move away from silence. This duality of means and ends will be explored in further detail in the subsequent chapters. What we can see from these students' examples is that, against the backdrop of silence, students were beginning to say significant things about themselves and about their context. The learner's narratives of success and the themes in the narratives, through reading, discourse, and consideration, became *their* words for their success in Consumer Mathematics class. But not only was it *in* their terms that their success was explored, but it was also *on* their terms, as they chose to enter into discourse about their success using the examples of their lived experiences that they selected to tell about as moments of success.

Marks as a Non-Theme of Success

We saw in the above examples that success was predicated on the students' studenting, learning, thinking, and identity-building. Focusing on studenting, learning, thinking, and identity-building is not often the primary way that individuals define success in school. When students, teachers, administrators, parents, or the general public are asked about whether a particular individual is succeeding in school, they will often include in their response a statement about the individual's marks. A response like that constitutes a marks-based definition of success, which is the predominant mechanism of noticing and expressing the success of students within the schooling system. A marks-based focus is concentrated on by students, often encouraged by teachers, necessitated by provincial standards testing, and enforced by the schooling system in general.

Exploring in detail a marks-based focus of schooling is outside the scope of this document, but it is important to recognize that marks have become a simulacrum for learning in schools. Baudrillard (1983) defines simulacra as simulations of reality that have replaced, or have come before, the actual reality. At one point a simulacrum was just a simulation of a reality – there was an obvious relationship between the two. As the simulation becomes increasingly the focus, some important characteristics of the reality that existed in the simulation become devalued (in terms of their relationship to the focus), and the relationship between reality and the simulation begins to disintegrate. Because of the increasing misdirection of attention, the simulation becomes the sole focus and exhibits no relationship to the reality from which it came – a simulacrum (Baudrillard, 1983). Although at some point, marks might have been an indicator of the

students' learning, marks have replaced that reality, the fundamental purpose of schooling. Rather than focusing on learning, the school system focuses on marks and often its purpose is to demonstrate good standing with marks in relation to other schools.

The themes of success in the learners' narratives I authored moved away from a marks-based definition of success. As I considered each learner-participant's data, moments of success that were not marks-based often presented themselves as moments of significance to talk about with the learner. These moments of success often became the focal point of the learners' narratives. Of the three narratives I authored for each of the eleven learner-participants, only three learner-participants had marks mentioned in any of their narratives. This variation in focus, from the rest of the schooling system, came partly from my presuppositions about marks and predominately from noticing the success of these students in the inquiry. Although I embarked on this inquiry to notice, and then be able to say, the nature of success, I believed that school was about more than marks and that success, then, could be situated within a broader definition than marks as well.

We can most likely agree that for many of these learners, their definition of success (or failure) had been based on marks in previous school years. Many of the learners started to use the words we had talked about in conversations to define their success. Their use of these definitions of success came from reading their narratives, considering the kinds of success that I pointed towards, and being in discourse about particular elements of their success. The use of broader definitions of success was evident as part of the students' languaging as several of them referred to their narratives' themes of success in their final portfolio. So, although our schooling system

communicates that marks are the goal of being in classes and are of central importance, it was not central to the nature of success of these learners.

Even though marks became a non-theme of success for these learners, I did enter into conversation with a few students about their marks. Several of the journals over the semester invited students to set goals and re-evaluate those goals within the context of their report card marks (distributed twice during the semester). Although I was deliberately ambiguous about how to talk about goals, many students set marks-based goals at the beginning of the semester. Some of my interactions with students in class were also about marks, much in part because of the milieu of the schooling system and the traditional contract between student and teacher. The fact that students brought up marks in their journals and interactions with me indicated to me that marks were still important to them, especially early in the semester. Because the discourse of marks was part of the lived experiences in the classroom, it became a topic of interaction in some of the conversations. Even so, the direction and focus of the conversation was often not about the marks, but the marks were used as an example space or a place to begin a conversation that students and I could talk about their success, *in* their terms and *on* their terms. Karl and Cynthia will demonstrate that although marks entered our discourse, the conversation was about much more than the marks students had in Consumer Mathematics as a way to define the nature of success.

Karl: Evolving Goals

We met Karl earlier when he was pointing towards *remembering* in some of his portfolio reflections, but did not define or support his use of the cognitive and studenting process. To Karl, remembering ideas and skills in mathematics class was important because if he remembered, he could explain the concept or complete the skill on a test and get good marks. In journal 1, Karl's goal for the course, "to try and get in the high 80's", demonstrated a marks-based definition of success. Re-evaluating his goals after his first report card, he noticed that he had reached his marks-goal and decided to "try and get into the ninties for [his] next report card." Because of Karl's focus on marks, I decided to ask him in our first conversation how he would cut his missed marks in half for the second report card. Karl had just completed describing to me some of the new strategies he was enacting this year to get good marks.

J: So do you think that those strategies that you're using right now, that it helped you cut your missed marks in half? Are they going to help you cut your next set of missed marks in half?
K: I hope so.
J: Can you say a little more?
K: Well, ah, I didn't use the quizzing of my parents and explaining stuff to my parents, like for my first report card, so that also improved my mark a bit.
J: Great. How did you decide to do that?
K: Well, I thought of what I could do in order to refresh my memory every now and then and ah, the like and that was the first idea that popped into my head. So, I used it.
J: That's great. That's very thoughtful about how to be a student, Karl. I like that. Let's go on to that marks idea we talked about in strategy. What do you think marks indicate?
K: Ah, how proficient you are at certain abilities.
...
J: Is there another example in that stuff?
K: Um,
J: Of how marks indicate that you're proficient in a skill?

K: Okay, um, I guess number 7 where I found a length or angle in a certain triangle. I, um, knew the mathematical formula with the proper abilities to my skills and such and I got the right answers.
J: That sounds good. I'm interested in that word "proficient" that you used. It's not just being able to do the skills, is it more than that?
K: Yeah, it's being able to do the skills well.
J: Okay. Can you explain doing skills well a bit more?
K: Like, uh, being able to do more than half of the questions right. Like, uh, reports or something like that.
J: Okay, sounds good. Do you think you could help me figure out how aiming for high marks sometimes means consistently using good strategies?
K: Yeah, because if you aim for a higher mark, you have to study and do other things to review your notes and such and when you do that you get higher marks because you know what you're doing.

Even though the interaction Karl and I had in the first conversation began by talking about marks, it moved towards what Karl believed it meant to get good marks – being proficient. Karl's description of study strategies and processes to support being proficient was a way that he entered into a metalearning discourse, specifically talking about his studenting in the classroom. More than talking about marks, it indicated a movement away from silence as he talked about studenting and began to explain, in general and with a specific example, what it meant for him to be proficient in mathematics class.

One of the other data pieces that supported the authoring of the first narrative was Karl's Trigonometry Portfolio overview. In the overview, he stated:

> All in all I'd say I had greatly improved in trig since last year. From mediocre marks to very nice marks in the 80's and 90's. I learnt and reviewed all of the things from the last cupple of years as well as learning new things.

Similar to the first conversation, Karl's primary focus was on his marks for the trigonometry unit. As we talked about his success in mathematics class over the first few months, Karl privileged discourse about marks over discourse about learning. Although

Karl was beginning to make a movement away from silence in the conversation, this overview continued to demonstrate Karl's marks-based conception of success.

I still had lingering questions about proficiency, so Karl and I returned to the idea of proficiency in our second conversation. I wondered if success, for Karl, was about proficiency, rather than receiving good marks. If Karl's success was about proficiency, I wondered what it meant to be proficient and proficient at what in mathematics class.

J: Can you say a little bit more about being proficient and getting questions right?
K: Well, the thing over here, the story about me, that you made. Umm, says that I've said before that getting half the questions right is being proficient. [mm, hmm] And {pause} apparently you also think that getting the assignments, or whatever it is – should I read it again?
J: Mm, hmm. You can read it out loud if you want.
K: No. {pause} And you also think that there's different ways that I've been proficient in math class. However they may be, I don't know.
J: Okay. Is there a clue there as to how you might be proficient in other ways?
K: Well, complete the assignment questions quickly and complete them.
J: Okay. Do you agree with that?
K: Yeah, I guess. {pause}
J: Do you tend to complete things quickly?
K: Yeah, usually. If I, I'm, like, I'm not bored or anything. Then I can do stuff quickly.
...
J: So, completing questions quickly, is that one way that you're showing me that you're successful in math class this year?
K: I guess. {pause} 'Cause if I'm finishing them, then I guess that means I'm being proficient. That I'm doing good.
J: Okay. Do you think it's showing yourself that you're being successful in math class?
K: Yes. Because I finally got over a 72 in math!
J: And that felt pretty good?
K: Yes.
J: Neat. Is it that idea of being proficient that helped you get a mark over 72?
K: Yeah.
...
J: The story fits with you?
K: Yes. Because I'm actually trying to be proficient.
J: Okay. So that's sort of your goal, too?
K: Yeah.
...

J: So, is completing all of the questions, all of the textbook questions, all activity questions, things like that. Is that important to becoming proficient?
K: Yeah. Because by doing, I learn. And I also get a better mark. So, it helps me getting proficient.
J: Okay. So there's two ideas. By doing them it helps you learn. And then it also helps you get a better mark. Can you say a little bit more about those two?
K: Well, by doing them, I could possibly get a better job in the future. And also by having a better mark, it will also affect my job in the future.
J: Okay.
K: That's why I'm trying to do better in math.

There are two changes that I began to notice in Karl's discourse during our second conversation. First, there is an ordering in Karl's responses to my prompts that changed. In the first conversation, marks began as the topic of conversation and then moved towards proficiency. In the second conversation, Karl addressed the idea of proficiency before marks. A few statements later, he privileged *learning* over *marks* in describing the importance of becoming proficient. This privileging of learning over marks remained throughout the semester as Karl wrote in his final portfolio reflection, "During this year in math I learnt many a new thing" and later moved to saying that he "had good marks." Second, Karl's goals for the course are changing. Rather than being solely marks-based, Karl expressed his goal of being proficient to me. He indicated his evolving sense of goals both through his privileging of learning-discourse over marks-discourse, and also his stated goal of proficiency, not just good marks.

Through Karl's words and evolving goals, he demonstrates that his success was more than the marks that he was receiving. His success was evolving to include being able to express his goals, as they became more complex and moved away from being solely marks-based. Karl indicated in his goal statements that he was beginning to think about his success in more complex ways, namely learning and proficiency. In turn, he

was able to say more about his success demonstrating a movement away from silence as he became more self-aware of his success. Karl also demonstrated a movement away from silence by making statements about his studenting in conversation with me, and showed a change in position with the schooling system as an authority figure as he essentially peeled back a layer of simulacrum to reveal metalearning-based goals.

Cynthia: Identity, not Marks

Cynthia was a Senior 3 student who found herself in the position of catching up on her mathematics credit from Senior 2. She was a very shy individual, who took much of her sense of accomplishment from playing flute in the school band. How others perceived her was of central importance to Cynthia, both academically and socially. She felt that school, and in particular mathematics class and tests in mathematics class, exerted a lot of pressure on her. She also showed the feeling of pressure outwardly through her facial expressions which I observed when tests were being returned in class. Cynthia worked diligently, but slowly, in class and found in Nadine a learning partner with whom she could learn and depend on throughout the course.

One of the key moments of success that Cynthia pointed towards several times was her first test. I recorded in my field notes the day I returned the test that, "Cynthia was so excited about her mark (aced the test) that she wanted to take it home to show her parents!", rather than allowing me to read and respond to her test reflection immediately. Cynthia frequently brought up her first mathematics test mark, as a source of pride and accomplishment *even in mathematics class*. I felt the test, and marks in general, were

important to discuss in our first conversation. Within a dialogue about marks, Cynthia stated, "I try, it's just that I'm not good at math". After the end of the semester, in our third conversation, notice the difference in Cynthia's recollection as she brought us back to that key moment of her first test.

J: So, Cynthia, the semester is done and I wondering if you could sit back and just kind of tell me about the semester, just describe it.
C: Well, it was, it was a lot of fun, actually. I never really liked math before, but this semester I actually enjoyed it. [Wow.] Yeah. I was really surprised.
...
J: Tell me about the start of the semester.
C: I was really worried 'cause just last year I got a really bad mark and well, it was generally bad and complicated. And then I came in with a bad idea, like every year I go, "Oh great, another math class. It's going to suck, I'm going to fail and be disappointed." But actually the first while I was like "Okay, maybe I'll get it, maybe I'll do okay." And then, getting my test back, there is hope for me {little laugh} 'cause I got a good mark and that was really important to me.
...
J: So, it was successful because of your marks. Was it successful in any other way?
C: Well, understanding 'cause you know that's pretty important. All the other times the teachers would try and teach you and you're like, "I don't understand." But now that I understand it, it's interesting.

As Cynthia brought the conversation back to her first test mark, what we can see in her responses are her first tentative steps toward confidence in herself. Cynthia's confidence in herself can be seen in her expression "maybe I'll get it, maybe I'll do okay." In Cynthia's words, she was successful because of her marks and because she understood and was interested in mathematics. She spoke the words in her third conversation with confidence in herself to be able to understand ideas that were being explored in mathematics class, but that the confidence began to emerge through her first test score.

The ongoing interaction that Cynthia and I had during the semester about her marks was not necessarily about the marks; rather, it was about her emerging sense of

identity in mathematics class and her development of self-confidence. The mark she had on the first test was a key moment to begin forming her self-confidence, but her confidence is most evident in her retrospective description of the semester. Cynthia came to the mathematics course as a complex self, as a mathematics learner, a mathematics student, and an individual. I believe she shows confidence in herself as a mathematics learner when she talks about being able to understand the mathematics in the class. Her own recognition of her understanding demonstrates an ability to construct approval for herself, rather than relying on approval from authority, which was a stance of silence. Her movement away from silence is also indicated in her ability to make a self-referential statement. Her emerging confidence is allowing her to view mathematics as something less than scary. Confidence in self was one of the ways in which Cynthia came to be successful in mathematics class.

Both Karl and Cynthia, during the semester, indicated that marks were important to them. I listened to what they said to me in interactive writings and portfolios closely enough to recognize the goals and importance they placed in marks. In weaving a discussion about marks into our conversation, I came to see that marks were a non-theme of success. Although these two learners, and some of their other classmates, began the semester by defining their success in terms of marks, more complex ways of being successful came into their view as we noticed individual moments of success for each learner. Success in metalearning and self-confidence were two elements of success that I noticed in Karl and Cynthia respectively, that moved beyond marks.

Listening: *More than Just* Seeing *the Success*

The narratives of success that I authored for each of the learners in the three conversation cycles were crafted directly from the data that I collected from the learners or me. Although the second and third narratives are developed around a theme of success that came from interpreting data, the themes and writing are grounded in specific examples taken from the learners' lived experiences. As the learners and I interacted with each other about the ideas in the narratives, the conception of success that evolved for each learner was defined *in* their own terms and *on* their own terms. It was a *particularized* interpretation – particular to each learner and her/his success. As I authored each successive narrative, I noticed that the learners' success became more complicated and complex. The particularized interpretation of their moments of success in the classroom, forming the foundation of the narratives and conversations, was one level of success that the learners and I noticed for their lived experiences. However, as van Manen (1990) indicated, more than one interpretation of data can exist. It is important to move beyond the particularized interpretation to a more meaningful interpretation. Interpreting data meaningfully requires that the inquirer and audience do more than *see* the words of the students. Interpreting the data meaningfully requires *listening* intently to students' words to understand what it means to be successful in Consumer Mathematics.

Observing the words of each learner involved in this inquiry has provided the opportunity to notice that each learner did not remain entirely within a stance of silence during our semester together. Rather, each of them, in particular ways, took steps away

from silence as they began to talk about their confidence in self, their confidence in context, their identity as unique individuals, their thinking, their learning, and their studenting. Against the backdrop of silence that was the learners' initial stance towards learning and studenting in this mathematics class, the nascent words of learners emerged as they engaged in reflective and self-referential talk to themselves and to others. Although the success of learners is complex and complicated, the movement away from a stance of silence embodies the *emergence of voice* for each of the learners as the *essence* of their success in Consumer Mathematics.

Chapter 8

The Emergent Voice

As an inquirer, I came to understand different elements of success that came from the lived experiences of each learner, my conversations with each of them, my reading of theoretical frames, and my intimacy with the data. This chapter will explore the meaning of the learners' success through the lens of an inquirer, or in the inquirer's terms. It will be important to, first, understand the process in which I began to notice a generalized theme, *the learners' emergence of voice*, in the data and the development of the theme. After we have come to see how I drew a generalized theme from the data, I will describe over the next two chapters, the theme of emergence of voice.

With the data in front of me and the lived experiences fresh in my memory, I began to consider, as an inquirer, what the nature of success of the learners had been during our semester together. Looking at the interpretations particular to each learner, there were many different kinds of successes, and bringing them together as a coherent whole was a difficult task. The appeal of characterizing a theme of success in a more holistic manner was strong. For instance, one of the themes that I considered was the progress students had made with metacognition and/or metalearning because nine of eleven final narratives contained this theme. But I felt the theme of metacognition was still too particular to the lived experiences of the students and did not interpret meaningfully the success of the learners.

It was through re-reading Baxter Magolda's *Knowing and Reasoning in College* (1992) that I came to see the essence of the success of my learners as *the emergence of voice*. Baxter Magolda, after describing a four-stage model of the development of knowing and reasoning in college students, believed that transferring her interpretations to a different context would require recognizing *underlying story lines*. She defined these story lines as "threads that run through the collective student stories that are more general than the specific ways of knowing or patterns within them" (p. 191). One of the underlying story lines that Baxter Magolda recognized was the "development and emergence of voice" (p. 191). I began to consider the usefulness of this theme to illuminate the success of my learners.

However, as I have mentioned previously, Baxter Magolda's (1992) students, even at the lowest level of her model *had voice*. They could say things to her in interviews about themselves, their positioning with authority, their beliefs about the nature of knowledge, their context, their thinking, and their learning. I realized that there was a large difference between my students and hers – and although she recognized that over her four stages students developed more of a voice, they already had voice. What Baxter Magolda saw in her participants was not the *emergence of voice*, but the *refinement of the voice* they already had and with which they could say things to themselves and others. Instead, my students began with little or no voice in their stance of silence. Their voice was only emerging as our semester together progressed.

In one sense, the learners in this inquiry succeeded in ways specific to each learner. The learners and I engaged in interpreting their success, particular to each learner. However, in order to tell the stories of these learners to others, for the learners'

stories to impact others and affect their understanding of success in mathematics class, I am compelled to interpret the stories of success in a more meaningful way as an inquirer. Making sense of the learners' success requires moving beyond particularized interpretations to drawing a global theme. To understand the nature of success of learners in Senior 2 Consumer Mathematics, the essence of their success, the *emergent/ce (of) voice* needs to be characterized and explored in detail. With the help of the learners, we can come to understand what it means to speak with an emergent voice.

The next two chapters will describe the nature and evolution of learners' success as *emergent/ce (of) voice*. Figure 2 portrays a visual model of the interplay of *emergent voice* with *the emergence of voice*. I will characterize voicelessness and emergent voice as types of voice-stance, the emergence of voice the dynamic of the learners' becoming.

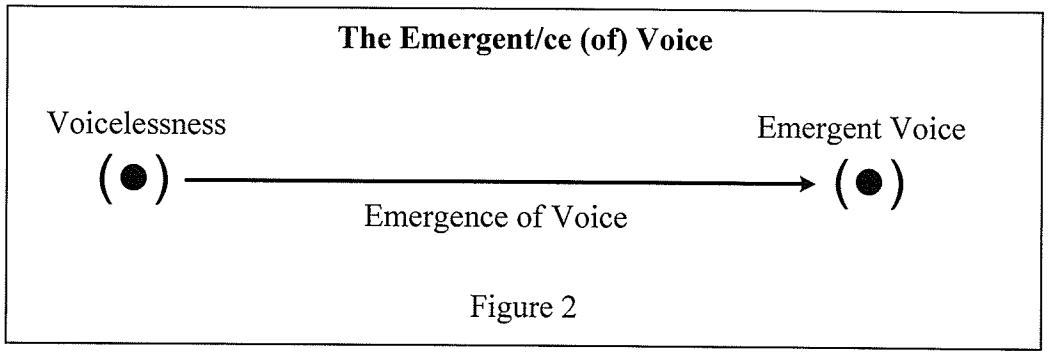

Figure 2

Characteristics of Emergent Voice

It is important to take a moment to consider the significance of the learners' stance of silence at the beginning of the semester. If coming to speak with an emergent voice is the essence of success and also a key part of the becoming of the students over the semester, then what did the silence mean? There are two important meanings that we

find in the stance of silence. First, it was the initial stance of the students in the classroom. Although the way in which students come to a stance of silence is outside the scope of this inquiry, their stance was evident in much of the earlier data collected. Second, the stance of silence was a type of voice-stance, indicating voicelessness for each of the students. Belenky et al. stated that their participants "felt 'deaf' because they assumed they could not learn from the words of others, 'dumb' because they felt so voiceless" (1986, p.24) to describe the voiceless nature of those who were silent.

Emergent voice, then, is another type of *voice-stance*, indicating a movement away from silence towards internal and mature voice. As the learners in this inquiry will help us understand, individuals do not move from silence to voice on their own initiative or immediately; they need opportunities and time for voice to be fostered in order for their voice to emerge. A discussion of the dynamic nature of voice and its emergence is forthcoming in the next chapter. Before we can come to understand the emergence of voice, I believe we must hear the learners speak in their emergent voice. To listen to the learners' emergent voice will help us to become aware of the constituent elements of emergent voice.

Specifically, there are three characteristics of emergent voice that were evident in the students involved in this inquiry. The students came to be *vocal* as they used words to say things they believed were worth saying. The students came to be *verbal* as they chose specific words to point towards the things they believed were worth saying. And finally, the students came to be *intentional* as they used words to affect themselves and their context. When I refer to students using words, they were either using words in a

written form (interactive writings and portfolios) or in an oral form (interactions in class or conversations with me).

Individuals are Vocal

The first characteristic of emergent voice is that the individual is *vocal*. Although the students will help clarify this characteristic, an initial definition of *vocal* is that the students felt that they could *speak out*, or say things out loud, and that they did *speak out*. The importance of being *vocal* becomes clear as we think back to the examples of students who maintained a stance of silence at the beginning of the semester. In Chapter 5, we noticed that there were absences in the words students authored. Because this absence of words was related to a stance of silence, the fact that students were saying things becomes a foundational element of emergent voice. As we listen to the vocal nature of Lindsey and Roger's emergent voice, we will have opportunities to develop a better understanding of what it means to be *vocal* and the significance of this characteristic to emergent voice.

Lindsey: Saying Things Out Loud

I first noticed Lindsey's initial stance of silence in the classroom when she started to ask for help, because it was a change from the assuring demeanour that Lindsey projected for the first few weeks of the semester. As she began to ask questions, she became *vocal* either by telling me that she was not sure what to do or sometimes by specifically seeking out classmates or me for help. The element of being *vocal* is

demonstrated in Lindsey's words in her shift in stance from silence to saying things in the classroom that would secure the kind of help that she needed to learn mathematics and succeed. Rather than considering the content and nature of Lindsey's words in asking for help, the significance to her emergent voice in asking for help was that she was *speaking out* in mathematics class. For Lindsey, *speaking out* meant that she would ask for help when she needed instead of sitting quietly in class unable to complete assigned tasks.

However, the classroom setting was not the only place that Lindsey was becoming *vocal*. There was also a change in her oral words in our conversations. I recorded the following reflection as I transcribed the tape for our second conversation:

> One other thing that I've been thinking about with this interview is that it is probably most dominated by me-talk. Lindsey isn't saying too much and she spends lots of time agreeing. Her answers to my "How come?" questions are pretty short, too. … I'm at about [6 minutes] into the conversation and Lindsey is having difficulty describing what net pay is. She finally says that she knows what it is, but can't put it into words.

In this early example, Lindsey is still limited in her ability to say specific things about net pay. Another example in this excerpt of a voiceless stance is to be agreeable and not support well her affirmative responses.

Lindsey's second conversation was quite lengthy and we had agreed to meet a few days after to discuss a few more examples that I felt were important to hear Lindsey's view on her success. Between the two parts of the second conversation, I had resolved to leave the questions more open-ended and leave more space for Lindsey to respond to questions, but I still found:

> I'm not getting much more from Lindsey – even with my resolve to do less talking. She doesn't say much and just blindly agrees with me all the time. I wanted her to say more than I did, and to do more than agree. Because, when she agrees, I'm not sure if she actually agrees, or if she's doing it just to get it over with. She's not telling me lots of her thinking. But, I guess that's part of the

> problem, she can't say much about her thinking because her words and use of words limit her so much. … It's only my "how come?"s or "why?"s that really get anything, and then she mostly shuts down and says "I don't know".

I decided to complete a word count on some of Lindsey's most common phrases for agreeing and shutting down in her transcript. In the 73 minute conversation, she began 202 statements with "yeah", "yep", "yes", and "okay" (over 40% of her statements), while also resorting to a response of "I don't know" approximately 29 times.

After I completed the third conversation, approximately a month and a half later, I recorded the following reflection:

> I found that Lindsey was sometimes answering more – in other words, saying more, than in previous conversations. Part way through I realized that she was giving more than just "yeah" answers, more than just agreeing. She was actually answering some of the questions.

Even though I found Lindsey often saying "umm" at the beginning of a response, I believe it was her way of thinking through a response – because she would usually respond authentically to my prompt afterwards. As well, her "agreeable" word count, in the 39 minute conversation, was reduced to 37 instances (30% of her statements) and she only said "I don't know" 15 times. This indicates an increase in Lindsey's willingness to *speak out* about her learning, thinking, and success in mathematics class.

In order to notice that Lindsey was becoming more *vocal* in her oral communication, we needed to notice the absence of her words in earlier conversations. As Lindsey's voice emerged, she began to say more things to me about her learning and thinking, demonstrating an emergent voice. But more than merely saying things, the characteristic of being vocal speaks to the evolving nature of Lindsey's positioning with *authority*. Subjective knowers, identified by Belenky et al. (1986), are knowers whose voices are beginning to emerge. Along with the gaining of voice, Belenky et al.

recognized that these individuals were beginning to also see themselves as their "own authority" (p. 54), rather than relying on external authority to tell them what to believe and to give them knowledge. As Lindsey began to say more, she was becoming an *authority* on her learning and her thinking, rather than agree with the success I articulated in a conversation. This demonstrates a shift in her stance with authority, where she is saying things because she is becoming an *authority* on herself, as a result of her emergent voice. Because Lindsey was becoming her own *authority*, we can see her emergent voice in her extended responses to prompts in conversations.

Roger: Saying Things in Writing

Using spoken words was not the only manner in which students were encouraged to say things in the classroom. There were many opportunities for students to record their thoughts and to say things to themselves and to me, through written words. Interactive writings and portfolios provided opportunities for learners to reflectively consider their thinking, learning, and studenting, and put that into words. In particular, test reflections, written after every test, provided moments for learners to choose what to write in regard to their thinking, learning, and studenting. The prompts often invited learners to not only write about one of those elements, but were open-ended enough in nature so that the learners could choose to write about more than one of their cognitive processes.

After the first test, students were asked to tell me about the question they found to be hardest on the test, but that they still did well on. I was encouraging them to describe some of their thinking while focusing on a success. Roger's response was, "Number 6. I did good because me smart." Remember, that Roger was the personality in the

classroom, and that often carried over into his writing. In this example, Roger did not decide to engage with the prompt and demonstrated an absence of words in his metacognition. Near the end of the semester, after Roger had more opportunities to write test reflections and came to know what my expectations were, he wrote the following response for test 8, "Well I did well on question 2. My thinking was that the net is wave of the furter so banking would be on there. ~~Well~~ I did well because I list in class when my class ment talk." In both test reflections, Roger began by pointing towards a question that he succeeded on as he wrote the test.

In the latter test reflection, Roger did more than just point towards a question that he had completed successfully. Rather, he *chose* to *speak out* about his success and describe it in two ways. First, he addressed his thinking. He told me about his thinking as he completed the question and some of the reasoning in which he had engaged by considering the effects of the Internet on banking. Second, he addressed his studenting. He told me about his learning processes in the classroom. Remember, one of the successes that Roger and I had noticed during his conversations was his focus on being actively involved in class in order to learn. In this test reflection, as I listened to what Roger was saying to me as he *spoke out*, I heard him tell me about one characteristic he believed was important in being actively involved – listening closely to his classmates.

Similar to Lindsey, the significance of Roger's second test reflection does not necessarily lie in what he said about his thinking and learning in the classroom (especially since he had not selected specific words to point to his cognition, which would have demonstrated the characteristic of being verbal). What is significant is that Roger was *speaking out*. He was using his emergent voice to communicate to me that he

was becoming an *authority* on his own learning and thinking. Instead of the idea of active involvement remaining a success that I mentioned to Roger, he was beginning to internalize that success and to *own* it and its expression. The *vocal* nature of Roger's emergent voice demonstrated that he could *speak out* because he was developing an *authoritative* stance on his success.

Although being *vocal*, or *speaking out*, might seem like a strong movement away from silence, Freire emphasizes the significance when he states, "Human existence cannot be silent … human beings are not built in silence, but in word" (2000, p. 88). To begin to emerge from silence, the students needed to first say something – and the content of what they said was not as significant as the fact that these students were beginning to say things to themselves and to others. Again, Freire, in his explication of liberation for the oppressed, mentions that the oppressed "must first reclaim this right [their primordial right to speak their word] and prevent the continuation of this dehumanizing aggression" (p. 88). As the students began to be *vocal*, they were saying with their words that the teacher was not the sole authority on their thinking, learning, and studenting. They were becoming aware of their thinking, learning, and studenting, and through that awareness and expression of the awareness developing a sense of *authority* in the classroom. The characteristic of being *vocal* was foundational to their emergent voice. Although a critical characteristic, students needed to add on to their success of *vocalizing* their thoughts by engaging in saying things that were important to them to affect their understanding of themselves and to affect their context.

Individuals are Verbal

Being *verbal* is the second characteristic of emergent voice. It implies more than just putting words to thoughts and saying them out loud (whether it is written or oral). Rather, being *verbal* means that the individual is pointing towards specific objects through the selective use of words. Freire (2000) identifies this process as *naming* and describes it in this way:

> To exist, humanly, is to *name* the world, to change it. Once named, the world in its turn reappears to the namers as a problem and requires of them a new *naming*. ... If it is in speaking their word that people, by naming the world, transform it, dialogue imposes itself as the way by which they achieve significance as human beings. ... Because dialogue is an encounter among women and men who name the world, it must not be a situation where some name on behalf of others. (pp. 88-89)

There are three important characteristics that Freire refers to in his defining of *naming*. The first characteristic is the conceptualizing of *naming* as a human endeavour, that in order to exist humanly in the world, individuals must *name* their world. In order for the learners in this inquiry to grow as individuals, being *verbal* becomes an important element in their emergent voice. The second characteristic is the acknowledgement of the dynamic nature of *naming* in the perpetual naming and refining of names as the individual is in dialogue with herself/himself and others about the world around her/him. The dynamic nature of perpetual naming intimates that learners need to say the names to themselves and others, and that as the naming continues it becomes more complex. The third characteristic is that the individuals must *name* objects for themselves, rather than someone else doing the *naming* on their behalf. The last characteristic is essential to emergent voice, as students assume authority in the construction of self-knowledge. The

ownership of *naming*, in order to be *verbal*, resides with the students. As we listen carefully to Karl's words, consider the *verbal* characteristic of emergent voice.

Karl: Remembering, Reviewing, Learning New

In the second portfolio of the semester, focusing on the trigonometry unit, Karl named three of his cognitive acts in his looking back at the learning he had engaged in during the unit. Consider three of his item reflections:

> *Similar triangles activity*: This was our intro to trigonomitry. It demonstrates how much I remembered from last year. This demonstrates my Reasoning ability in that I reasoned with my self as to what I should do.
>
> *Trigonometry Assignment*: This Item was one of our first hand outs it shows my ability to make connections, the labels opp, hyp, adj with the correct side. It shows how much I improved over last year.
>
> *Hand-in Assignment*: This was an assignment I was absent for. I did it the day I handed this in. It shows what I learned in trig. It shows my Connecting ability (what I learned and what to do).

It was not until I read Karl's overview reflection, where he stated "So in summery, I learnt many new things, reviewed older things and remembered many older things and had a blast with getting good marks" that I began to listen carefully and realize the significance of Karl's thinking and writing in his Trigonometry Portfolio.

In each of the item reflections, Karl used a specific example to illustrate his *naming* of a specific cognitive process. The first process is *remembering*, which to Karl meant going back to things he had learned further back than the current unit and recalling the concept or how to perform a skill. The second process is *reviewing* or *improving*, labels he used to demonstrate getting better as specific skills (usually more currently situated). The third process is *learning new*, pointing towards the knowledge or

understanding he had just recently acquired in the unit. Karl used these names in two different ways in the portfolio – to point to specific instances and then to describe in general his actions during the trigonometry unit. I felt that Karl's *naming* of these three processes was important, so we discussed them in the first and second conversation. As I listened to Karl, I came to see that his *verbal* characteristic of emergent voice was significant to his story of success. So, in his final narrative, I pointed back to this verbalizing as a success.

> *Talking about your learning and success* in math class is a very challenging thing, Karl. I think you've been improving at doing that over the semester, though. I noticed in our second conversation that you talked about many *different kinds of learning*. A good example is when you made a distinction between remembering and learning new. We looked at those ideas in both conversations. In the first conversation, you used specific *examples* to try to make distinctions between reviewing and learning new. But by the second conversation, you could say that remembering was "trying to think of what I did in past years. And learning is going through new stuff and trying to learn it." Instead of making it an either-or situation, like in our first conversation, you used *ideas* to describe remember and learning new – and struggled with the idea that they both involve thinking. In your final portfolio overview, you chose to use the different ideas of learning new and remembering to *tell me about your learning* over the semester.

Karl demonstrated sophistication in his naming. Not only did he name the objects that he recognized, but he continued to name similar objects with the same label. In the first conversation, Karl used examples other than the trigonometry unit to try to clarify what he meant by *remembering* and *learning new*. Searle supports this process of repeated naming when he states, "we need to make repeated references to the same object, even when the object is not present, and so we give the object a name" (1983, p. 231). *Verbalizing* occurred as Karl could say things in general and use specific examples to tell me about remembering, reviewing, and learning new.

I believe that there are two constitutive elements that exist when an individual engages in *naming*. The first element is to identify the object. This requires of the individual a reflective stance that makes use of opportunities to notice and recognize significant objects in her/his world. When this is applied to the opportunities I provided for learners, it means that they noticed their thinking, learning, and/or studenting and recognized it as an important cognitive act. Karl used the portfolio as an opportunity to notice the different kinds of cognitive acts he had engaged in to be successful in the trigonometry unit. He also began to recognize the distinctions between these cognitive acts and used specific examples to clarify his thoughts.

The second element is to give a name to the object. Within this element, the individual proactively seeks out and constructs a label that serves her/his purpose of pointing to the object under consideration. Within the context of this inquiry, students were sponsored to write and talk about their thinking, learning, and studenting. In order to be in dialogue about these processes, the students needed to name their specific cognitive acts. As Karl wrote his item and overview reflections, he constructed several labels that would communicate what he noticed about his own cognition and learning. This bifurcation of naming, both to notice through reflection and then name the significant object is similar to the two elements that Freire mentions, "But the word is more than just an instrument which makes dialogue possible … within the word we find two dimensions, reflection and action, in such radical interaction that if one is sacrificed – even in part – the other immediately suffers" (2000, p. 87). *Reflection* occurs as the individual notices and recognizes the object and *action* occurs as the individual names the object and speaks the name.

By *speaking out* and writing more thoughtful reflections than in his first portfolio, Karl had already begun to develop his *authority* in his emergent voice. However, with the additional element of being *verbal*, Karl became an *author* of his own cognition. An *authorial* stance required of Karl to construct and create words that were meaning-filled for him and that he could use to interact with the world around him. As his classmates also engaged in *naming* their thinking, learning, and studenting, they too moved beyond their stance of silence and towards an *authorial* stance in the classroom. They began to author their own success. The *authoring* was at once retrospective as they talked about what they had done well, and forward-looking as they were beginning to say how they would learn best and succeed in mathematics class.

Individuals are Intentional

Intentionality is the third characteristic of emergent voice. Being intentional in saying things is more than just *speaking out* and *naming* specific objects. I believe that the element of being *vocal* is foundational to intentionality in words because individuals use their speech for specific purposes that they recognize as important. Being in discourse with oneself or others could include naming objects that are the focus of the conversation, but I see being *verbal* as a secondary element to the intentionality that individuals bring to their words. Being *intentional*, then, means that individuals say things to themselves and to others with specific purposes. These purposes, which are analogous to intentions, place intentionality behind the things individuals say. The learners in this inquiry used words intentionally in two different ways, which we will

explore further with the help of two students. First, they were intentional in *what* they said. In other words, they chose what they wanted to say to a specific audience for reasons they believed were important. Second, they were intentional in *how* they said their words. They chose the words they wanted to say to a specific audience to affect the audience in ways they believed were important. Although some similarities to being vocal and verbal exist, learners were using their nascent abilities of speaking out and naming to say things *to* a specific audience with the intent of *affecting* the audience.

As we listen closely to the learners who spoke with intention, we will come to see more clearly the intentionality that is inherent in emergent voice. Searle's (1983) work on intentionality will provide a framing to understand the meaning of the learners' statements. He connects the idea of intentionality with the things individuals say, by stating:

> There is a double level of Intentionality in the performance of the speech act. There is first of all the Intentional state expressed, but then secondly there is the intention, in the ordinary and not technical sense of that word, with which the utterance is made. Now it is this second Intentional state, that is the intention with which the act is performed, that bestows the Intentionality on the physical phenomena. (p. 27)

He views a *speech act* as one which is imbued with intentionality. When students are intentional about what they say to themselves or others, they are saying their words with the purpose of affecting the audience. To clarify what students are aiming to affect, we need to listen to the learners in this inquiry.

Daniel: Using Words to Affect His Learning

In the last chapter, we saw Daniel as a student that used words to say things about himself. He wanted to be remembered as the "one who explained" because he came to

use that strategy during our semester together. His expression made me wonder why Daniel felt explaining things in his own words was important to his success in mathematics class. Here is how Daniel clarified for me the role of explaining things in his own words in our second conversation:

J: Is it better to write out stuff in your own words for ideas that you understand already? Or would it be a better idea to do it for topics that you're not too sure about?
D: I think that it goes for both.
J: Okay.
D: That you know and what you don't know. 'Cause, you know it already, but it's good to keep it there around because you might just lose it while doing the steps. And the thing that you don't know, it's good to put down since you don't know it, you can get familiar to it.
...
J: There might be a difference between learning and remembering. And I'm not too sure. But when you're writing things out in your own words, do you think it helps you learn it for the first time, or does it help you remember it later on?
D: Umm. It helps me learn it. And then I'll start remembering it later on. [Okay.] I just have to keep writing it down some more. And then I'll learn it more. And then I'll start reminding myself about it.
J: Can you say a little bit more about how writing it in your own words helps you learn?
D: Like, I'll have the sheet and we're doing something, and I'll just write, like, notes down for the same question. [Mm, hmm.] For the same object. And I'll just sit there and I'll go over it. If it's in class, I'll look it over. [Okay.] And then I'll go, ** and then I'll take the notes and look at it.

Daniel described two different roles of explaining mathematical steps in his own words. First, he believed that the process would help him *learn* the mathematical steps. He viewed learning as an act of "getting familiar" with the mathematical steps. Second, he believed that the process would help him *remember* the mathematical steps he needed to recall on tests and the final exam. Looking back over the steps he had previously authored would jog his memory, as well as help him memorize the steps by repeatedly going over the steps he had written in his own words.

Daniel believed saying things in his own words would *affect his learning and success* in mathematics class. As he learned new skills, or was reviewing them, he wrote down steps in his own words with the *intention* of getting better at the skill, thus learning it. Writing the steps in his own words was not a random act that Daniel engaged in during class time, but something that he was thoughtful about and continued to do in order to be successful in mathematics class. Searle defines *intentionality* as a type of mental state that is "directed at or about or of objects and states of affairs in the world" (1983, p. 1). In the inquiry's context, Daniel's 'world' was our mathematics classroom and his learning of mathematics. His intentions were directed at improving his learning and his emergent voice was *intentional* in supporting his learning and remembering to be successful in mathematics class.

Daniel was using his emergent voice to put mathematical steps in his own words so that he could learn and remember – his intention was to affect his learning. But it raised, in my mind, the question of who Daniel anticipated the *audience* of his words to be as he spoke them. In our first conversation, Daniel told me about the importance of putting mathematical steps in his own words:

D: Because it helped me get better marks – made me remember old topics and I could pinpoint where I was by reading just the little paragraph I wrote or something about the question.

...

J: Neat. Would you recommend this to somebody else who is having some trouble?

D: Not really. Then I would have to explain it to him and then they would probably write their own sentences **. It's in my own sentences, in my own words, he might not get it all. That's why it's hard.

J: Okay

D: It's just like … someone do your own work, do your own examples; why not do it yourself.

In Daniel's response to my prompt, we can hear that Daniel believes *he* is the *audience* of his explaining, his saying of words. He does not say his words to others but to himself. As well, he does not say his words to affect others, but to affect himself. He generalizes this belief when he extends that notion to other classmates, where *their* words need to be spoken to *themselves* in order to understand. Although in other moments in our conversations Daniel points to the importance of explaining as providing opportunities for the teacher to hear his thinking, when he is using explaining in his own words for his learning and remembering, the statements are made for himself. Daniel demonstrates well intentionality in saying words as an important characteristic of emergent voice.

Terri: Using Words to Affect Relationships

The final conversation provided an opportunity for me to inquire into the classroom and inquiry processes during the semester. I was interested in learning whether the learners perceived an importance in talking about their *success* in mathematics class. For some learners, like Terri, the conversation naturally arose in the discourse about their narrative.

J: What do you think? Do you think it's important that you got to tell me about the times when you were understanding math?
T: Yes. 'Cause, I don't know. I knew I was successful and there were times I wasn't and I can go back and see what I did wrong. [Okay.] And you knew I was having trouble or whatever.
J: Okay. So when did you take opportunity to tell me about when you understood?
T: In reflections and stuff.
J: Do you think that's an important thing to do?
T: Yeah.
J: How come?
T: 'Cause then you know how if you're, if you're having problems or if like, if you ** get it ***.
J: Okay. Is it important for you as a student to do that?

T: Mm, hmm. 'Cause then you write back and stuff. And it will help you, or whatever.
J: Okay. And then is it important for teachers to make use of that stuff?
T: 'Cause it's, you know if you **, you would change them. And then [Mm, hmm.] and then understanding the stuff.
J: Okay. So those are the times when you told me about what you were understanding in math class, whether it was math that you were understanding. It was those times that you could tell me that, "Hey, you know what, I'm doing a good job here. I'm being successful at learning math."
T: Yep.
J: Do you think it's important for teachers and students to think about how the students are being successful?
T: Yeah. 'Cause if they're not, then you know that they need extra help or whatever.
J: Okay. So that's kind of one of your statements that "Hey, I'm having a little bit of trouble", [Mm, hmm.] but what about when you are saying, "Hey, I did a really good job here. I'm being successful." Is that important too or is just talking about that success?
T: Yeah, 'cause I mean you know that you're proud of yourself or whatever and the teacher is going to be like, "Come on, hand this in." and "You're failing. What are you doing?" And stuff like that.
J: Okay. So it's a way for teachers and students to communicate then?
T: Yep.

Notice that Terri believed that telling me about her success was important because it was a way to communicate with me, her teacher. Although she did not have a strong sense of what a teacher would do with her telling of success, she did have a sense of what a teacher would do if Terri indicated in her authorship that she was not understanding the mathematical concepts.

Terri's intention in telling her teacher about her success and difficulties in mathematics class was meant to affect the teacher-with-learner relationship. She was intending to affect her context, rather than just herself, as she spoke and wrote to a broader audience. I believe that Terri was telling me about her learning and understanding in her interactive writings so that I would come to know her and understand her better as a learner, a student, and an individual. Near the end of the

excerpt, Terri communicates that if I knew her well as a learner I would know when to encourage her to do better. She was intending to affect our pedagogical relationship in order to be successful in mathematics class.

I believe there are two layers of speech that are intended to affect the teacher-with-learner relationship in this example. I have already addressed the first layer, which is in the dialogue between Terri and me in her interactive writings. But the other layer is in the actual discussion Terri and I are having during this conversation. Because we were in the third cycle of our conversations, Terri knew what to expect in the conversation. Through the narratives I authored for her, I think she was coming to recognize that I was an authentic audience for her to say things to. When she did intentionally say things to me, I listened carefully in order to understand her as an individual, a student, and a learner. As she told me about the importance of a teacher and student being in discourse about the student's success, I think she believed that what she was saying would once again affect the pedagogical relationship that we had formed. She is speaking out, or being vocal, in this instance, but Terri is also doing more than just saying words – she is saying words for a specific purpose.

Terri has a different *audience* in mind, compared to Daniel's example of explaining in his own words, when she told me about the importance of telling her teacher about her success and where she is encountering difficulties. Rather than saying those words to herself, she says the words to me, her teacher. Her *audience* consists of *others* instead of just herself. This does not preclude the idea that Terri is also saying these words intentionally to herself, but she is also including other members in the audience to hear her words. Expanding the audience to include others demonstrates that

Terri is being *vocal* and also *intentional* in what she says as she wants to affect her audience is specific ways. I remember after the first conversation with Terri, that her behaviour changed starting the following day in mathematics class. Normally, Terri was quite quiet in class, staying mostly to herself and rarely interacting with me. However, when she came to class the next day, I noticed that she was more willing to interact with me and began a routine of saying "bye" at the end of each class. Perhaps she believed that what she said in the conversation the previous day had been said to an *authentic audience*, an audience who listened to her words, and that her words affected the relationship between her and the listener, me.

Returning to Daniel's example for a moment, we can also view the two audiences, self and others, in his act of speaking out. Daniel demonstrated well saying things to affect *his* learning. However, Daniel is engaging in another level of discourse during the conversation. As he told me about the importance he places on saying things in his own words, he is also speaking to me with intention. In this additional layer of discourse, Daniel's audience is another, specifically me as teacher, where he is intending to affect the teacher-with-learner relationship. I think he believes that by letting me know how he learns best, he will help me come to understand him as a learner and more effectively support his learning. Throughout this inquiry, as learners were demonstrating different characteristics of their emergent voice they often evidenced more than one characteristic. This made listening to the learners a complex, but worthwhile endeavour. Often, the characteristics were on different levels of discourse, as Daniel demonstrated in his example.

The concept of *audience* is important to consider when viewing the intentions of students to say things. The intentions with which students engage in speech acts considers the audience that is receiving the words. In other words, the perceived audience affects the intentions of the student. In Daniel's example of explaining things in his own words, we saw that he was the audience for his words and that his intentions in saying the words was to affect his own learning and studenting in the classroom. In Terri's example, we saw that her audience was others, specifically me, and that her intentions in saying words were to affect the teacher-with-learner relationship. Although in these two examples, the distinction between *self as audience* or *others as audience* is visible, this distinction in students' words is not always simple to ascertain.

The words students say, that we can hear, are words that they say within a particular context. In this inquiry, students would say things that they authored in their interactive writings and portfolios, and they would also say things that they authored during interactions with me in class or in our conversations. However, what becomes difficult to distinguish is whether these utterances were self-talk, or talk directed towards me (as other). If the majority of the utterances were the latter, it becomes difficult to hear student's self-talk, as that talk might be internal discourse and only sometimes spoken out loud. In some ways, there are limitations to inquiring into self-talk because as soon as those utterances are given to the inquirer, the audience broadens. Belenky et al. believed that individuals who were gaining voice would also "engage in self-expression by talking to themselves" (1986, p. 86). What becomes clear is the importance of both types of audiences for a student's emergent voice. The emergent voice needs to say things to self in order for the individual to internalize, author words of significance, and explore

intentions imbued in statements to self and others. And, the emergent voice needs to say things to others in order to establish her/his authority, to make intentions explicit to others, and to be in discourse with others about herself/himself.

Emergent voice can be identified through the three elements that characterize the words students say in that voice. If we remember back to the examples and elements of a stance of silence, changes in what and how students say things are evident as they speak with their emergent voice. Both characteristics of being *vocal* and being *intentional* were not present in the silence of the learners in this inquiry. There were large absences in what they said in their silence, indicating a limited sense of *speaking out*. Because of their limited sense of being *vocal*, when they did speak out it carried with it few intentions because the learners did not realize the effect their words could have on themselves and others. Occasionally, a primitive form of being *verbal* was present in the learners' silence; although learners tended to point to objects with names without being able to explicate the meaning of the name or to name similar objects again. The learners did not remain in their voiceless stance, however, but moved away from that stance as their voice began to emerge in their lived experiences in mathematics class.

As we hear the emergent voice, each of the three characteristics becomes important to a learners' emergence of voice. Students develop a sense of *authority* over their thinking, learning, and studenting as they become *vocal*. From this sense of authority, students who are *verbal* began to *author* their own ideas about their thinking, learning, and studenting. As students become *intentional* in what they say, they begin to consider the *audience* they want to affect with their words – themselves, others, or both. A question arises with these three characteristics – whether each of them needs to be

present in emergent voice each time it is used. I believe that this is not necessarily the case, that a student can still be vocal, but not authorial in what he/she says, for example. Even as you think back to the five examples used in this section, you might notice elements of one or two or three of the characteristics in the students' use of their emergent voice. However, it is important to recognize that not all three elements need to be present every time but that at least one is present, which indicates a student's movement away from voicelessness and towards emergent voice. Each of the students in this inquiry experienced some of this movement (with some becoming more sophisticated in their emergent voice as they used multiple characteristics consistently), and the *meaning* of their success comes from the new voice-stance they formed – speaking with an emergent voice.

Emergent Voice is Nascent

The three characteristics of emergent voice that I have described are fundamental to the nature of emergent voice. Some or all must be present to distinguish a voice-stance of voicelessness from a voice-stance of emergent voice. However, each of these characteristics, being *vocal*, being *verbal*, and being *intentional*, are not necessarily small steps away from voicelessness. They each require of the individual a certain sophistication within their movement away from a stance of silence. Even though the characteristics of emergent voice are grounded in the lived experiences of the learners, they still have a quality of being somewhat idealistic. Learners spoke with emergent

voice, to be sure, but it was also a significant success for them in mathematics class. There is a reality to the saying of things with emergent voice. The reality of emergent voice is just that, that the voices are just *emerging*. I have selected the label of *emergent* deliberately to convey that the learners did not come to a fully refined and internal voice by the end of our semester. Instead, their emergent voice was *nascent*, in the act of coming into existence and in the process of being established. By definition, the *nascent* nature of emergent voice does not assume a robust and mature voice, but a voice that is growing at differing rates and in a variety of directions as it becomes more established.

I return, once again, to the theoretical models for a framework to use in order to interpret the lived experiences of my students and their *nascent* voice as it began to emerge. Baxter Magolda's (1992) model of knowing is a stage-based model, which assumes linear growth. Linear growth assumes that a student moves in a direct fashion from absolute to transitional to independent to contextual knowing, without returning to previous stages. Belenky et al. (1986), although they never claim a stage-based model because they themselves did not watch women move from one way of knowing to another, still assume a somewhat linear movement through their "stages". These models will need to be placed aside as we interpret the non-linear movement of students in this inquiry as they gained an emergent voice during our semester together. Rather, I will explore the use of Chickering and Reisser's (1993) vectors and Vygotsky's (1978) conception of the zone of proximal development to help understand the *nascent* quality of emergent voice.

The Tentative Nature of Emergent Voice

Along with a strong presence of the three characteristics of emergent voice, I began to notice some non-consistencies in what the learners were saying to me in their writing and in our conversations. Even though I recognized emergent voice as nascent, I had expectations that learners would use their emergent voice consistently as they engaged in self-talk and discourse with others. This is analogous to a baby learning to walk. As a baby's ability to become mobile emerges, the baby does not leave crawling completely behind in favour of walking. Rather, the baby, when it desires to, "falls back" to its well-established ability of crawling to move from one place to another. For this baby, the ability to walk is *tentative*, an ability that is in the process of emerging but has not been consolidated. Similarly, emergent voice is *tentative* in nature, prone to "fall backs" as voice emerges. Listening to Andrea will illustrate the tentative nature of emergent voice as she strives to say things to me with her emergent voice, yet sometimes returns to a previous stance.

Andrea: My Words are Important, Mostly

When we first met Andrea as a student who engaged in silence, she did not believe that her words and ideas were worth remembering. As Andrea's voice emerged during the semester she came to view her ideas and words much differently. One of the ways Andrea came to use her emergent voice in class was to answer questions. In the previous chapter, I pointed to Andrea telling the class about perimeter as a way in which she was becoming confident in the mathematical context of this course. Andrea believed

that perimeter was her idea; she was beginning to recognize the importance of her ideas within our community of learners. In a similar shift in stance, Andrea began to see her words as gaining importance to her as she learned mathematics. In our second conversation, I asked her to pick out a phrase from a paragraph in her narrative that seemed significant to her success.

A: {pause} Resaying other people's words.
J: Resaying other people's words?
A: Yeah.
J: Okay. So what's important about that?
A: Well, if they can describe it better. And you don't really have the right ** trying, what you're trying to say. But you know the answer, but you can't write it down in your own words. [Mm, hmm.] Then it's easier to use somebody else's because then you can look back on it. And if there's a question on describing it, then you, later on you'll put it in your own words, [Oh, okay.] instead of using other people's.
J: So, for right then when you're not quite sure, you write down exactly what somebody else said.
A: No, you change it a little.
J: Oh, okay.
A: 'Cause they can use their words, and you might not understand it. But, you can kind of change it a little so that you will understand it. [Okay.] And then, later on you'll be able to put it all into your own words.
J: Oh, okay. And, is it important to put it all into your own words later on?
A: Yeah.
J: How come?
A: 'Cause then you're not relying on other people all the time.

Andrea expressed the importance she perceived of putting mathematical ideas in her own words, instead of the words of others, in this excerpt. She believed that it was important to put mathematical ideas in her own words so that she could *understand* and develop an *independent* stance in her learning. This demonstrates an emergent voice in two different ways. Andrea was becoming more vocal about her lived experiences in the classroom and how she was being successful. She was also choosing to say words to affect her

learning. Her words contained an intention to support her learning so that she could understand the problems she was solving in mathematics class.

Near the end of the same conversation, I turned Andrea's attention towards the end of the semester. Andrea was completing her semester a week earlier than the rest of the class and so we had already discussed, in class, a timeline for completing course elements and writing the final examination early. However, I still wanted Andrea to explain to me the processes she felt would best support her studying for the final examination. This is what she told me:

J: What's your goal for studying for the exam?
A: Review everything that I learned from the beginning of the year.
J: So, your goal for studying for the exam is?
A: To review everything that I learned and to be **
J: Okay. Can you tell me two different ways you're going to try to do that?
A: Use some of the questions and figure them out. To see if I can still remember how to do the questions or not.
J: Okay. That's a good idea. One other one?
A: Review the examples.
J: Okay. In your notes?
A: Yep.
J: How are you going to go about doing that?
A: {pause} See if I understand what I'm doing. And compare it to the work that I tried and see if it was right, if I did it right.

As I listened to Andrea's words after the conversation had been completed, I found that Andrea had moved back towards a stance of silence in her strategies for studying for the final examination. What I heard in this excerpt was that Andrea was planning to use a practice-based approach for studying. She was intending to try more of the same questions she had completed and then rely on her notes, created by an external authority, to remind her what the mathematical concepts were and how to perform the mathematical skills. A study strategy that would have been more consistent with her early comments in the conversation would have been to explain the different skills and concepts she learned

over the semester in her own words, and to create specific examples to illustrate her general, word-based steps. Instead of maintaining a strong valuation of saying mathematical ideas in her own words within her authoritative stance, she valued the words of an external authority. Her emergent voice was *tentative*.

The shift that I observed in Andrea's discourse from earlier to later in the conversation indicated a shift from emergent voice to an earlier stance of voicelessness. It concerned me that I observed this non-consistency in Andrea's emergent voice, and I sought to understand what this could mean to her success and the theme of emergent/ce (of) voice which I had drawn from the data. Chickering and Reisser (1993) use a different model than most educational researchers to demonstrate the growth that individuals experience as they mature. Rather than a linear or cyclical model, their model is based on vectors, which contain a direction of growth as well as a rate of growth. They describe clearly how students move along the vectors:

> Movement along any one [vector] can occur at different rates and can interact with movement along the others. Each step from 'lower' to 'higher' brings more awareness, skill, confidence, complexity, stability, and integration but does not rule out an accidental or intentional return to ground already traversed. We assume that 'higher' is better than 'lower', because in adding the skills and strengths encompassed by these vectors, individuals grow in versatility, strength, and ability to adapt when unexpected barriers or pitfalls appear. (pp. 34-35)

If we view voicelessness as "lower" than emergent voice, these vectors demonstrate an acknowledged function of growth as returning "to ground already traversed." This was certainly true of Andrea, as she returned to familiar forms of studying for the final examination, which were not consistent with her nascent voice-stance. When transferring the use of her emergent voice to a new context, Andrea demonstrated a lack of versatility and adaptation that would be consistent with the *tentative* nature of emergent voice. Only

as Andrea's voice would move beyond *emergent* would she be refining that voice so that it could be adapted to a variety of situations and experiences that she encounters in learning and in life.

Although Chickering and Reisser's interpretation of growth in individuals allowed me to notice the *tentative* nature of emergent voice, it did not help me answer the question of why Andrea, and her other classmates, would occasionally return to a stance that was more indicative of voicelessness, as they moved forward. Kieren and Pirie developed a model of mathematical cognition that is pictured as nested circles (Kieren, Pirie, & Gordon Calvert, 1999). They chose nested circles to demonstrate their model because they found that students needed to be

> prompted to *fold back* to an inner level of activity in order to *extend* their current action capabilities and action spaces. This returned-to – and possibly observed as less sophisticated – activity, is not the same as the original inner-level activity for that person in that topic. It is now shaped by the previously developed, more sophisticated understanding actions. (p. 218)

With Kieren and Pirie's conceptualization of mathematical cognition informing the *tentative* nature of emergent voice, it might be necessary in the emergence of a new voice-stance that individuals return to a former stance as they move towards more 'sophisticated' or 'higher' stances of voice. The *tentativeness* in Andrea's voice could have been a function of the cognitive growth that she was experiencing as a learner in mathematics class.

In order for individuals to make an intentional shift in stance, I believe that they need to see the limitations of their current stance, limitations that make that stance of thinking and learning inadequate for the growth they want to experience. However, individuals would struggle to see their current stance as limiting within the view of their

current stance. Rather, individuals need to have developed a different vantage point to see the inadequacies of a particular stance and to move forward. This shift back to a previous voice-stance provides an opportunity for individuals to notice that they were indeed moving forward, away from voicelessness, and that the stance shift was a positive movement for their growth as learners, students, and individuals. So, although at a cursory glance the *tentative* nature of emergent voice seems to denote a pause in success, it is a necessary element of emergent voice.

The Non-Autonomous Nature of Emergent Voice

Emergent voice is nascent because of its tentative nature; that is, students, while their voice is emerging, sometimes return to previous voice-stances as they move away from voicelessness. Emergent voice is also nascent, and not robust, because of it *non-autonomous* nature. By *non-autonomous*, I am referring to the limitations of students to say things with their emergent voice on their own, without the supportive atmosphere and guidance of an authentic audience. With an emergent voice-stance, my learners did not usually engage in using or refining their emergent voice without prompts from me. Although they engaged in some self-talk, they did not necessarily view themselves as an authentic audience of their authorship. Rather, they relied on me, their teacher, to be an authentic audience for their emergent voice. Perhaps it is also in their shaping of an authoritative stance about their thinking and learning that they need an authentic audience as other to demonstrate their authority. Erin is an example of a student who, with her emergent voice, had difficulty recognizing and using that voice autonomously. A

student's emergence of voice is interconnected with the teacher's fostering of voice, as will be seen in the non-autonomous nature of emergent voice. In this section, however, I will limit my discussion of autonomy and fostering emergent voice to the non-autonomous nature of the voice. I will explore what it means to foster emergent voice from the teacher's perspective in the next chapter.

Erin: I Was Saying Things about My Thinking and Learning?

In the final portfolio of the semester, students were given control to shape their document to demonstrate their good thinking and learning, and how they had improved over the whole semester (some general prompts were provided for the item and overview reflections). Erin, who had taken seriously each of the unit portfolios, approached her final portfolio with similar rigour. She selected carefully, often from previous unit portfolios, pieces that demonstrated her good thinking and learning. Her diligence was especially evident in the reflections she authored for each item that had been selected. Consider the reflections for her fourth and fifth items:

> Reflection #4 – Comparing Cell Phone Costs: I choose this item because I also did some good thinking in it when I seen it in my portfolio I grabbed it out right away. I learned how to compare a whole bunch of different cell phone bills to see which one was best because all of them have twist an turns to them and they take awhile to compare but it is worth it in the end to get your moneys worth. A strategy that I used in this was to get all the extras off the final cost before you compare them. This shows that I'm a good math thinker because you have to have a certain amount of money without going over and to get a plan from each company with a certain amount of money isn't exactly easy, so that's why I did some good math thinking. You would use this in the real world for example when you are shopping and you go store to store comparing prices to get the best buy. This demonstrates reasoning and problem solving because you have to get the cheapest company for the amount of money that you are given.
>
> Reflection #5 – Crossing the River Assignment: I choose this item because I did a lot of metal thinking and we didn't have a lot of metal thinking assignments this

> semester. I remember having to use five sheets just to get the right answer. From this assignment I learned how to look at the question harder and figure out different methods how to get everyone over the river with having only one adult in the boat at a time. A strategy that I used was to send both kids the first time together and then bringing an adult there and then the child coming back and picking up the other child and for the rest you would just follow this pattern. This shows that I'm a good math learner because you have to figure it all out for yourself. This would connect to math in the real world if you had to get a group people over a river in as little trips as possible. This demonstrates problem solving because you are trying to figure out how many times it takes to get everyone over the river.

I was delighted, as a teacher, to read what Erin had written. Her emergent voice is clearly established in both of these items. She demonstrated being *vocal* by saying a variety of things about each piece, including why she used the item, what she learned by completing the mathematical task, how she was strategic in using the task to learn or improve, her stance as a mathematical thinker or learner, a connection to real life, and one of the mathematical processes that was demonstrated in the item. She was *verbal* as she named her thinking and learning by employing specific examples. She was also *intentional* in her reflective stance as she chose what she believed was important to say to her audience, her teacher, about her learning and thinking.

What struck me the most about each of these reflections is that Erin always included the sentence "I am a good math thinker/learner because …". It was in completing this sentence with the reasoning that I believe Erin demonstrated metacognition and metalearning. This ability to make self-referential statements and demonstrate an authoritative stance in regards to her learning and thinking was far from the voicelessness that Erin demonstrated in the statement "I don't know" in Chapter 5. I was curious about her sophisticated emergent voice, and decided to ask her about the metacognition and metalearning in our final conversation.

J: When you think of using your math this semester, did you, did it even cross your mind to think about how you were thinking or how you were learning in the course?
E: No.
J: But, did that become a part of what you did all semester?
E: I guess. Yeah. I guess.
J: Can you say a little bit more about that?
E: I never really thought about that. [Yeah?] I guess I thought about the marks and asking questions and stuff. I don't know.
J: Mm, hmm. So that idea of thinking about your thinking and thinking about your learning, does that have anything to do with being a math thinker or a math learner?
E: Yeah. I guess. Again, {pause} umm, I don't know. {little laugh}
J: You're not sure?
E: I don't know. I guess it connects with both of them.
J: Yeah. Which one does it connect better with? Does it connect better with a math thinker or does it connect better with a math learner?
E: Ahh. Probably math, {pause} thinker.
J: Okay. How did you, why did you pick that one?
E: I don't know. {little laugh} I just picked that one.
J: Why did it kind of stick out a little more to you?
E: 'Cause, I don't know. It just stuck out more to me.

Erin had been engaged in metacognition and metalearning throughout the semester. But now asked to recognize this as thinking about her thinking and thinking about her learning, she was unable to notice these cognitive processes. I believe that if Erin could not notice the processes that she had already engaged in, that engaging in those processes would not occur autonomously.

As disappointed as I was in Erin's response to my prompts about her thinking about metacognition and metalearning, it demonstrated to me that emergent voice, especially when it is nascent, is *not autonomous*. Erin could engage in metacognitive and metalearning thought when the prompts were within her ability to respond to, but could not distinguish this cognitive act from others to engage in it autonomously. Erin's response caused me to wonder why emergent voice is non-autonomous. Vygotsky's

(1978) conception of *zone of proximal development* was effective in framing the non-autonomous nature of emergent voice. He states that

> The zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state. .... The actual developmental level characterizes mental development retrospectively, while the zone of proximal development characterizes mental development prospectively. (pp. 86-87)

The emergent voice that I was noticing in Erin and her classmates was not a part of their actual development level, but was within their zone of proximal development. What this means is that Erin and her classmates could engage in refining and using their emergent voice with the guidance of their teacher. Erin brings into view a process that was "currently in a state of formation, that [was] just beginning to mature and develop" (Vygotsky, 1987, p. 87). This dynamic nature of emergent voice, or the process of the emergence of voice, is what I will explore in the subsequent chapter.

It might seem like a step back for learners to be tentative and non-autonomous in their use of emergent voice. As I considered the students' stance shift from voicelessness to emergent voice and in the light of educational researchers' (Chickering and Reisser (1993), Kieren, Pirie, & Calvert (1999), and Vygotsky (1978)) understanding of development, the nascent quality of emergent voice almost necessitates an incompleteness. The tentative and non-autonomous nature with which students became authoritative and authorial with their thinking, learning, and studenting is what distinguishes emergent voice from mature and internal voice. In other words, emergent voice does not experience consolidation because of its *nascent* quality. What Andrea and Erin demonstrate to us is that emergent voice is vulnerable and continually needs to be fostered by another who recognizes the importance of voice and who has voice already,

their teacher. These learners were just beginning their journey of gaining a voice and the essence of the nature of their success was *emergent* voice, a dynamic process.

Framing the Nature of Success through Literature

In preparing for this inquiry, I had readied myself with six theoretical models (Belenky et al., 1986; Baxter Magolda, 1992; Chickering & Reisser, 1993; Weiner et al., 1972; Dudley-Marling & Searle,1995; Romagnano, 1994). In considering these models with the particular success of the learners, the generalized theme of *emergent/ce (of) voice* was drawn from the data. The theme was initially supported by Baxter Magolda's research, but also informed by Belenky et al. and Chickering and Reisser. When I view the three latter models, attribution, ownership, and resistance, within the light of my data, I noticed that these models were not effective in supporting my effort to define and understand the success of the students. For example, Romagnano's (1994) conceptualization of resistance described students who were pushing back against an authority that had intentions for classroom discourse that were contrary to their intentions. Although at times my intentions and the students intentions were not in synchrony, in this inquiry the learners' success was not resisting to changes in the didactic contract or changes to their identity. These three models seemed to miss describing the success; in other words, they were not a match for the data.

Two other models came a little closer to helping with interpreting the data. The vectoring model suggested by Chickering and Reisser was helpful in the conceptualizing

the emergence of voice, however none of the seven vectors they proposed was beneficial in defining or understanding the students' successes. With Baxter Magolda's (1992) model, my students could be placed within absolute knowing and recognizing growth between and within the stages of her model was of value. The underlying story line of the development of voice provides more support in interpreting my data. However, Baxter Magolda fails to realize that her participants had voice and she describes the *refining* of voice rather than the *emerging* of voice. These two models, although somewhat beneficial, were still a significant miss in describing the success of my students. As I considered Belenky et al.'s (1986) model, it appeared to provide more support for interpreting my data, yet left large gaps in educing meaning from the data. Because this model is the closest match to my data, it is important to understand what was missing from it to use as a complete model.

Belenky et al.'s (1986) ways of knowing provide static "stages" that students could be placed in as I noticed their positioning towards authority, their belief about how they come to know (or learn), and in whom they believe mathematical ideas reside. When I held these elements of the model up to my learner-participants and their data, I noticed that my learner-participants were silent and received knowers. Belenky et al. also address the idea of individuals "gaining a voice" (p. 86). They contribute this growth to individuals who are subjective knowers, yet my students who were predominantly received knowers experienced emergence of voice. There was a mismatch of the model to the data that I was coming to understand. As well, even though Belenky et al. point towards a gaining of voice, they never describe clearly how their participants came to gain a voice and what that initial voice sounded like. This is an important piece of

becoming that was lacking in Belenky et al.'s sense making of their data. As well, their participants who were gaining a voice were not for the most part vocal, while that was an important characteristic of my students' emergent voice. Finally, Belenky et al.'s model does not provide a sense of movement within or among stages and although I wanted to come to understand what success was for these students, I also wanted to make sense of the evolution of learners' success. The researchers did not follow their participants, but rather collected data primarily on a one-time interview basis. Although there were elements of Belenky's understanding of how individuals come to know that were beneficial to consider in interpreting the data, there were also significant absences in the model to support my sense-making of the data.

Understanding Success as Emergent Voice

In the previous chapter, we were able to see what it meant for the students to be successful. That success for each learner, *in* their own terms and *on* their own terms, included building confidence and beginning to say things about themselves and their context. These successes were particular to each learner. However, a more generalized interpretation can be drawn. Regardless of the nature of the success for each learner, the students were gaining an emergent voice by expressing it. In a recursive sense, being successful was the success that the students experienced.

Emergent voice was characterized by the students' growing ability to be vocal, verbal, and intentional with the words they wrote and spoke. The emergent voice of each

student shared qualities with the others but was simultaneously unique to each individual. Emergence of voice was not easy to characterize because of the tentative and non-autonomous nature of emergent voice. At one moment, a student's emergent voice was visible and audible, and the next it seemed to be fleeting, nascent and fragile.

It is important to understand that *emergent voice* is not a stage or a milestone or a point of achievement. The use of a noun in our language to describe the nature of success for these learners confines us to see it as a position. Rather than a position, emergent voice is a continuum along which each student moves. It was always in flux, as the learners were continually refining their sense of their own success. Emergent voice is recursively both an end and a means, a dynamic process where emergent voice supports and fosters the emergence of voice. The concept of *the emergence of voice* invites us to listen to the becoming of each student.

Chapter 9

The Emergence of Voice

The *emergence of voice* is central to the stories of the students as they came to express their success in Senior 2 Consumer Mathematics. In this chapter, I return to narrative inquiry, which provided the original framing for the inquiry process. At the core of narrative inquiry is the living, telling, and retelling of the stories of experience, here, from inside the classroom. As the inquirer and participants tell and retell their stories, there is an opportunity to understand and make sense of those experiences (Clandinin & Connelly, 2000). I will tell the story of one student to illuminate the emergence of voice and to portray the flow of a story of success.

The inquiry question that I posed at the outset of this study did not only intend to explore the *nature of success of learners* but also the *evolution* of the nature of success. Although the essence of success was emergent voice, the evolution is understood as the process of that emerging, as students built on earlier successes with more complex success. The emergence of voice is an integral part of the story of success of learners in this inquiry. After telling the story of one student's emergence of voice, the chapter concludes by examining the teacher's influence in fostering students' success.

Listening to the Emergence of Voice

Emergence of voice is the process of moving away from a stance of silence, or voicelessness, and beginning a journey of gaining a voice. The emergence of voice captures the initial utterances as individuals begin to say things to themselves and to others. It is akin to seeing the first flickers of light from stars in the night sky. Those initial pieces of light seem to be brilliant because of the background of the dark sky. So too, the first attempts of the students saying things, pointing to objects with words, and being purposeful in what they say are brilliant moments against their voicelessness. The first lights in the sky also seem to flicker before they shine steadily. So too, the first attempts of the students with their emergent voice are tentative before their emergent voice can be refined to an internal and mature voice. What is the nature of the emergence of voice? What does the emerging of voice mean? By telling Andrea's story, I hope to capture her voice as it emerges. Andrea's story is an exemplar of the *becoming* that the learners in this inquiry lived in Consumer Mathematics.

Asking the Teacher for Help

When we first met Andrea in Chapter 5 she was engaged in class by asking me, her teacher, questions when she did not know what to do or when she was stuck on a specific question. Andrea was using a limited number of words to tell where she was stuck, so that an authority in the classroom would explain clearly and slowly how to complete a question. She used this as a strategy early in the semester to request of me to

tell her exactly what to do and then she would do it. At one time, Andrea had approached a resource teacher, viewed as an authority figure as well, to explain similar triangles to her. She told me about the experience by relating, "And finally, she told us what to do. And then, she said that what we were doing was wrong. But we were doing it the **exact** same way she taught us" (bold is mine). Her stance of silence in wanting an authority figure to say how to do the question and to listen patiently can be seen in Andrea's frustration with the perceived "help" she had received.

These early moments of asking me, and other authority figures, for help demonstrated Andrea's voicelessness in learning mathematics. By relying on me to give her the knowledge, she demonstrates a *received knower* stance (Belenky et al., 1986), a stance in which the knowers have not yet begun to gain a voice according to the authors. Noticing Andrea's voicelessness is important to identifying her initial stance in Consumer Mathematics. Andrea's voicelessness provides a backdrop for the successes that she experienced subsequently. Andrea was tentatively beginning to speak out and use words intentionally to shape her and her environment.

Asking Peers for Help

As the semester progressed, rather than waiting for me to come to her or interrupting when I was assisting another student, Andrea began to ask her peers for help when necessary. When we discussed this emerging strategy in our first conversation, Andrea mentioned, "'Cause if you don't understand a question, and they do, then, if they do, then somebody you know tells you how to do it. They explain it differently." Andrea

believed that her peers could explain, better than a teacher, how to do a question because they would use words that she understood. She found teacher's words hard to understand, partly because "they learned it so many times, they sometimes talk like their professors would talk." When I probed further, Andrea clarified that her peers explained the same steps to her, but just in different words. There is a shift in Andrea's actions in class when she needed help, to ask peers because their words were more understandable than a teacher's words, without a shift in her belief about the nature of knowledge.

Listening to Andrea's words in the conversation provides an insight into the emergence of her voice. I believe Andrea was communicating that the mathematical ideas and skills that she was to be learning in mathematics class were still her teacher's ideas. The mathematical knowledge, which the teacher was to give to her, could be mediated by peers. Mediation of ideas and skills by peers did acknowledge their words as important for transmitting the ideas to her. There is a subtle shift in authority that Andrea is demonstrating by locating an increasing authoritative voice in her peers, rather than only belonging to me, the teacher in the classroom. Instead of interacting in an asymmetrical power relationship with a teacher, Andrea's emphasis on asking peers for help indicates a small movement away from silence as she began interacting laterally to obtain information from others. As well, several weeks after Andrea had incorporated this strategy into her studenting process, she could say to me that asking peers was a better strategy to support her learning than asking me. Expressing that one strategy was better than another demonstrated an increasing authoritative stance towards her learning and becoming intentional in the audiences she selected to hear her emergent voice.

While Andrea's prioritizing of asking peers for help demonstrated her emergence of voice by shifting her stance of authority roles in the classroom, her voice had not fully emerged. In believing that her peers had to *give her* knowledge and *tell her* how to complete questions, Andrea still demonstrated the stance of a received knower (Belenky et al., 1986), which was similar to her stance in voicelessness. Andrea was engaged in the emergence of her voice, a process that necessitated taking small steps one at a time. And because, in retrospect, Andrea could say some of her story of her emergence of voice to me, we can hear the tiny movements as she moved away from silence. Expecting the refining of voice immediately was not realistic for Andrea, nor was it realistic for her classmates as their voices were emerging from voicelessness.

Andrea was not the only learner in the class to enact this strategy. With many requesting intensive one-on-one help, several students reported asking table partners or other peers for help in class. They appreciated the convenience and relative anonymity of the kind of help peers provided. However, asking peers for help was more than just a matter of convenience for the students, but a process in which their voice was beginning to emerge.

Baxter Magolda's (1992) epistemological reflection model provides a small comparison to aid in understanding the significance of the stance shift of these students. In the model, Baxter Magolda explores is the role of peers. Unfortunately, students who live in silence do not correspond to a stage Baxter Magolda's model, but essentially come before absolute knowing. Her absolute knowing stage, though, which is similar to received knowing in Belenky et al.'s model (1986), describes the role of peers as explaining "what they have learned to each other" (Baxter Magolda, 1992, p. 75), or

transmitting content knowledge from the course. If voiceless students are not included in this model, a shift to absolute knowing where peers are expected to tell ideas to another is a shift in stance for the learners in this inquiry. The shift in stance is from obtaining the teacher's knowledge from the teacher to obtaining the teacher's knowledge from peers, in peers' words. The learners' shift in stance is a subtle shift, a subtle emergence of voice. And although there was progress and emergence, Andrea and her classmates were using words in this context just to get done, just to finish specific questions or tasks. Andrea's intentions for her words did not really include *learning* the mathematical ideas or skills. Her voice was still in the process of emerging.

Interacting with Others to Learn

As I continued to observe Andrea and talk with her in further conversations, I began to notice that asking peers for help was not the only way that she interacted with classmates. Andrea was building on that success by engaging in more complex interactions with her peers. While the previous interactions with individuals had occurred before the first conversation, I began to notice this next type of interaction between the first and second conversations. The theme of Andrea's second narrative was the way in which she used words in the classroom. In response to the narrative, Andrea told me about her three learning partners, Whitney, Susanne, and Lindsey. Although each learning partnership had unique characteristics, there was a common element between Andrea's interactions with Susanne and with Whitney.

When Andrea sat with Susanne, she did more than ask Susanne how to do specific questions. As she stated in the second conversation, "And Susanne, well, we're both kind of the same, try to figure it out both … well, we had fun trying to figure out stuff for the assignments!" Because she felt they had similar ability levels, she contrasted Susanne with Whitney, who told her, and Lindsey, whom she told. There is a shift in words that Andrea used to describe her interactions with Susanne. Rather than asking questions of each other or telling each other how to do something, Andrea and Susanne were *figuring out* the concepts and skills that they were learning *together*. The mutuality indicated in this phrase demonstrates that Andrea and Susanne were working towards a common goal of learning, rather than one's goal being to clearly explain and the other's goal to listen carefully. Instead of a one-directional information flow with Whitney or Lindsey, Andrea and Susanne were interacting in mutuality to progress in mathematics class. It also shows a shift in the kind of interactions Andrea was initiating and involved in, in order to *learn*. Andrea and Susanne were interacting to *learn* (a learning role) rather than to complete assigned questions (a studenting role). Andrea was developing a sense of authority over her actions in the classroom as we see her voice emerging in this example.

When Andrea sat with Whitney, she told me that she also did more than ask Whitney questions. At first, Andrea described Whitney as someone she "could rely on … because she could understand", relying many times on Whitney to explain. Later on in the conversation, she also talked about a different kind of interaction with Whitney when I asked her about her best table partner. She believed Whitney was the best table partner, as she justified her claim by saying, "And when we were working together, she'd, we'd both work, instead of just one or the other." Rather than focusing on the help that

Whitney often provided, Andrea was beginning to see the importance of *learning with* her table partner. I also noticed this mutuality during class time. Instead of interacting with Whitney for the purpose of Whitney giving knowledge to Andrea, Andrea was interacting with Whitney so that together they could learn. The intentions that Andrea had for her words, to affect her learning and to affect her relationship with Whitney, was a step forward from the intention of acquiring help. The complexity of her new intention with words demonstrated that her voice was emerging within the context of learning mathematics.

A shift in Andrea's role within the peer-to-peer relationship is evident as she moved from *listening* to *actively engaging* in the classroom discourse and in her learning. Within the process of the emergence of voice, students are actively involved in gaining their voice. For all the students, their voice emerged through their efforts and attempts to speak out, to name what they were experiencing, and shape intentions for their words. In other words, Andrea and her classmates were not passive in their emergence of voice; it did not just happen to them. They were actively involved. The emergence of their voices occurred as they worked at refining the initial pieces of emergent voice that they had gained already.

A parallel can be made to current research in mathematics education (Borasi, 1992; Davis, 1986; Pugalee, 2001b; Ward, 2001). Within the constructivist view of learning, students must be active in the construction of their own knowledge and understanding. Being actively involved in their own construction leads to rich and complex learning. The emergence of voice, similar to constructing mathematical knowledge and understanding, is a rich and complex task that requires the individual

gaining a voice to be active throughout the process. Andrea was using the emergent voice that had already begun to form and she used to it build on her previous successes. As she used her emergent voice, she continued to refine what she was saying about herself and her learning. For her classmates as well, who demonstrated active engagement through responding to writing prompts and being in discourse about themselves in conversations, the emergence of voice only occurred as they took an active part in the voice's emergence.

Explaining Mathematical Concepts and Skills to the Class

Up until now, all of Andrea's interactions have been one-on-one or small group interactions for gathering knowledge or learning in mutuality. As we see these moments within the whole of Andrea's story of success we see her emergent voice evolving as she continues to build on more complex successes. As Andrea built confidence in her context, both with individuals and with mathematics, the nature of those interactions continued to evolve. Just before our second conversation, an interaction occurred between Andrea and me, where I was helping her with a question that asked her to calculate daily vitamin intake. As we corrected the assignment later on in class, Andrea volunteered to explain the answer and concept behind the solution to the class. Andrea was becoming more vocal in class, willing to provide explanations to the whole class.

Because this was a new way that I noticed Andrea using her words in class, I highlighted the moment in her second narrative (see Chapter 5 for the narrative). In our subsequent conversation, Andrea selected that moment as in important example from her

narrative of success. Although she explained how to calculate a full daily vitamin intake again in our conversation, I was interested in her willingness to explain to the class. I asked her about the meaning of checking with me first and then explaining to the class. She responded by saying,

> Well, teachers have different ways of describing things. And their definitions, they would make you copy down the definitions so you would **. And everyone is different, so you, I would put them all together, from each year. … . They're somebody else's ideas, in a way. But it's just being described differently.

The nature of the use of her words in this example was to explain to the class an idea, but she was sure to check with me first to see if she was correct. She still did not view the idea as her own, but her voice was emerging as she vocalized a mathematical idea and took ownership of giving that knowledge to her classmates. This still demonstrates a received knower's stance (Belenky et al., 1986), yet Andrea was beginning to recognize the importance of *her* words and that they had value for her and for others.

As I helped Andrea with the assignment and then observed her explaining it to the class afterwards, I recognized growth from her previous stance of being the individual who had to be *told.* Now, Andrea was doing some of that same *telling.* I believe that this educational phenomenon occurred within Andrea's zone of proximal development. She was able to complete the question and also to explain the mathematical idea and skill to the class "under adult guidance" (Vygotsky, 1978, p. 86). The ability to be vocal was within her zone of proximal development as she engaged in vocalizing to the class under my guidance, as the teacher in the classroom.

The need for my guidance indicates that being vocal was not something that Andrea had already learned, but something that we can *see* emerging within her zone of proximal development. By understanding Andrea's use of her emergent voice in this

successful moment, we are able to *hear* the emergence of her voice and the dynamic nature of the emergence of voice because of her active involvement in the guiding that I was providing. Applying Vygotsky's (1978) concept of cognitive development to the emergence of voice, the teacher guidance that Andrea relied on was a necessary element in the emergence of her voice. But more so, it highlights the dynamic nature of the emergence of voice as it's initial utterances occur within the zone of proximal development before and as it goes through the process of being refined into different expressions of emergent voice.

A few weeks later in class, I observed Andrea contributing a mathematical idea and skill again to the class – the concept of perimeter that we saw as an example of Andrea's emergent voice in Chapter 7. The context of her contribution to class differed from the daily vitamin intake example because in this instance Andrea did not check with me before explaining to the class what perimeter was and how it is calculated. In our second conversation, she recalled that example as a time when she explained something in class without checking with peers or me first. She felt it was a good moment that demonstrated her success because the ideas she explained were her own and "'Cause it's like, it really makes you feel confident. Like, other people are using how you describe stuff."

The emergence of Andrea's voice in this example differs in two distinct ways from the daily vitamin intake example. First, she was using her words intentionally, to affect her identity as a confident mathematics learner and also to affect her classmates' knowledge. Second, she believed that an idea was her own. Andrea's belief that an idea was *her idea* demonstrates a significant shift in voice-stance from our first introduction to

her as a student who believed her words and ideas held little value and were not worth remembering. Rather, she was using her words to build on more complex successes as she moved away from voicelessness in the emergence of her voice.

In listening carefully to Andrea's words, we can come to hear another step in her emergence of voice. Chickering and Reisser (1993) might see the shift from checking to not checking with an authority figure before explaining to the class as a movement from dependence to independence. While that might be true on a small scale, I believe that Vygotsky's (1978) zone of proximal development lends a better interpretation to Andrea's movement. Notice that Andrea's actions remain consistent in her explanations to the class of mathematical ideas and skills. What has changed is the way she accomplishes this use of words. Her independence is emerging in the perimeter example, compared to the daily vitamin intake example. The refinement of Andrea's use of words in this shift indicates that being vocal, a characteristic of her emergent voice, was becoming part of her schema and her identity in mathematics class. By being actively involved in the dynamic process of extending her zone of proximal development a few weeks earlier, she was refining the ability to be vocal and assimilating it into her actual development. This is not to say that Andrea had reached a point in her emergence of voice where she *had learned* to be vocal, but rather it signifies the beginning of the consolidation of being vocal. The independence with which Andrea was beginning to contribute to the class demonstrated that the delineation between her actual development and her zone of proximal development was moving in a progressive manner. Andrea was making progress in the complexity of her successes and her emergent voice. Shifting a characteristic of emergent voice from primarily her zone of proximal development to her

actual development level made it possible to again consider stretching her zone of proximal development to refine other characteristics of voice, such as being verbal and being intentional.

Beyond the application of zone of proximal development, Andrea's explanation of perimeter to the class is an example of a more important element of the emergence of voice. With the emergence of Andrea's voice, she was not only getting better at the same kinds of successes throughout the semester, but also she was retaining her original successes and building on more complex success. We saw this in her movement of asking for help from teacher (authority figure) to peers, and it becomes evident once again as she moves from explaining to the class a teacher's idea in her words to explaining to the class her own idea in her words. We could view her successes as concentric circles, where closer to the inner circles was the successful moment where Andrea was explaining to the class, but first checking with me. As we move a circle towards the outside, the next successful moment contained the first but was more complex because she explained to the class without first checking with me. The emergence of voice is characterized by this consolidation of previous successes while building on more complex success, where emergent voice is used to be more vocal, verbal, and intentional.

Andrea's lived experiences and storytelling provide an example of what occurred during the emergence of voice for the learners in this inquiry. Thinking about their thinking, learning, and studenting, and then saying things to themselves and to me about that or their identity was not something many of the learners had done before. Scaffolding was required so that learners could engage in this kind of complex thought

and discourse. Thinking about their thinking, learning, and studenting was within their zone of proximal development. The nature of learning and thinking within the zone of proximal development provides a strong understanding of what it means to view and to listen to the dynamic nature of the emergence of voice. In other words, the emergence of voice was not something that the students had already acquired or attained in their learning as they came to Consumer Mathematics. Emergence of voice was a dynamic part of becoming that the learners actively engaged in during the semester. It required another, me in this context, who could foster the emergence of voice by inviting students to engage in a process that was located in their zone of proximal development. As well, each of the students in the inquiry developed several forms of success, each subsequent kind of success being more complex than the previous and all contributing to the way they used words with their emergent voice.

Having a Good Idea, But Remembering It?

Andrea had moved beyond voicelessness and had also moved beyond just telling about other's mathematical ideas in her words. She was beginning to see ideas as her own. She also perceived those ideas as having value for herself, as well as for others. For example, in her stance with Lindsey, Andrea was engaged in learning on her own and giving information to Lindsey in her own words. As the semester progressed, I continued to look for moments of success where Andrea was generating her own ideas and saying them out loud. In Chapter 6, I described Andrea's silence as not remembering the good ideas that she had. I recorded a moment of listening to Andrea's pattern recognition and

pattern generalization that I believed was a significant cognitive moment for her. The mathematical success Andrea experienced in this situation was the idea that she constructed from the inquiry activity to build a more complex understanding of area and perimeter. In my field notes that evening I recorded, "What a concept! I couldn't believe that she saw a pair of sides basically didn't matter. … That's a pretty sophisticated thing to notice." I was certainly encouraged by Andrea's thinking.

However, she demonstrated in an extra conversation a few days later that she had no recollection of thinking the idea or saying it out loud. She finally stated, "I don't remember thinking that" near the end of our conversation, after I guided her to see the same pattern she had recognized and communicated a few days earlier. Andrea's success, in this example, is not contained in the event that she could not remember having a good idea. Her success is in having the good idea. Eleanor Duckworth views "the having of wonderful ideas [as] … the essence of intellectual development" (1996, p. 1). Having her own ideas was success enough to understand this as a building on to previous successes Andrea had experienced. Within the process of the emergence of voice, this example of Andrea's inability to remember her idea demonstrates the nascent nature of her emergent voice and the fragility of the process of the emergence of voice.

Even though Andrea did not remember thinking the pattern idea, which is some sense demonstrated voicelessness, this phenomenon was still a moment of success. In noticing and generalizing the pattern, Andrea was engaged in mathematical thinking and reasoning that is integral to the element of rigour in Consumer Mathematics. But what is significant about this moment is that *I noticed* the success. I knew Andrea well enough as a student, learner, and individual, to recognize this moment of cognition as something

that was significant to her lived experiences in the classroom. I also, in retrospect and in understanding the theme of the success of the learners' stories, recognized Andrea's mathematical cognition as a way in which her voice was emerging. She was beginning to believe that she could have important ideas, and that, combined with her confidence in her context, provided enough of a foundation for Andrea to begin to have her own mathematical ideas.

My noticing Andrea's success signifies that the emergence of voice is a process that requires another to be inviting students to engage in the process of emerging and to be vigilant. The emergence of voice is so quiet that it would be easy to miss if the teacher did not know her students well, if she did not live in pedagogic relationship with them, and if the teacher was not engaged in authentic listening and seeing throughout the course. As I lived with my students, I was continually looking for successful moments that I could celebrate with each learner. My noticing of the success also means that the emergence of voice is a process that occurs in small shifts and little steps that the students take as they begin to be successful and say things about their thinking, learning, and studenting. When I talk of students moving away from voicelessness and engaging in the emergence of voice, they are not large, paradigmatic shifts of success and of voice stance. It could not even be described by a stage shift in Belenky et al.'s model (1986) or Baxter Magolda's model (1992), as the shifts between those stages are large steps. Rather, the emergence of voice is characterized by small shifts and movements that are rewarding to notice and could only be caught by *listening* to the students.

Valuing Her Own Words for Understanding

In the previous chapter, I described the tentative nature of Andrea's emergent voice. In our second conversation she had expressed the importance of saying mathematical ideas in her own words so that she could understand. This stance demonstrated emergent voice because she was being both vocal and intentional. Within the story of Andrea's emergence of voice, this conversation is also significant because Andrea was coming to value the words she said as effective in learning mathematics and in identifying herself as a successful mathematics learner. For Andrea, to explain the value in saying things in her own words for her understanding was building a success on previous successes. Previously, she had used her words to explain to the class, but had not intended for her explanations to affect her. With her belief of the necessity of saying things in her words to understand, she was using words to do more than report to the class. Andrea now turned inward in her explanations, intending to affect her understanding and learning. Valuing her own words for understanding also demonstrated a shift away from received knowing (Belenky et al., 1986) because she was engaged in constructing her own understanding with her words instead of relying on the teacher to give her the mathematical ideas *and* the words. Andrea's success was using words to affect her identity and her understanding.

Andrea's indication that her words were important to her understanding was an important moment for me to notice her success in our second conversation. Remember that near the end of the same conversation, Andrea indicated that her study strategies would be reviewing examples and everything she had learned to see if she could

remember the steps. Studying in this manner demonstrated a return to a stance of knowing that reflected more closely the characteristics of received knowing, where the examples I provided in class and the answers in the textbook were the authority for the mathematical ideas and words. Chickering and Reisser's (1993) conception of vectoring aids in making sense of Andrea's comments because they noted that development, in their vectoring model, is not always linear. Rather, part of the process of gaining a voice incorporates a movement "forward" and "backward" as voice emerges.

Using Chickering and Reisser's model of vectors can support noticing the emergence of Andrea's voice in this example and bring meaning to her emergence of voice. Vectors, in mathematics, have two component elements to represent movement. One part of the vector indicates a direction for the movement. Using this example, we can hear Andrea's emergence of growth through the overall direction that she was moving throughout the semester. The vector began at her voiceless stance and was pointing towards the refinement of an internal and mature voice. The emergence of voice is the movement being represented more generally by the vector. The second part of the vector indicates a rate for the movement that is being represented. The rate for emergence of voice, although showing progression, is not necessarily a steady rate and not always a "forward" bearing rate. Instead, it varies because of the tentative nature as voice emerges and incorporates the movement of the lived experiences of Andrea and her classmates. In other words, as Andrea worked hard to add on more complex successes, she would sometimes return to a previous stance readying herself to experience more success as her voice emerged.

Andrea Telling about a Successful Moment

Andrea, as I have mentioned earlier, completed the semester approximately a week early. A few days before she finished the course, she and I had a moment that was a capstone for her experiences in Consumer Mathematics and a capstone for her emergence of voice. Because Andrea was completing the course early, I had given her a list of textbook assignments that she needed to complete on her own. She would read the examples in each lesson and then try the questions that I had suggested. One of the topics in this list was capture-tag-recapture sampling, which is a method used for determining the population of wildlife. Conceptually, capture-tag-recapture sampling is based on ratios (a common conceptual theme in Senior 2 Consumer Mathematics). Because Andrea's last day was not definite, she happened to be in class when the rest of her classmates learned this idea and skill.

Although Andrea never had an opportunity to retrospectively tell me about this capstone moment, I recorded our interaction in my field notes. This is what I wrote:

> Andrea was really happy that she had done the assignment already and knew how to do the questions. She came up to me, just before I went over the questions on the chalkboard with the class. She said (something like), "You know what I saw with these questions, Mrs. McFeetors? You just use the numbers backwards from the way the question is written. You start with the last number and you put it over the second last number and then that's equal to the first number over what you need to find. I noticed that [pattern] while I was working on the questions." She was really proud of herself. And, she came up to me just to tell me that. It made me think about if she was willing to look for those general ideas and come and tell me them because we have an open communication about when she is doing things really well in class. I wonder if it has to do with the writing of stories I have been doing and our conversations together. But what is significant is that she came to communicate to me something she saw. It's also a thoughtful piece – that she at least noticed (and was maybe thoughtful) about the structure of the questions she was doing. It is a metacognitive piece that is within the grasp of these students. Andrea did it!

There are a number of important elements to point to in my initial interpretation of Andrea's successful moment. However, I believe it is important to just see in the event that Andrea had told me that she had been successful and exactly how she was successful. She noticed her success and expressed her success to another. It was a pinnacle moment for Andrea for learning and self-identity.

We could point to the metalearning statement that Andrea made to me when she generalized the steps for the question, noticing that the steps were the same for each of the questions she had completed. We could point to Andrea's responsibility to complete assignments ahead of time and in a nearly self-directed manner. We could point to Andrea learning how to complete capture-tag-recapture questions on her own, without the support of her peers or me. These are all elements of this interaction that are important, but do not make the moment remarkable. The significance of this moment of success was not in the metalearning, metacognition or studenting necessarily. The significance of this moment of success is in Andrea noticing and expressing her success.

The capstone event that demonstrated Andrea's success in Consumer Mathematics was about her emerging voice. The process, which started near the beginning of the semester as Andrea and I established our pedagogic relationship, was continuously progressing. Andrea's emergence of voice progressed as she continued to add small successes and small characteristics of emergent voice on top of previous successes. Her emergent voice continued to evolve with each interaction and event in the classroom, and as she refined the way in which she used words. Her authority over her own thinking and ideas is established as she vocalized to me her moment of success. She spoke out about her success. Her authorial stance is apparent as she verbalized the

pattern of completing the questions. She named her cognition as she explained the steps. Her sense of audience is complex as she came to me with certain intentions in what she said to me. *She purposefully told me about her success.*

I believe that this last characteristic of emergent voice, intentionality, comes to it's most refined sense in Andrea in this moment. She *intended* to tell me about her successful moment – to point out to me that she was successful in mathematics class. I believe that Andrea's telling was a result of our pedagogical relationship and our discourse around success that had been an integral part of our semester. By telling me about her successful moment, I believe Andrea intended to affect her learning about capture-tag-recapture sampling. As well, I believe she intended to affect her relationship with me as she initiated the discourse about success (rather than my initiation through narratives). More importantly, in this example of telling of success, Andrea was intending to affect her *identity*. By telling about her success, she identified herself as a successful mathematics learner who could construct her own ideas and she identified herself as an individual who could say significant things about herself – her success. The emergence of her voice, from voicelessness towards emergent voice is captured in a moment Andrea and I could celebrate together.

Andrea's Journey as an Exemplar

Andrea is an exemplar of the emergence of voice. An exemplar is an individual who serves as an ideal model or example for a group of individuals that all demonstrated some emergence of voice. Andrea is an exemplar because her story allows us to hear

many of the small steps of the emergence of voice throughout her semester. We hear in her example the small moments of success that demonstrated her voice was emerging from a stance of voicelessness. The emergence of voice occurred through her active involvement as I listened closely to her successes and guided her in exploring her zone of proximal development. The journey was not flawless, because no journey in the gaining of voice is. Rather, the return to previous stances provided opportunities for Andrea to consolidate specific characteristics of emergent voice before building on more complex successes. Andrea is not an exemplar of the emergence of voice because she experienced the largest or smallest amount of growing and stretching during our semester. This would be quite difficult to ascertain because of the unique nature of the journey of each learner.

The unique nature of the journey of each learner is of central importance to this inquiry. It is of central important because of the particularity of the individual learners who participated in the inquiry. It is of central importance because of the nature of the inquiry question and the process of inquiring into the success of learners and how that success evolves. Just as with Andrea, each learner's story is distinct and highlights different processes of the emergence of voice, perhaps in differing orders and also in differing intensities. What Andrea's story does exemplify, on behalf of all of her classmates, is that the emergence of voice was a tentative process and one in which I needed to listen closely to their moments of success to catch the subtle shifts in stance as they lived a process of *becoming*. Andrea also illustrates, on behalf of her classmates, the brilliance of each of the small steps the learners took as they moved away from a stance of silence and the fact that they were constantly in the process of building on more

complex successes to the ones that they already had. The pleasure of watching and living with the learners as their voice emerged was particular to each of them, but significant for all of them.

Fostering the Emergence of Voice

The emergence of voice for learners in a classroom is not a simple process. It is complex, and it is particular to each individual. As I have foreshadowed above, the emergence of voice for each of the learners was not a process that they undertook on their own. Rather, the emergence of voice happened within a specific context where learners were invited through specific opportunities to engage in gaining a voice.

There are numerous words I could use to describe my role and the role of the context in the emergence of voice. I have chosen the idea of *fostering* the emergence of voice because it implies an initiating by me and the classroom context while maintaining a place in the emergence that could be characterized as coaching or guiding. Other verbs that I could have associated with my role, as teacher, and the influence of the context (both classroom processes and the classroom environment) were encouraging (which implies the teacher and context have sideline, almost passive roles), inviting (which implies that there is merely an initial role of teacher and context), guiding (which places too much responsibility on the teacher and context), causing (I did not collect data to demonstrate a generalized, causal relationship between specific influences and the emergence of voice) or sponsor (which is most similar to fostering, yet again implies

passivity). However, both the classroom context and I were active participants in the learners' gaining of voice, and at the same time I recognized (as one who controls my actions and the classroom context) that it was each *learner* who was in the process of gaining their own voice. The learners needed to be actively engaged in their *becoming* because voice could not be given to them. It was *fostered* through their experiences in mathematics class.

Before the semester began, I deliberated on how I would interact with the students and how I would structure the classroom context. Throughout these deliberations, I considered how I would foster the success of the students. When I clarified the literature themes for this inquiry in Chapter 2, I explained in detail how being in relationship with the students and sponsoring rich mathematical learning would foster the success of the students I had yet to meet. It was a *look forward.* As I approach the end of this inquiry, I have recognized the necessity to look back on the lived experiences in the classroom. A *look back* at factors that fostered success provides an opportunity to make sense of the factors within the nature of success that I noticed and described. A look back allows me to notice how the emergence of voice came about during the semester. A look back also allows me to notice the interconnectedness of the emergence of voice and my actions and decisions in the classroom. This section will chronicle the phenomena in the classroom that I can now, in the light of the theme of success, point to as crucial elements of fostering the students' emergence of voice. Looking how the factors that fostered success did in fact foster the emergence of voice will act as a post-hoc analysis and interpretation of the classroom factors. Three elements of fostering the emergence of voice that I will explore are my influence as the teacher, the effects of classroom processes, and the

effects of the environment. To clarify, when I speak in first-person for this section of the chapter, I will be speaking as the teacher in this inquiry context.

The Influence of the Teacher, Myself

In Chapter 2, I described my philosophy of teaching as a relational endeavour. As I lived with these students over the semester, I would characterize my relationship with them as a pedagogical relationship (van Manen, 1986), as I enacted a stance of teacher-with-learner and learner-with-teacher. Rather than focusing on a philosophical statement of teaching, the application of these guiding principles to my actions and the classroom needs to be heard in order to understand how I influenced the emergence of voice for each student. I began to see and listen to each student in a way that many others could not see – seeing each student in multiple ways as we interacted. For example, through interactions with Roger, I came to see him as an individual who was spirited and wanted to have fun, as a student who was struggling in his positioning with authority, and as a learner who was beginning to say the process of how he learned best. Through this *multiple seeing* of Roger, I began to foster his voice through specific conversations because I saw him as a whole individual. I became an authentic audience to whom Roger could say things and with whom he began to develop intentions in what he said. As well, within the conversations, Roger refined his stance of authority over his own studenting and learning by saying out loud the process in which he believed he learned best. His voice emerged within the pedagogical relationship we had formed over the semester.

I believe that my influence on the students' emergence of voice was inextricably linked to the pedagogical relationship that I forged with each learner in the classroom. The centrality of relational teaching is difficult to express because it is an underlying way of interacting with learners that is more than the words I said and the actions that I embodied in the classroom (Van Manen (1986) and Ohanian (2001) also experienced difficulty saying in words the pedagogical relationship). It was at times much less of a conscious thinking and acting, but rather a part of who I am as a person and a professional in the classroom. As a way of being, living in pedagogical relationship affected the things I said and did, my interactions with students, and the way I reflected on the teaching and learning occurring in the classroom. But living in pedagogical relationship also influenced the emergence of voice because my relationship with each student was particular, thus providing opportunities for them to begin to speak with an emergent voice (being vocal and verbal) in just the way each individual needed, as they needed to (building a sense of audience).

As I interacted with the students, I found that seeing them in multiple ways was a way in which I suspended my judgment of each of them – I liked them just the way they were. Noddings' (1984) sense of *receiving* individuals captures this stance of a teacher with students. Receiving the students, just as they were, communicated to them my belief that they could be and become "competent, caring, loving, and lovable people" (1995, p. 366) from the moment they walked into the classroom. It was not for me that they needed to grow and become; I did not have a desire for any of them to be *more* of something or *less* of something else (even as the non-implementers and disrupters played out their interactions in the classroom, I recognized their need to do so as part of their

process of positioning and identity-formation). However, I did want them to develop an awareness and concern in growing and becoming for themselves. The act of receiving the students fostered emergence of voice by allowing them to say out loud, in their own terms and on their own terms, what their individual success would be – the unique ways in which each student was growing and becoming. In other words, it did not pre-define in an authority's terms what success would be and the route they would need to follow to attain that success. Receiving the students just as they were provided opportunities for them to become authors of their own success. Voice emerged from this stance of receiving students because they were encouraged to form their own identity.

Being in pedagogical relationship with the learners necessitated a change in the traditionally defined power relationships in a classroom. Rather than living within this traditional relationship, my caring stance towards the students and desire to learn from them caused the traditional, asymmetrical power relationship to diminish. In many interactions, when learners and I were in conversation about their thinking or learning, I would emphasize that I wanted to learn from them and that they were the experts at their own thinking and learning. In our second conversation, I clearly expressed this to Erin as she was telling me about her mathematical thinking (see Chapter 7). Erin's tentative, emergent voice was continuing to emerge as I encouraged her to take an authoritative stance in relation to her own thinking.

Perhaps the idea of being in pedagogical relationship and receiving the students as they are could be construed as a lack of authority in the classroom, or a permissive teacher-stance. However, the authority that the students were gaining as their voices began to emerge was authority over their thinking, learning, and shaping of ideas and

words. At the same time, I still maintained an authoritative stance over the learning opportunities that students were being invited to actively engage in. It signifies a difference between *authority of words and ideas* and *authority of classroom processes*. Voice emerged as students were given opportunities to become authorities in their own thinking, learning, and studenting.

My reflections and deliberations on how to best teach these students also were influential in the fostering of the emergence of voice. As I prepared for each day, I found myself designing invitations for success. Invitations for success included opportunities to "do mathematics, to be reflective, and moments to use and gain emergent voice. Defining and implementing these moments could only come as I was in relationship with the learners and came to engineer specific opportunities for learners to say things about their thinking, learning, and studenting. Planning in this manner was responsive to the students and their personal and educative needs. Because of the uniqueness and particularity of each learner in the classroom, there is no specific recipe or prescription to plan for the emergence of voice. Rather, it comes in the moments where students are invited to name their thinking and learning and to say that to an authentic audience. As well, the focus of my reflections was to notice success in the lived experiences of the learners, which occurred predominately when I was preparing for their conversations. I fostered the emergence of voice by listening carefully to what the learners had said to me previously and amplifying their words to them so that they could come to say their success in their own words. Voice emerged as I continued to reflect on their success and enter into conversation with the learners about their success.

A pedagogical relationship was fundamental to my influence on the emergence of voice. Not only did it form a foundation for the interactions in the classroom, but also for the initial and continued emergence of voice throughout the semester. Even though a pedagogical relationship is difficult to describe, it is inextricably linked to seeing the individuals in multiple ways, accepting them just the way they are, and by making a shift in a stance of authority. From this pedagogical relationship, learners were provided opportunities to gain authority over their thinking, learning, and studenting as they said things to me in their naming of the processes and finding an authentic audience to whom they could communicate. As I look back on my influence on the emergence of voice, I can see an essential connection between my way of being with learners and their emergence of voice. The effects of the classroom processes and the environment on the emergence of voice flowed directly from the pedagogical relationship that I formed with each learner in the classroom.

The Effects of Classroom Processes

Aside from the influence that I had as a teacher in the emergence of voice, the classroom processes that I planned and implemented also affected the emergence of voice. The classroom processes which I used encompass all the things done in the classroom as instructional and learning processes, ranging from daily classroom routines, regular (but less frequent) elements of classroom practice, how the mathematics was taught and learned, how student mathematical understanding was assessed and evaluated, and a general philosophy of learning that attended to the experiences learners were

having in the classroom. Rather than influencing the emergence of voice, as my actions and thoughts did, classroom processes *affected* the opportunities for emergence of voice and the way in which voice emerged in the classroom context. That is to say, rather than the classroom processes being foundational and continuous in the emergence of voice, the classroom processes were individual phenomena that fostered the emergence of voice.

Over the semester, I provided many opportunities for students to say things about their thinking, their learning, and their studenting in Consumer Mathematics. Two key elements in the writing processes in the classroom were interactive writing (including journals and test reflections) and portfolios. These writing opportunities, which opened and maintained direct lines of communication between myself and each learner, were open-ended invitations for learners to say what they felt was necessary in response to specific prompts. As the students decided how they would affect their learning and relationships with words, the authority of words and ideas shifted from me to each of the students. Additionally, in these reflective moments, learners were invited to decide to what audience they were writing. Sometimes their audience was self (engaging in self-talk) and other times I was the audience for their writing. I believe that it was in the moments as students reflected on their thinking, learning, and studenting, that some of what was once unconscious thought became conscious as they authored words to say what they were thinking and learning. Voice emerged through these two writing processes because students were provided with opportunities to be vocal, verbal, and intentional, and they accepted the invitations to do so. Voice could not emerge from situations where the teacher would have stated explicitly what was to be written, but in

the ambiguity of their own choice to speak out, authoring the words and ideas they felt were important for them and for me to hear.

Students were also encouraged to say things about their thinking, their learning, and their studenting in Consumer Mathematics during our three cycles of conversations. The conversations became a integral process of listening for the students and me. I initiated this listening process by listening to the words the learners had authored in their interactive writing and portfolios. Sitting down and spending time listening to each of the students individually was valuable. Listening to the students in the conversations fostered the emergence of voice by providing an authentic audience with specific inquiries about the way they were approaching mathematics class and the successes they were already experiencing. The specific inquiries and my interest in them encouraged the students to say things about their success (being vocal) and to name some of their successes (being verbal). Daniel is an example of being verbal, where he stated in our first conversation that he would be remembered as the one who explained. He was in the process of naming his success, but also shaping the way in which his voice was emerging as it emerged.

Although I thought I grasped, at the outset of this inquiry, the effect of adding the conversations on as another instructional and learning process in Consumer Mathematics, it was only after the conversations had been completed that I came to realize their effect on the learners and me. I believe that the students developed a greater sense of audience with me as we progressed through the conversations, because they came to see that I listened to their written and spoken words. Nadine and Cynthia, after the first conversation, commented that they thought the narratives were "cool". Susanne

recognized the value of the conversations as a time where a teacher and learner could talk one-on-one, which was not always possible in a classroom setting. She said of the narratives and conversations,

> Especially from the making a decision one. 'Cause it just talked about, let's see. {pause} Just talking about how I did have my goals and my talents. And I sat there and I went through some [the narratives] and they worked. And how, like, just hearing that, somebody, like, is almost happy for you. And so it's good. And just showing you, too, you did it! Good job! Sort of thing. I don't know. I like that.

For Terri, her openness to enter into classroom discourse increased greatly after our first conversation. And finally, for Nadine and Erin, what we talked about in conversations affected the way they viewed their thinking, learning, and studenting in subsequent moments in the course. Erin demonstrated that she deliberated, after the first conversation, about the definition of problem solving and finding suitable examples for her portfolios. Nadine continued to consider effective strategies she could add on to continue to be successful in Senior 3 Consumer Mathematics, as evidenced in her final portfolio. The intentionality of the learners came from their emergent voice, which they were shaping and forming as they said things to me and pointed to specific elements of their thinking and learning. The conversations also affected the pedagogical relationship between the students and me, which I have already described as being influential in the emergence of voice.

Specific to the mathematical learning that was occurring in the classroom was the way in which I implemented the course curriculum. There were still direct instruction lessons in which students were required to complete textbooks questions to develop and refine specific mathematical skills. However, I also incorporated mathematical tasks where students were invited to *do mathematics* and where they were encouraged to

engage in mathematical thinking and learning. I will use one specific example, fractal cards, to illustrate what I mean by doing mathematics. In order to learn about the concept of scale factor and then the skill of calculating scale factor, students were introduced to fractal cards. Fractal cards are a step-like structure that the students built by cutting and folding paper. The fractal cards allowed the students to see and touch scale factor, instead of using it as an abstract idea to calculate specific answers. After they built the fractal cards, they completed a series of learning sheets. The learning sheets first asked them to complete some basic arithmetic and then to consider the meaning of the scale factor (what the scale factor meant within the context of the fractal cards) and to extend their mathematical thinking about scale factor to other situations. Rather than just completing a textbook assignment, the fractal cards task provided an opportunity for students to make sense of a discrete piece of mathematics. As well, to complete their experience of scale factor, they were asked to consider the mathematics inherent in the fractal cards through interactive writing.

I believe that implementing mathematical tasks such as the fractal cards provided opportunities for voice to emerge within this classroom. Rather than me, the teacher, being the arbiter of mathematical knowledge, students were actively constructing their own understanding of scale factor and the methods by which they could apply scale factor to various problems. Active construction of knowledge encouraged students to move beyond a received knower's stance (Belenky et al., 1986), as they began to value the mathematical ideas that they constructed as a result of experience-based tasks. Even in our conversations afterwards, Nadine, Cynthia, and Roger all talked about the learning that had occurred as a result of engaging with the fractal cards. But what is key to the

emergence of their voice is that they could say to me, as a result of constructing their own understanding, some of their learning and understanding that had emerged from the mathematical task. The vocalizing of their learning indicated an emergence of voice that was related both to mathematics and to their formation of identity.

The way I approached assessment also fostered the emergence of voice. I chose to focus on assessment, rather than on evaluation, of student thinking to foster success. Rather than having unit tests, tests were administered every four or five concepts. Portfolios were used to assess learning over a unit. In this way, the learners became actively engaged in saying how they learned and what they learned. Each time they authored a portfolio, the students were being encouraged to refine their emergent voice by writing about their learning and studenting. Their voice emerged through the portfolio process because they developed specific intentions in their reflections, vocalizing their learning and studenting to me and to themselves. As well, this type of assessment process provided space for interactive communication, rather than the teacher saying what the student had or had not learned. The assessment processes shifted the authority of words and learning to the students, which encouraged authority over their learning. As the students were invited to say how and what they had learned, they also developed an authorial stance – using specific words to name their learning and studenting processes. As the students vocalized and verbalized their learning and studenting in assessment processes, their voice emerged as an authentic way of looking back at their learning. Erin, and some of her classmates, reported the positive effects of being able to look back over the unit. She described using the portfolio to see what she had learned, and how she used it as a tool to review. Even in the meta-analysis of the portfolio process, Erin's

emergent voice was audible as she said the intentions she had developed for the portfolios.

Many of the rich learning activities, where students were invited to engage in doing mathematics, were founded on Dewey's sense of experiential learning. However, the experienced-based learning extended beyond mathematical learning in our classroom. As the students lived out a semester in a mathematics classroom, they were not only fulfilling the role of mathematical thinkers, but of students and as learners. As students, they were engaging in multiple experiences of being a student, by listening to and following instructions, by attending classes and coming to class on time, by studying for tests and adding on successful studying strategies, by working out their positioning with authority, and by submitting assignments. As learners, they were engaging in multiple experiences of being a learner, by engaging in the process of learning individually and/or in conversation with peers, by asking for help when they were learning new concepts and skills, and by being actively engaged in the learning processes. However, for Dewey, experiencing these moments is not sufficient for the experience to be complete and to affect the learner. In addition, learners must be reflective about the experience to understand their experiences. Through the classroom writing processes and the conversations, learners did engage in discourse and contemplated the meaning of their *learning experiences*. McLaren suggested, along with "Henry Giroux and Paulo Freire, that we must take the *experiences* and *voices* of students themselves as a starting point. We must *confirm and legitimate the knowledges and experiences through which students give meaning to their everyday lives*" (1989, p. 231, italics in original). Encouraging reflection through conversation about success fostered the emergence of voice by

providing opportunities for the learners to be authoritative about their learning and to say it to me. By doing what McLaren pointed to as confirming and legitimizing the learning and studenting experiences of individuals, voice was given opportunity to emerge.

The classroom processes the students experienced were varied. The students experienced mathematical tasks, assessment processes, learning processes, and studenting processes. Within each of these classroom processes, the voice of learners was privileged as something that was integral to the process. It was in this privileging of voice, the fact that the students were being listened to closely and that their words did affect their learning and their relationship with me, that voice emerged. Just in the basic act of privileging student voice, authority could be assumed by the students in saying their thinking and learning out loud. Students not only said their thinking and learning out loud, but also said things *about* their thinking (metacognition) and learning (metalearning). But as they said things about their thinking and learning, they became more specific by pointing to precise moments and experiences with words that made sense to them. And throughout these experiences, they were given authentic audiences (themselves or me) to say things to so that they began to develop their own intentions in speaking out about their thinking and learning. The emergence of voice was fostered in the students' experiences of classroom processes.

The Effects of the Environment

Although it seems as if the discussion of the effects of environment should belong at the beginning of a discourse about how emergence of voice was fostered, the

classroom environment was not what formed the backdrop but was a part of what affected the emergence of voice. The learners in this inquiry did not experience their emergence of voice asituationally, or without context. Two parts of the context have already been described – my influence as a teacher in pedagogical relationship with the learners and the classroom processes that encouraged mathematical, studenting, and learning thinking to be vocalized and verbalized. Although to a lesser extent, the environment in the classroom was a part of fostering the emergence of voice. The environment in the classroom can be seen as including a focus on the success of students and the classroom milieu.

Throughout the semester I brought a focus to the class on how the students would succeed in Consumer Mathematics. The curriculum, and the manner in which I implemented it, provided opportunities for students to re-view (see again, perhaps in a different way) mathematical concepts that they had seen in previous years and to make connections between the mathematics they were learning and the real world. The implementation of the curriculum in this manner fostered mathematical success. The prompts that I employed for journals and test reflections asked students to consider how they had been successful in specific situations. Sometimes for test reflections I would just ask them to say some of their thinking for a question and at other times I would ask them to find the hardest question they did well on and tell me about what they did well. The selection of items for portfolios focused on moments when the students had understood or learned effectively a mathematical concept or skill, and the reflective writing the students engaged in invited them to consider how they had improved, how they had learned and what some of their successful moments (in terms of studenting

and/or learning) were in the unit. The narratives I authored for the conversations focused on successful moments the student had had in class. Our discourse in conversations was focused around students' success and the theme of success for their mathematics story. Even during informal classroom interactions, I focused on what the student was doing well. I believe that this focus on success was part of the fostering of success for each student. As I noticed the success and pointed it out to the students, they began to notice and say their successes themselves. Andrea's example earlier in this chapter is an exemplar of a moment when a student focused on her success and said it to me, demonstrating as well how her voice was emerging.

The general classroom milieu also contributed to the effect of the classroom environment on the emergence of student voice. Although the asymmetrical power relationship diminished, I still maintained firm expectations of class attendance and engagement in learning opportunities. Along with these expectations came clear consequences for inappropriate actions in relation to the expectations. For example, I closely adhered to the school's policy for tardiness. Firm expectations with clear consequences engendered a classroom milieu where learners came to see they were respected as individuals within a community of learners, and with that respect came the responsibility of living within a community of learners. The community of learners was critical to the classroom milieu because learners came to see that it was a place where they could take risks because of the clear parameters for the interactions and behaviour in the classroom. A safe environment fostered the emergence of voice because students felt they could take risks and speak up, instead of maintaining their initial, voiceless stance.

Although the physical arrangement of the room was not integral to the emergence of voice for the most part, the seating arrangement in the classroom became something that students pointed to as an important element in their success at learning mathematics. Rather than sitting in rows of desks, learners sat in pairs at tables in the classroom. The learners were encouraged to be in constant discourse with their learning partners throughout the course, whether they were working on individual textbook assignments or the mathematical task required of them to learn in collaboration with their learning partner. Students said very little in the conversations about the classroom layout; however, the idea of learning and working with a table partner was significant. Remember back to Andrea describing her three table partners and the interactions she valued with them as a process of learning in the course. In the second conversation, Whitney pointed to activities when she was collaborating with her table partner as moments when she was *learning* rather than just *practicing* questions. Roger, in our last conversation, pointed to working with table partners as a successful moment for him because they helped him stay focused and he could ask them clarifying questions as he was learning. The feeling of safety that the learning partners provided was effective in fostering the emergence of voice. The idea of speaking out, or being vocal, necessitates a milieu where students do feel safe to start vocalizing some of their thoughts and for others to confirm their ideas.

Understanding Emergence of Voice

At the outset of this inquiry, I described two factors – relational being and mathematical learning – that I believed would foster success of learners in Consumer Mathematics. Although my sense of the nature of success was unformed at the beginning of the inquiry and as I taught the students, what I believed to be central to fostering success was at the same time what provided opportunities for voice to emerge within a mathematics classroom. The emergence of voice is situated within a specific milieu and within a relationship with others.

Through my lived experiences in this inquiry, I have come to understand that the milieu within which voice emerges must be characterized by an ethic of care and a pedagogical relationship with each student. Teaching within an ethic of care changes the nature of authority structures in the classroom, allowing for students to be seen and heard as whole individuals. Freire (2000) recognizes this context as an emancipatory context – one in which students are afforded opportunities to develop an authoritative stance in their learning. As I acted as a guide in these students' journeys of becoming, it was necessary for me to be encouraging when the emergent voice became tentative. Listening to the words of the learners was vital – that an authentic audience was listening intently to the quietest of utterances from an emergent voice. My stance as a caring one with each learner was essential to her/his emergence of voice.

Emergence of voice is also situated within the context of relationships with others. Although closely related to the pedagogical relationship, relationship with others includes the broader community of peers. Emergent voice is brought forward in

interactions with others. Each of three characteristics of emergent voice requires the individual gaining voice to be saying things to another. In being vocal, the authoritative stance means a specific kind of positioning of the individual with others around her/him, as she/he speaks out. In being verbal, an authorial stance can occur alone (for example, in writing to self), but the rationale of naming objects is so that the individual can claim ownership of ideas and words in relation to others, and also has tools to communicate her/his ideas and identity to others. Finally, developing intentions is done for the purpose of saying things of value to others for specific reasons which the individual fashions. The audience is key to the forming of intentions for the emergent voice. As individuals with emergent voice dialogue with others, they begin the process of refining and consolidating their emergent voice.

The emergence of voice is not an easy process for a student to engage in – it requires an abandoning of a way of being that is familiar and has little risk associated with it. The initiating of emergence of voice is not a single process that occurs devoid of situation or relationships. A relationship must be forged between teacher and learner in which trust is established and communication about a variety of topics is broached. For Andrea, this process of initiating emergent voice was tentative and required of me to listen to much of her silence before I had the opportunity to listen to her words. And for each learner, the process of initiating emergent voice was unique.

As the learners' voices emerged from voicelessness, fostering the emergence of voice required of me a complex and proactive stance. Fostering the emergence of voice was complex because it required intensity in listening to silence and sometimes to voice. There were moments when students' tentativeness meant their emergent voice wavered.

However, within the complexity of initiating and fostering emergence of voice, there is efficacy because hearing the beginning of the emergent voice, against the backdrop of silence, was like seeing the first evening stars against the dark sky. Emergence of voice is a success to be celebrated by the learners. Emergence of voice is also a success for the teacher who diligently listens and patiently encourages and fosters that emergence.

Chapter 10

Learning from this Inquiry

The stories contained in this document are stories of success in mathematics class, stories of *becoming*. Clandinin and Connelly (2000) recognized the importance of gathering stories and learning from those stories as a way to inform daily practices of teaching and learning. The learners and I learned as we lived, told, and retold our stories. We contributed to an understanding of what it means to be successful in Consumer Mathematics through the complexity of our journey. The learners began their journey in the course with a stance of silence. Through my listening stance, as a teacher, and our discourse about successful moments, the voice of learners began to emerge. Each learner had a story of success to tell, and through their telling, were in a process of gaining an emergent voice. Using the theme of the inquiry, *emergent/ce (of) voice*, to come to understand the nature of learners' success and the evolution of success provides an opportunity to notice the learners' *becoming*.

Significance in the Theme of Success

Returning to the inquiry question I posed at the beginning of this inquiry, I asked: How does the nature of success of learners evolve in Senior 2 Consumer Mathematics? I view this question as having two important, yet related, parts – what is the uniqueness of the nature of learners' success in *this* course and how does that success evolve as learners

experience success? Drawing out a generalized theme from the data that addressed these two parts of the inquiry question was challenging. It was challenging because of the complexity of the lived experiences and the appeal to celebrate each learners' success by noticing only their particular successes. Remaining within the particular successes, though, would not contribute to an insightful understanding of what it means to be successful in Consumer Mathematics. I believed that drawing out a generalized theme of significance from the data meant to make sense of the data as lived experiences framed within the inquiry quest.

I drew out a significant theme from the data, as a way of making sense of the learners' successes in Consumer Mathematics. Even though each of the learners had particular themes of success, the commonality was that their stories pointed towards the essence of the nature of success. The nature of the learners' success was their *emergent/ce (of) voice*. Through the emergence of voice, learners were gaining an emergent voice.

I proposed in Chapter 2 that the success the learners would experience would be a *way of being* (a *process*), and that it would be *dynamic*, *particular*, and *interpersonal*. The emergence of voice was a way of being in our classroom – it was a process of *becoming*. Because voice was just *emerging* for these learners, it was dynamic. Emergent voice was not a stage, but a stance that was in constant flux. Emergent voice was particular because it did not emerge in the same way for each learner, but within the uniqueness of each learner's successes. It emerged within the interactions among individuals in the classroom; the emergence of voice was interpersonal. I believe the

theme, *emergent/ce (of) voice*, is significant because it is illuminative, explicative, interpretative, and effective.

A significant theme is *illuminative* when it *highlights* important lived experiences of the participants in an inquiry. The *emergent/ce (of) voice* was effective in demonstrating a shift in voice-stance for the learners through specific moments of voicelessness and then emergent voice. Their *significant* moments of success were brought forward through the use of specific examples that demonstrated the dynamic of the emergence of voice. For example, Andrea's saying of a moment of success was a capstone for her lived experiences in Consumer Mathematics. The moments of success for each learner were plentiful, and the significant theme provided an opportunity to distinguish between successes and compelling successes for each learner.

A significant theme is *explicative* when it aids in *describing* and *situating* the phenomena as they were lived and then relived through the telling of stories. Chapters 5 and 7 contain more than a collection of successful moments, but contextualize them within the classroom and inquiry context. Although a particularized interpretation, the details contained in the stories supported the development of the generalized theme. For each of the learners, seeing the silence in their words situated their emergence of voice and demonstrated the significance of the first tentative words of an emergent voice. Without familiarity with the learners, understanding their stories would be difficult. The *emergent/ce (of) voice* contextualized the lived experiences of the learners.

A significant theme is *interpretive* when it supports the *understanding* of the lived experiences in an inquiry, providing a coherent and considered explanation. *Emergent/ce (of) voice* provided a framing through which the lived experiences could be understood.

Instead of remaining with an interpretation that was particular to each learner, using the stance of silence (Chapter 6), the emergent voice (Chapter 8), and the emergence of voice (Chapter 9) provided opportunities to understand the learners' success. For example, not only could we see that the learners were gaining voice, but we came to hear specific characteristics of emergent voice that aided in understanding what it means to speak with an emergent voice and what it means to *become* through the process of emergence of voice. The theme not only supported an understanding of the success of learners, but also an understanding of the *importance* of the learners' success.

A significant theme is *effective* when it combines the highlighting, describing, and understanding of experiences in *communicating* the learners' stories. The stories of learners in this inquiry were captivating and compelling for the students and me. As we told and retold our stories, the nature of success affected their success. It affected the learners' identity in mathematics class and their learning in mathematics class (Erin as a mathematical thinker and learner; Nadine in adding on to her success-based strategies for learning). Although the audience will have to determine the power of the learners' stories for themselves, I believe the readers can learn about what it means to *listen* to learners through the stories. Communicating the learners' stories of success through the theme of *emergent/ce (of) voice* provides coherence in understanding the nature and evolution of success.

I had prepared myself with six interpretative frames at the outset of this inquiry. As I have stated before, some of the interpretative frames (Belenky et al., 1986; Baxter Magolda, 1992; Chickering & Reisser, 1993) were effective in supporting my drawing out the significant theme in this inquiry. However, the interpretative frames I had been

prepared to use did not emerge whole through the filtering of my data. In other words, although they provided places for me to begin my interpretation, they did not describe or inform completely the learners' success. Instead, the theme of *emergent/ce (of) voice* was unique and particular to the learners in this inquiry.

Understanding the Theme of Success

Drawing out a generalized theme provided an opportunity for me to make meaning of the data I had collected and to share my understanding of learners' success with a broader audience. I have described in Chapter 8, in some detail, the process I engaged in to draw out a theme from the data. I have also made the case, above, that this theme was significant to the lived experiences of the learners and in coming to understand those lived experiences. Just as meaning was made of the success of the learners through the significant theme, meaningful interpretation of the theme *emergent/ce (of) voice* can also be brought forward. Even though this theme addresses a coherent understanding of learners' success in Consumer Mathematics, I believe that a meta-theme can inform further my inquiry into the success of learners.

The learners in this inquiry were gaining an emergent voice, through the process of the emergence of voice. By collecting and understanding the stories of learners in Consumer Mathematics the theme of this inquiry explored and responded to the inquiry question. However, the learners' stories were not only stories about success in mathematics class. The learners' stories were not only stories about their emergent voice,

and its emergence from a stance of silence. The learners' stories were *stories of becoming from inside a mathematics classroom.* The essence of a learner's becoming is the *forming of the learner's identity* in the mathematics classroom. The forming of each learners' identity occurred as they engaged in the emergence of their voice. It was an identity that they were implicated wholly in forming, actively shaping the way in which they defined themselves with their words and in saying words about self to others. Forming of an identity in mathematics class was inextricably linked to the emergence of voice. Thus, *the forming of an identity* shapes the meta-theme for this inquiry.

The individuals in the classroom were in the process, through the emergence of their voice, of forming their identity as students, learners, thinkers, and human beings. They were *forming their identity as students* as they repositioned themselves with authority in the classroom. Each individual was gaining authority as he/she spoke out with his/her emergent voice. They were defining their position within a mathematics classroom, and a school system, by making explicit decisions about how they would relate to authority. They were *forming their identity as learners* as they became aware of their learning in mathematics class. As they became aware of their learning, they began to name their learning with specific strategies and to consider how they would improve in their learning.

They were *forming their identity as thinkers* as they began to say some of their mathematical thinking out loud. They developed a confidence with which they approached mathematical tasks, believing that they could engage in good mathematical thinking. Most importantly, they were *forming their identity as a human being* in relation with others in the classroom context. They shaped specific intentions for saying things to

others in order to communicate who they are and to initiate the kinds of interactions that were important for them. They began to see themselves as particular and unique individuals and they expressed this stance in the classroom with self-referential statements. Through the *emergence of voice* individuals were forming and reforming their identity, an identity they used to approach mathematics class with a successful stance.

Focusing on Mathematics Education

As I reflect on the significant theme, *emergent/ce (of) voice*, which was drawn from the learners' stories of success, I noticed the absence of *mathematics* in their stories of becoming. The theme was about the forming of learners' identity (in mathematics class). The theme was not about mathematical cognition. As a mathematics teacher who is interested in inquiring into the teaching and learning of mathematics, the absence of mathematics seemed peculiar to me. After all, this inquiry is situated within a high school mathematics classroom, where the individuals in the classroom come together and interact because of mathematics. I became concerned that my learning had not focused on mathematics, especially in a capstone experience that was to exemplify my learning about the teaching and learning of mathematics. Perhaps this was a concern of the audience as well.

My concern with the absence of mathematics would have remained if this document and my learning were about mathematics. But it was not. My journey through

this inquiry is about mathematics *education*. It is about how students come to learn in a mathematics classroom, but more importantly how they grow and become in mathematics class. Mathematics was a mediator through which the learners and I interacted over a semester. Mathematics was a medium through which the learners engaged in gaining a voice, forming their identity as students, learners, thinkers, and human beings. The distinction between *mathematics* as an inquiry focus and *mathematics education* as an inquiry focus is similar to Olson's (2000) distinction between *narrative* and *narrative inquiry*. She says of narrative inquiry:

> People often focus on the word *narrative* but skip lightly over the word *enquiry*. Yet it is the enquiry into the stories that creates the educative experience as individuals find new and more expansive ways to interpret their own and others' experiences. (p. 350, italics in original)

Just as in Olson's conceptualization of narrative inquiry, this current inquiry does not skip lightly over the word *education*. It was through an educative process that the learners in this inquiry experienced and told about their emergence of voice as a significant success in their stories of becoming.

Implications for Curriculum, Teaching, and Learning

The focus of this inquiry was learning about success for learners in one particular classroom, Consumer Mathematics. Both the learners and I learned much from our interactions and the stories we lived, told, and retold. The learners came to see many different kinds of specific successes as we were in discourse, and built on each success more complex successes. I learned to notice the success and to explicate a generalized

theme of success from the lived experiences. However, I believe there are some implications, in understanding these stories, for other high school mathematics educators to consider. If teachers are interested in fostering the emergence of learners' voice in the classroom, implications for curriculum, teaching, and learning can be suggested based on the stories in this inquiry.

Curricula guide the actions of teachers in many high school mathematics classrooms. In Manitoba, curriculum documents focus on mathematical content and provincial standards tests focus on acquiring skills and perhaps understanding concepts. If teachers are interested in fostering learners' emergence of voice, a re-evaluation of the guiding principles behind the courses must occur. There needs to be a change from a solitary focus on mathematically-based outcomes (see Figure 1 in Chapter 1) to outcomes that acknowledge students as human beings who are in the process of becoming. Outcomes that focus on learning processes and the interactions among individuals would sponsor a process of becoming. Inclusion of an outcome such as "celebrate and build community" (from English Language Arts) could sponsor a process of becoming. I am recommending that the guiding principles need to be re-authored to recognize the humanity of each learner.

In Chapter 9, I described several facets in this inquiry that contributed to the emergence of voice from a teacher's perspective. What I believe is of importance is that interactions in the classroom need to exist within an ethic of care, and that the teacher and learners are living in pedagogical relationship. Providing a safe environment where learners trust their teacher and feel safe to take risks invites learners to say things with an emergent voice. Practically, this implies that teachers are *listening* to the individuals in

their classroom – as students, learners, and human beings. I believe that the stories of the learners in this inquiry demonstrate that it is possible to foster the emergence of voice – that it is more than a possibility, but a probability as teachers *listen* to the voices (and silence) in their classroom. However, it is not an easy or simple process. Fostering the emergence of voice demands of the teacher a certain kind of relationship with learners that is at once complex and challenging, as well as rewarding.

Fostering *emergent/ce (of) voice* has implications for the understanding of how learning occurs in the classroom, focusing on mathematics *education* rather than mathematics. There is much more to learning than learning mathematics in math class, such as students learning about their positioning with authority and the school system, learning about how they learn, learning about how they think, or learning about the prescribed content. The multiplicity of learning foci shape students' intentions. Significant learning occurs when individuals learn about themselves and how they interact in a variety of ways with a variety of individuals.

As well, emergence of voice did not occur in isolation, but was initiated and supported through interactions with others. Learning about self and the forming of identity is a human endeavour that depends on mutuality with others. Further inquiry into co-emergence and the emergence of voice needs to be undertaken in order to situate the learners' success within an enactivist framing (Maturana & Varela, 1987). I believe *emergent/ce (of) voice* is fostered through relational being and a focus on learning about self that implies a reconceptualization of curriculum, teaching, and learning in the mathematics classroom.

My Learning Journey in this Inquiry

Nearing the conclusion of this inquiry, I believe it is important to articulate my learning through this inquiry. I was at once a teacher, inquirer, and learner. As a teacher, I have confirmed that listening is vital to the success of learners. More importantly, I have learned to *hear* the learners more effectively. I have come to see that Consumer Mathematics can be an integral part of considering mathematics-for-*all*. I have come to understand the complexity in my classroom, of the learners, myself, and our interactions. As an inquirer, I have learned what it means to systematically inquire into my practice and student learning in the classroom. Although I teach within an inquiring stance, it is significant to me that I shaped and implemented this inquiry, learning much about what it means to make meaning of the words of learners and myself. As a learner, I have been engaged continuously throughout this process in learning about the learners in my classroom, about success in mathematics class, about myself, and about systematic inquiry.

For me, this inquiry was a quest. I had prepared deliberately before the quest began – I shaped the general direction as I posed an inquiry question, but I was unsure where the quest would take me, what I would learn. I found that as a teacher and an inquirer, my quest was complex. The complexity came from the interactions with the learners as I listened intently to them. The complexity also came from the multiple layers of meaning and learning that were occurring in the inquiry and in the classroom. As the learners' narratives and their words tell a story of their becoming, this document illustrates my *becoming* through the inquiry.

Looking forward, I believe that the stories of the learners from this Consumer Mathematics classroom were worth listening to and they were worth telling. Not only have I experienced growth as I engaged in this inquiry of storytelling, but I believe that the stories can be significant to others outside the context. *Listening* to learners is critical, more so vital, to their becoming in a mathematics classroom. I recognize the limitations of an individual study and I recognize that there are many ideas left to explore. My intentions were not to form a complete answer to what the nature of success is in Consumer Mathematics and how it evolves. Rather, it was a starting place, just as it was for the emergent voices of the learners, needing yet to go through consolidation and further exploration. I have become more interested in understanding what it means to listen to high school students and what it means for their growing and becoming. I hope that others are encouraged to not only continue inquiring into the success of learners in mathematics classrooms, but also that they are encouraged to *listen* to the learners that they interact with daily and learn in mutuality.

Voices Inside the Classroom

My most significant learning has come from listening to the voices inside my classroom, to the uniqueness of each learner as we interact within a pedagogical relationship. I have come to value more highly what each learner says, in her/his silence and in her/his emergent voice. And even though at times listening was a challenging endeavour, I needed to listen more closely because the learners had stories of worth to

hear (understand) and they had stories of worth to say to others. And they said their stories best, in their own terms and on their own terms. The stories were theirs to be said and theirs to be amplified – it was their *becoming*.

Central to narrative inquiry are stories that inform and draw us into understanding the lived experiences of learners so that we, as teachers, can inform our practice. 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 inside the classroom. The last act in my journey is to provide an opportunity to listen to a learner. Cynthia authored the following in her final portfolio overview. She tells us about her journey in Consumer Mathematics and makes significant self-referential and learning claims. *This* is the possibility for learners in Consumer Mathematics and *this* is the voice of a learner who had a story of becoming to tell.

Overview Reflection

> This semester in math was the best ever! I can not remember a year that I did so well in math as I did this year.
>
> I really improved, i think, in all aspects and all parts of math. I use to be very afraid of both math and math teachers, but this year and this semester i didn't get very stressed out about tests and the like.
>
> I really liked learning Wages and Salaries, and balancing checks, because those are the things that really pertain to real life and when I leave school and go into the world I will be able to apply this to real life more than $\frac{X}{Y} = \frac{P}{Q} = XYZ$, it is all more practical.
>
> ...
>
> The way I learnt, the strategies i used were ask alot of questions, because asking questions is how you learn, and if you don't understand you can get a better understanding. Get other peoples ideas, how did another person arrive at the answer, and maybe there is a simpler way to do it.
>
> What is very important to me in learning math, is to apply vizualisation ☺ when ever I can. I will try very hard next semester to stay on top of my assignments and strive for a better understanding. I think all the assignments i used in this portfolio show that i am a good math learner because in previous years i was a poor student with bad marks and now I have good marks.

References

Alper, L., Fendel, D., Fraser, S., & Resek, D. (1997, November). Designing a high school mathematics curriculum for all students. *American Journal of Education, 106* (1), 148-178.

Anderson, G. L., & Herr, K. (1999, June-July). The new paradigm wards: Is there room for rigorous practitioner knowledge in schools and universities? *Educational Researcher, 28* (5), 12-21, 40.

Baker, B., Colley, L., & Trigueros, M. (2000, November). A calculus graphing schema. *Journal for Research in Mathematics Education, 31* (5), 557-578.

Baron, C., Wunderlich, R., Zorn, L. (2001). *Essentials of Mathematics 10*. Victoria, BC: British Columbia Ministry of Education.

Baudrillard, J. (1983). The Precession of Simulacra. In D. Hlynka & J.C. Belland (Eds.), *Paradigms Regained: The Uses of Illuminative, Semiotic, and Post-Modern Criticism as Modes of Inquiry in Educational Technology* (pp. 441-480). Englewood Cliffs, NJ: Educational Technology Publications.

Baxter Magolda, M. B. (1992). *Knowing and Reasoning in College: Gender-Related Patterns in Students' Intellectual Development*. San Francisco, CA: Jossey-Bass Publishers.

Baxter Magolda, M. B. (2001). *Making Their Own Way: Narrative for Transforming Higher Education to Promote Self-Development*. Sterling, VA: Stylus Publishing.

Bednarz, N. (2000). Why teach mathematics to everyone? In E. Simmt, B. Davis, & J. G. McLoughlin (Eds.), *Canadian Mathematics Education Study Group Proceedings 2000 Annual Meeting*, 181-188.

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1986). *Women's Ways of Knowing: The Development of Self, Voice, and Mind*. New York, NY: Basic Books, Inc., Publishers.

Bempechat, J. (1998). *Against the Odds: How "At-Risk" Children Exceed Expectations*. San Francisco, CA: Jossey-Bass Publishers.

Borasi, R. (1992). *Learning Mathematics Through Inquiry*. Portsmouth, NH: Heinemann.

Borasi, R. (1996). The invisible hand operating in mathematics instruction: Students' conceptions and expectations. In P. C. Elliott & M. J. Kenney (Eds.), *Communication in Mathematics, K-12 and Beyond* (pp. 174-182). 1996 Yearbook of the National Council of Teachers of Mathematics. Reston, VA: National Council of Teachers of Mathematics.

Bottge, B. A. (2001, March/April). Reconceptualizing mathematics problems solving for low-achieving students. *Remedial & Special Education, 22* (2), 102-112.

Bourdieu, P., & Passeron, J. (1977). *Reproduction: In Education, Society and Culture*. R. Nice (Trans.). London, England: Sage Publications.

Brew, C. (2001, January). Women, mathematics and epistemology: An integrated framework. *International Journal of Inclusive Education, 5* (1), 15-32.

Burke, P. (1991, February). Should we stop force-feeding math in high school? *Education Digest, 56* (6), 67-69.

Carl, I. & Frye, S. M. (1991, October). The NCTM's standards: New dimensions of leadership. *Mathematics Teacher, 84* (7), 580-585.

Chapman, K. P. (1996, October). Journals: Pathways to thinking in second-year algebra. *Mathematics Teacher, 89* (7), 588-590.

Chase, P., & Doan, J. (1996). *Choosing to Learn: Ownership and Responsibility in a Primary Multiage Classroom*. Portsmouth, NH: Heinemann.

Chickering, A. W., & Reisser, L. (1993). *Education and Identity*. 2nd Ed. San Francisco, CA: Jossey-Bass Publishers.

Choike, J. R. (2000, October). Teaching strategies for "Algebra for All". *Mathematics Teacher, 93* (7), 556-560.

Clandinin, D. J. (1986). *Classroom Practice: Teacher Images in Action*. London, England: The Falmer Press.

Clandinin, D. J., & Connelly, F. M. (2000). *Narrative Inquiry: Experience and Story in Qualitative Research*. San Francisco, CA: Jossey-Bass Publishers.

Clay, W. C. (2001). Coming to Know My Place. In J. Zeni (Ed.) *Ethical Issues in Practitioner Research* (pp. 24-34). New York, NY: Teachers College Press.

Conle, C. (2000, Summer). Thesis as narrative or "What is the inquiry in narrative inquiry?". *Curriculum Inquiry, 30* (2), 189-214.

Costa, A. L., & Liebmann, R. M. (1997a). Preface to the trilogy. In A. L Costa & R. M. Liebmann (Eds.), *Envisioning Process as Content: Toward a Renaissance Curriculum* (pp. xiiii-xix). Thousand Oaks, CA: Corwin Press, Inc., A Sage Publications Company.

Costa, A. L., & Liebmann, R. M. (1997b). Toward a renaissance curriculum: An idea whose time has come. In A. L Costa & R. M. Liebmann (Eds.), *Envisioning Process as Content: Toward a Renaissance Curriculum* (pp. 1-20). Thousand Oaks, CA: Corwin Press, Inc., A Sage Publications Company.

Craig, C. J. (1995, Summer). Knowledge communities: A way of making sense of how beginning teachers come to know in their professional knowledge contexts. *Curriculum Inquiry, 25* (2), 151-175.

Craig, C. J. (2000, Spring). Stories of schools/teacher stories: A two-part invention on the walls theme. *Curriculum Inquiry, 30* (1), 11-41.

Davis, A. B. (1995). Why teach mathematics? Mathematics education and enactivist theory. *For the Learning of Mathematics, 15* (2), 2-9.

Davis, A. B. (1997, May). Listening for differences: An evolving conception of mathematics teaching. *Journal for Research in Mathematics Education, 29* (3), 355-375.

Davis, B. (2000). Why teach mathematics to all students? In E. Simmt, B. Davis, & J. G. McLoughlin (Eds.), *Canadian Mathematics Education Study Group Proceedings 2000 Annual Meeting*, 167-171.

Davis, R. B. (1986). Conceptual and procedural knowledge in mathematics: A summary analysis. In J. Hiebert (Ed.), *Conceptual and Procedural Knowledge: The Case of Mathematics* (pp. 265-300). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Dewey, J. (1938). *Experience and Education.* New York, NY: Macmillan.

Dougherty, B. J. (1996, October). The write way: A look at journal writing in first-year algebra. *Mathematics Teacher, 89* (7), 556-560.

Duckworth, E. (1996). The having of wonderful ideas. In E. Duckworth (Ed.) *"The Having of Wonderful Ideas" & Other Essays on Teaching & Learning* (pp.1-14). 2nd Ed. New York, NY: Teachers College Press.

Dudley-Marling, C., & Searle, D. (Eds.) (1995). *Who Owns Learning? Questions of Autonomy, Choice, and Control*. Portsmouth, NH: Heinemann.

Dryden, K. (1995). *In School: Our Kids, Our Teachers, Our Classrooms*. Toronto, ON: McClelland & Stewart Inc.

Eisner, E. W. (1997, August-September). The problems and perils of alternative forms of data representation. *Educational Researcher, 26* (6), 4-10.

Flewelling, G., & Higginson, W. (2000). *Realizing a Vision of Tomorrow's Mathematics Classroom: A Handbook on Rich Learning Tasks*. Kingston, ON: Centre for Mathematics, Science and Technology Education.

Fouche, K. (1997, February). Algebra for everyone: Start early. *Mathematics Teaching in the Middle School, 2* (4), 226-229.

Freire, P. (2000). *Pedagogy of the Oppressed.* 30th Anniversary Ed. New York, NY: Continuum.

Grunder, P. G., & Hellmich, D. M. (1996, Fall). Academic persistence and achievement of remedial students in a community college's college success program. *Community College Review, 24* (2), 21-33.

Heid, M. K., Choate, J., Sheets, C., Zbiek, R. M. (1995). *Algebra in a Technological World.* In Curriculum and Evaluation Standards for School Mathematics Addenda

Series, Grades 9-12. Reston, VA: The National Council of Teachers of Mathematics.

Henderson, J. G. (1992). *Reflective Teaching: Becoming an Inquiring Educator*. New York, NY: Macmillan Publishing Company.

Henningsen, M., & Stein, M. K. (1997, November). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for Research in Mathematics Education, 28* (5), 524-549.

Herbst, P., & Kilpatrick, J. (1999, March). *Pour lire* Brousseau. *For the Learning of Mathematics, 19* (1), 3-10.

Hiebert, J., & Lefevre, P. (1986). Conceptual and procedural knowledge in mathematics: An introductory analysis. In J. Hiebert (Ed.), *Conceptual and Procedural Knowledge: The Case of Mathematics* (pp. 1-27). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Hirsch, C. R., & Coxford A. F. (1997, May). Mathematics for all: Perspectives and promising practices. *School Science and Mathematics, 97* (5), 231-241.

Hodgson, B., & Muller, E. (1994). Working group B: Popularizing mathematics. In M. Quigley (Ed.), *Canadian Mathematics Education Study Group Proceedings 1994 Annual Meeting*. Calgary, AB: University of Calgary.

Houssart, J. (2001, November). Rival classroom discourses and inquiry mathematics: 'the whisperers'. *For the Learning of Mathematics, 21* (3), 2-8.

Kennedy, M. M. (1997, October). The connection between research and practice. *Educational Researcher, 26* (7), 4-12.

Kieren, T., Pirie, S., & Gordon Calvert, L. (1999). Growing minds, growing mathematical understanding: Mathematical understanding, abstraction and interaction. In L. Burton (Ed.), *Learning Mathematics: From Hierarchies to Networks* (pp. 209-231). London: Falmer Press.

Koch, L. C. (1996, Winter, Spring & Summer). The development of voice in the mathematics classroom. *Focus on Learning Problems in Mathematics, 18* (1, 2 & 3), 164-175.

Kozol, J. (1991). *Savage Inequalities: Children in America's Schools*. New York, NY: Crown Publishers, Inc.

Lesser, L. M. (2000, January). Reunion of broken parts: experiencing diversity in algebra. *The Mathematics Teacher, 93* (1), 62-67.

Manitoba Education and Training. (1998). *Senior 2 Pre-Calculus Mathematics: A Foundation for Implementation*. Winnipeg, MB: Author.

Manitoba Education, Training and Youth. (2001, March). *Increasing Choice and Flexibility: Changes to Senior Years Graduation Requirements*. [On-line]. Available: http://www.edu.gov.mb.ca/ks4/policy/gradreq/updateapr01.pdf.

Manitoba Education, Training and Youth. (2002). *Senior 2 Consumer Mathematics: A Foundation for Implementation*. Winnipeg, MB: Author.

Masingila, J. O., & Prus-Wisniowska, E. (1996). Developing and assessing mathematical understanding in calculus through writing. In P. C. Elliott & M. J. Kenney (Eds.), *Communication in Mathematics, K-12 and Beyond* (pp. 95-103). 1996 Yearbook of the National Council of Teachers of Mathematics. Reston, VA: National Council of Teachers of Mathematics.

Mason, R. T. (2000). Mathematics – By invitation only. In E. Simmt, B. Davis, & J. G. McLoughlin (Eds.), *Canadian Mathematics Education Study Group Proceedings 2000 Annual Meeting*, 109-114.

Mason, R. T., & McFeetors, P. J. (2002, October). Interactive writing in mathematics class: Getting started. *Mathematics Teacher, 95* (7), 532-536.

Maturana, H., & Varela, F. (1987). *The Tree of Knowledge: The Biological Roots of Human Understanding*. Rev. Ed. Boston: Shambhala Publications.

Mayer, R. E. (2000, August-September). What is the place of science in educational research? *Educational Researcher, 29* (6), 38-39.

McCaslin, M., & Good, T. L. (1996). *Listening in Classrooms*. New York, NY: Harper Collins College Publishers.

McLaren, P. (1994). *Life in Schools: An Introduction to Critical Pedagogy in the Foundations of Education*. 2nd Ed. Toronto, ON: Irwin Publishing.

Meier, D. (1995). *The Power of Their Ideas: Lessons for America from a Small School in Harlem*. Boston, MA: Beacon Press.

Meiring, S. P., Rubenstein, R. N., Schultz, J. E., de Lange, J., & Chambers, D. L. (1992). *A Core Curriculum: Making Mathematics Count for Everyone*. Reston, VA: National Council of Teachers of Mathematics.

Montis, K. K. (2000, November). Language development and concept flexibility in dyscalculia: A case study. *Journal for Research in Mathematics Education, 31* (5), 541-556.

Nagy, P. (1996). International comparisons of student achievement in mathematics and science: A Canadian perspective. *Canadian Journal of Education, 21* (4), 396-413.

National Council of Teachers of Mathematics. (1989). *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics (2001-2002). *NCTM E-Resources: Mathematics Teacher*. [On-line]. Available: http://my.nctm.org/eresources/journal_home.asp?journal_id=2.

Noddings, N. (1984). *Caring: A Feminine Approach to Ethics & Moral Education.* Berkeley, California: University of California Press.

Noddings, N. (1992). *The Challenge to Care in Schools: An Alternative Approach to Education*. New York, NY: Teachers College Press.

Noddings, N. (1995, January). A morally defensible mission for schools in the 21st century. *Phi Delta Kappan, 76* (5), 365-368.

Noss, R. (1998, June). New numeracies for a technical culture. *For the Learning of Mathematics, 18* (2), 2-12.

Ohanian, S. (2001). *Caught in the Middle: Nonstandard Kids in a Killing Curriculum.* Portsmouth, NH: Heinemann.

Olson, M. (2000). Where the story leads: A response to Cheryl Craig. *Canadian Journal of Education, 25* (4), 349-352.

Paquette, J. (1995, Spring). Universal education: Meanings, challenges, and options into the third millennium. *Curriculum Inquiry, 25* (1), 23-56.

Pirie, S. E. B. (1996). Is anybody listening? In P. C. Elliott & M. J. Kenney (Eds.), *Communication in Mathematics, K-12 and Beyond* (pp. 105-115). 1996 Yearbook

of the National Council of Teachers of Mathematics. Reston, VA: National Council of Teachers of Mathematics.

Popham, W. J. (1999, March). Why standardized tests don't measure educational quality. *Educational Leadership, 56* (6), 8-15.

Pugalee, D. K. (1997, April). Connecting writing to the mathematics curriculum. *Mathematics Teacher, 90* (4), 308-310.

Pugalee, D. K. (2001a, January). Using communication to develop students' mathematical literacy. *Mathematics Teaching in the Middle School, 6* (5), 296-299.

Pugalee, D. K. (2001b, Summer). Algebra for all: The role of technology and constructivism in an algebra course for at-risk students. *Preventing School Failure, 45* (4), 171-176.

Reisser, L. (1995, November/December). Revisiting the seven vectors. *Journal of College Student Development, 36* (5), 505-511.

Rhodes, L. K. (1996). Students and teachers: Sharing ownership and responsibility in reading. In C. Dudley-Marling & D. Searle (Eds.) *Who Owns Learning? Questions of Autonomy, Choice, and Control* (pp. 29-39). Portsmouth, NH: Heinemann.

Ritchie, J. S., & Wilson, D. E. (2000). *Teacher Narrative as Critical Inquiry: Rewriting the Script*. New York, NY: Teachers College Press.

Romagnano, L. (1994). *Wrestling with Change: The Dilemmas of Teaching Real Mathematics*. Portsmouth, NH: Heinemann.

Romagnano, L. (2001, January). The myth of objectivity in mathematics assessment. *Mathematics Teacher, 94* (1), 31-37.

Romano, R. M. (2000). *Forging an Educative Community: The Wisdom of Love, the Power of Understanding, and the Terror of It All*. New York, NY: Peter Lang.

Schoenfeld, A. H. (1987). What's all the fuss about metacognition? In A. H. Schoenfeld (Ed.) *Cognitive Science and Mathematics Education* (pp. 189-215). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Searle, D., & Dudley-Marling, C. (1996). Understanding ownership in classroom interaction. In C. Dudley-Marling & D. Searle (Eds.) *Who Owns Learning? Questions of Autonomy, Choice, and Control* (pp. 16-28). Portsmouth, NH: Heinemann.

Searle, J. R. (1983). *Intentionality: An Essay in the Philosophy of Mind*. Cambridge: Cambridge University Press.

Shepard, L. A. (2000, October). The role of assessment in a learning culture. *Educational Researcher, 29* (7), 4-14.

Silver, E. A. (1994). Mathematical thinking and reasoning for all students: Moving from rhetoric to reality. In D. F. Robitaille, D. H. Wheeler, & C. Kieran (Eds.), *Selected Lectures from the 7th International Congress on Mathematics Education*. Sainte-Foy, PQ: Les Presses De L'Université Laval, 311-326.

Silver, E. A. (1997, February). "Algebra for All" – increasing students' access to algebraic ideas, not just algebra courses. *Mathematics Teaching in the Middle School, 2* (4), 204-207.

Simon, M. A. (1995, March). Reconstructing mathematics pedagogy from a constructivist perspective. *Journal for Research in Mathematics Education, 26* (2), 114-145.

Smith, J. P. III. (1999, Winter). Tracking the mathematics of automobile production: Are schools failing to prepare students for work? *American Educational Research Journal, 36* (4), 835-878.

Steen, L. A. (1990). Pattern. In L. A. Steen (Ed.), *On the Shoulders of Giants: New Approaches to Numeracy* (pp. 1-10). Washington, D.C.: National Academy Press.

Steen, L. A. (1999, October). Numeracy: The new literacy for a data-drenched society. *Educational Leadership, 57* (2), 8-13.

Tyler, R. W. (1949). *Basic Principles of Curriculum and Instruction.* Chicago, IL: The University of Chicago Press.

Usiskin, Z. (1994). From "Mathematics for Some" to "Mathematics for All". In D. F. Robitaille, D. H. Wheeler, & C. Kieran (Eds.), *Selected Lectures from the 7th International Congress on Mathematics Education.* Sainte-Foy, PQ: Les Presses De L'Université Laval, 341-352.

Valentine, J. J., & Taub, D. J. (1999, Fall). Responding to the developmental needs of student athletes. *Journal of College Counselling, 2* (2), 164-179.

Van Manen, M. (1977). Linking ways of knowing with ways of being practical. *Curriculum Inquiry, 6* (3), 205-228.

Van Manen, M. (1986). *The Tone of Teaching.* Richmond Hill, ON: Scholastic.

Van Manen, M. (1990). *Researching Lived Experience: Human Science for an Action Sensitive Pedagogy.* London, ON: The Althouse Press.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Cambridge, MA: Harvard University Press.

Wahl, K. H., & Blackhurst, A. (2000, June). Factors affecting the occupational and educational aspirations of children and adolescents. *Professional School Counseling, 3* (5), 367-374.

Ward, C. D. (2001, February). Under construction: On becoming a constructivist in view of the standards. *Mathematics Teacher, 94* (2), 94-96.

Weiner, B. (1972). *Theories of Motivation: From Mechanism to Cognition.* Chicago, IL: Rand McNally College Publishing Company.

Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, S., & Rosenbaum, R. M. (1972). Perceiving the causes of success and failure. In E. E. Jones, D. E. Kanouse, H. H. Kelley, R. E. Nisbett, S. Valins, & B. Weiner (Eds.), *Attribution: Perceiving the Causes of Behavior* (pp. 95-120). Morristown, NJ: General Learning Press.

Willis, P. E. (1977). *Learning to Labour: How Working Class Kids Get Working Class Jobs.* Westmead, England: Saxon House.

Wilson, S. M. (1995, November). Not tension but intention: A response to Wong's analysis of the researcher/teacher. *Educational Researcher, 24* (8), 19-22.

Wong, E. D. (1995, April). Challenges confronting the researcher/teacher: Conflicts of purpose and conduct. *Educational Researcher, 24* (3), 22-28.

Appendix A

Research Processes

This appendix contains two listings of data: 1) a bulleted list of primary data / interim research texts; and 2) a chronological list of primary data.

Bulleted List of Primary Data / Interim Research Texts

This data was generated continuously throughout the inquiry.

- ***Daily field notes***: I wrote these after each school day.
- ***Weekly reflections***: I wrote these for the first nine weeks of the semester.
- ***Authoring narratives of students' success***: I wrote one for each student, approximately one week before conversations occurred.
- ***Reflections on conversations***: I wrote these each evening for each conversation.
- ***Transcribing audio-recorded tapes***: I completed these approximately one week after the conversations occurred.

Chronological List of Primary Data

This list contains discrete pieces of data that were generated in the inquiry.

August 28, 2002

Journal 1: Student information. Why did you decide to take Consumer Math? What is your goal for this course? Describe three specific things you will do to achieve your goal. Tell me about one interesting thing you did this summer.

August 30, 2002

Journal 2: Do you think we did any math in the Fibonacci/Golden Ratio activity? What kind of math did you do?

September 18, 2002

Journal 3: How would you go about getting a job? What is a realistic job for you as a student? What are your strengths and weaknesses?

September 20, 2002

Test 1 Reflection: Tell me about the hardest question you did well on.

October 3, 2002

Test 2 Reflection: Describe how you prepared for the test. Be specific. Why?

October 7, 2002

Wages and Salaries Portfolio

October 15, 2002

Journal 4: Write a short story about how the Pythagorean Theorem came to be.

October 18, 2002

Journal 5: Look back to journal #1 and your goals and strategies. Take a look at you report card mark. Tell me about your progress. Talk about if you are doing your strategies. Do you need to set a new goal or use different strategies?

October 21, 2002

Test 3 Reflection: Check off what you have completed from the list of assignments. How does the completion match up to how you did on the test? Which topic do you need to work on?

October 29, 2002

Introduction of Inquiry to Students

October 30, 2002

Trigonometry Portfolio

November 4, 2002

Journal 6: What did you do on Friday (when the substitute was there)? Why do you look different in your school picture compared to looking in a mirror?

November 6 - 8, 2002

Conversation 1

November 12, 2002

Test 4 Reflection: Which transformations do you find easier to do – rotations or reflections? Why? On the next test you will need to complete some rotations and reflections without the blocks. Do you think that will change the way you approach the test?

November 21, 2002

Journal 7: Create two report card comments for yourself. Explain why they are appropriate report card comments.

November 27, 2002

Journal 8: What was mathematical abut the fractal cards? Why? Tell me about some of your thinking on either the T-shirt question or the Nike shoes question.

December 5, 2002

Journal 9: Use the cell phone activity. Which plans were easiest to read? Why? Describe the steps used to help you make good consumer decisions. Why are they good steps?

December 6, 2002

Spatial Geometry Portfolio

January 6, 2003

Consumer Decisions & Geometry Portfolio

January 7, 2003

Test 7 Reflection: Use a question where you did some good thinking. Describe, in words, the thinking you did. Describe why it was good thinking. What type of question is it that you described?

January 8 -16, 2003

Conversation 2

January 15, 2003

Journal 10: Complete the sentence "If math were an animal, it would be …"

January 21, 2003

Test 8 Reflection: Select one question that you did well on for the test. Tell me about your thinking. Tell me why it was an example of something you've been doing well on in class this semester.

January 22, 2003

Final Semester Portfolio

January 23, 2003

Journal 11/Final Journal: Tell me what you liked and disliked about Senior 2 Consumer Mathematics (for example: units, specific activities, classroom processes).

February 25 - March 5, 2003

Conversation 3

March 8 - 9, 2003

Authored the "Teacher's Story"

Appendix B

Portfolio Guidelines

Portfolio Assessment

At the end of each unit, it is important to look back over all the concepts and skills in the unit and observe how well you understood them. Since our tests are not at the end of each unit, we will be using a portfolio to accomplish this.

A portfolio is a collection of items along with reflections about what those items show about what you learned in the unit. It helps you and Mrs. McFeetors to celebrate what you learned or make a plan to help you understood what you missed during the unit. It might also show how you struggled with a concept at the beginning of the unit and worked hard to understand it by the end of the unit.

The Consumer Mathematics courses are developed around nine different mathematical processes. They include: communication, connections, number sense, organization and structure, patterns problem solving, reasoning, technology, and visualizations. Mrs. McFeetors will explain these in more detail in class, or you can refer to the classroom posters.

Each unit portfolio will include some specific items along with items that you get to choose. As well, some will require a longer reflection than others. A reflective writing includes why you chose to include the item, at least one type of mathematical process that was used, and how it demonstrates your understanding or lack of understanding.

The items that you must include in the portfolio are: a cover page, a table of contents (with a list of the items you included in the correct order – the attached checklist may be used), an overview reflection, one test that occurred during the unit, and a reflective writing about the test.

The items that you get to choose are five items from the unit. You can pick from homework assignments, in-class assignments, problem solving analysis, games analysis, mental math, journals, quizzes, projects, or any other related course work. For each item, you must write two to three sentences about what the item shows about your understanding of the unit content.

The unit portfolio will be due two days after the last concept has been covered, at the beginning of class. The following checklist and assessment page will help you organize your portfolio.

Portfolio Assessment Sheet

Item	Your Checklist	Assessment
Cover page	❑	/ 2
Table of contents	❑	/ 2
Overview reflection	❑	/ 10
Test	❑	/ 1
Test reflection	❑	/ 5
Item 1 & reflection: _____	❑	/ 4
Item 2 & reflection: _____	❑	/ 4
Item 3 & reflection: _____	❑	/ 4
Item 4 & reflection: _____	❑	/ 4
Item 5 & reflection: _____	❑	/ 4
Bonus: _____	❑	

Individual Reflections for Each Item

Sentence 1: State what the item is.
Sentence 2: Describe what the item demonstrates about:
-what you learned
-some good thinking you did
-how you improved
Sentence 3: Include a mathematical process and why it is a good example of the mathematical process. Use the sentence: "This demonstrates _____ because …"

Mathematical Processes:

Communication: communicate mathematical ideas

Connections: connect mathematical ideas to other mathematical concepts and to real-world situations

Number sense: sense of magnitude of numbers and measurements, and the reasonableness of answers

Organization and structure: apply or find a mathematical structure in a situation

Patterns: recognize, describe, and develop patterns

Problem solving: analyze problem contexts and solve problems

Reasoning: reason logically and justify thinking

Technology: select and use appropriate technology to solve problems

Visualizations: visualize to assist in processing information, making connections and solving problems

Overview Reflection

Be sure to write this ½ to 1 page reflection after you have put the rest of the portfolio together. This reflection should help you look back over the unit and write about how your learning in the unit progressed. I would like you to use one specific example from the items you selected to demonstrate how you learned or got better over the unit. Describe how you see yourself learning some of the ideas from the unit. You may also include comments about your progress in the course in general.

Appendix C

Teacher's Story

Introducing the Story

I am going to tell the story of me, the teacher, in a Consumer Math classroom. The writing of this story is a re-telling of my experience, since the initial telling has happened through my writing of field notes, and interacting with others. The field notes will guide my writing, but the re-telling will be open to wondering about and thinking about the living of the teacher's story. It will be a chronological telling. The need for chronology in telling stories is often very strong. The movement of time and individuals as they interact can often be best viewed through a chronological telling. Within narrative inquiry, this represents the temporal dimension of the three-dimensional inquiry space. Clandinin and Connelly also write about the situational and interaction of the inquiry space. These two dimensions could be brought forward in the teacher's story in several ways. In other words, there are many different foundations that I could choose to provide a running narrative for the story. One choice is to use the content of the course as a framing, and the decisions that I made for content and for students learning the content. However, using content as a framing would emphasis the importance of the mathematics content that students were learning in the course. It would demonstrate a teacher's prioritizing of content. Although I felt that the students should be learning mathematics in the course, that was not my sole intention of the course and my time with them. Often related closely to the content students are learning is the manner in which

they are learning the content, or learning process. A teacher's story could use learning processes to bring to the story elements of decision-making and critical situations of student learning in the classroom. Although this begins to move the focus away from merely "covering" content and using content as a unifying structure, it brings complications to the flow of the narrative.

Deciding how to frame the telling of the teacher's story brought me to reflect on how I tell others about my experiences in the classroom, as a teacher. When I retell my experiences in the classrooms to others, the stories are usually about individuals in the classroom. And the stories usually focus on my interactions with particular students. It brings the individuality and particularity of each student to the surface in the story. But within those interactions, the nature of teaching and learning can be seen. This means that the framing of the story will be about my interactions, as a teacher, with the students in my classroom. The story will tell about the forming of relationships through various interactions in the classroom. It is in this relational nature of teaching and learning that the teacher's story can be understood, in part because of my belief that teaching and learning occurs through the relationships that exist in the classroom. The focus of the teacher's story will be on the teacher's thoughts and actions in living with and in relation with my Consumer Math students.

[In the writing of this narrative I have used the following process. I first read through my field notes for one specific week. As I read, I made notations in the margins of students' names, their actions, content, specific activities, the nature of my interaction with a student, or my actions as a teacher. As I read through the week, memories came flooding

back, more than I could have recorded in the field notes. I began to select important elements from the week. Many times they were interactions with students, but not every time. And many segments of the narratives began with a specific activity or starting point that I had provided for the class and then moved to interactions with students. I wonder why the focus on students, in a teacher's story. But teaching is about the students and is about living in relation with students, so the teacher's story necessarily is about how the teacher lived with the students – and perhaps how the teacher changed in some way as a result of living with the students. After I had selected the important elements from the week, I wrote a paragraph around each of the moments. I often connected it back to the students and the nature of my interactions with them. Then I would continue on with the next week.]

Before the Students Arrived

I spent almost my whole summer thinking about these students. That is not a luxury I have with all of my classes. I wondered what the students would be like. I wondered where they would have come from, what they would be like as individuals, how I could foster success, how I could teach them best, and what the class would be like as a whole. I spent the month of July writing my thesis proposal, and the students were always at the back of my mind. As I wrote my first chapter, I was thinking back many times to the students I had the previous year in Consumer Math. They really let me know what Consumer Math could be, for students who had struggled and perhaps were willing

to give math, and math class, a chance again. Some of the students from the previous year had not even been willing to give math a chance again, but came to see by the end of the semester that it was a possibility. When I wrote the first part of my second chapter, exploring factors that foster success, I once again thought back to my Consumer students, and also to math students in general. And I thought hard about how I could foster and develop a relational teaching stance with the class I would have in the fall. I thought about the decisions I could make, especially early in the semester, that would set the tone and provide opportunities for students to figure out what I was all about as a teacher. The second part of the second chapter let me conjecture about how students might be successful, what their success might look like as we lived together. The third chapter in my proposal also helped me think about what my class would look like with my students. It outlined more specifically the steps I would take to listen carefully to the students and be thoughtful about their success.

But writing the proposal was not the only opportunity I took to think about the students I would be teaching in the fall. I had already taught two sections of this course before. So, the majority of the planning had been completed already. (That usually takes six 10-hour days to complete in summer.) I was pleased with how many of the aspects of the course had gone the previous year and was willing to leave many things the same. One decision I made was to move the spreadsheet unit to the beginning of the year. I decided to make it a mini-unit, where the students had opportunities to build basic skills with spreadsheets such as filling in templates, creating formulas, and using fill down/across techniques. I made a conscious effort to integrate more spreadsheet work through out the rest of the semester. I added spreadsheet activities in the wages and

salaries and statistics and probability units. One application of spreadsheets was to re-conceptualize the Payday Project to complete the majority of the work with spreadsheets and formulas. I also went through all the units, thinking about different projects or learning activities that could compliment what I had already planned. I also spent some time creating different problem solving opportunities for my Friday classes. In the end, I used very few of these activities. I did spend time reading through the curriculum document, once again, in part because there a new "edition" had been published earlier in the year.

The week before school began, I spent time preparing my classroom. I had planned to do an activity exploring the Fibonacci sequence to begin the year. It would involved creating student artifacts, so I cleared one bulletin board for that use. On the other bulletin board, I had made heading "Mathematical Processes" and then made one 8 ½" × 11" poster for each of the mathematical processes. This brings to mind the physical layout of my classroom. It is a rectangular room with the door at the north side and front of the room. Along the front of the room (west) are two large chalk boards, with a single cupboard at the end. Along the south wall there are cupboards on the floor with a counter above. There are two windows at the far sides of the wall and cupboards on the wall in between. The north wall has a large jug into the room (for the air conditioning vents) and then at the back of the room I have my desk, two filing cabinets and a little table nestled in the corner. The one small filing cabinet that stands beside my desk has a computer monitor on it and my computer stands behind my desk on the floor. The two bulletin boards are on the east wall. The middle of the classroom is filled with 15 pair tables. The tables have ample room for two students to work at them with textbooks and binders

open. I have a "teaching station" at the front of the room. It consists of a table that is lower in height than the students' tables. On the table is an overhead machine and enough room for me to keep my materials for the class. The overhead screen pulls down in the middle of the front of the room on the west wall. I predominately try to have student work to put on the walls, rather than other posters.

What was I thinking as the end of August drew closer? I was anticipating meeting the students. At the back of my mind, there was some worry about my study and what I would find with the students I had in my class. But I was looking forward to meeting them and beginning to build relationships with them. I was looking forward to getting to know each of them. And I thought a lot about the tone I wanted to set and the environment that I wanted to be created in my classroom. There is a difficult balance to strike between caring for the students and upholding the responsibility of a teacher (and the authority that seems to be wrapped up in that responsibility). It is a tension between relationship and role and a tension between teacher action and student perceptions. I spent time in my room, visualizing what the classroom would look like, full of students.

September

Week 1

I met my students for the first time on August 27. It was the first day for the grade 10s to attend school, and we had short class periods in the afternoon. Less than

half the class was there that day because, as I was to find out, many of the students in my class were Senior 3 students. So, the second day of classes is when all of my students arrived. There is a high degree of transience in the first week or two of school. Many students spend that time switching classes and changing their schedules. Because of the perception of Consumer Math as the "easy" mathematics course, the Consumer Math classes usually become bigger in the first two weeks. One day, during this time, my class swelled to 34 students (but because not all the students show up every day, I did have enough seats for all who attended class). This makes the first week of classes a struggle to create a community in the classroom. Creating a community in the classroom was something that I focused on, especially for the first few weeks of school. So, the transient population can at times be frustrating.

I began the semester with a problem solving activity, providing opportunities for students to experience the Fibonacci sequence and then explore the Golden Ratio. There were several intentions behind my decision. Because of the transience in the first week, the activity had several entry points where students could engage in thinking mathematically when they did come to class. In terms of mathematics content, students could use previous knowledge about patterns and the Pythagorean Theorem to help them explore the problem situation. The intention was that these mathematical ideas were familiar enough to students that they would be successful at exploring the problem. In terms of mathematical processes, it provided opportunities for students to use almost all of the processes within the one activity (although it related to elements of problem solving, representation, and communication to the greatest degree).

However, the most important intention for me was the tone the problem solving activity would set in the classroom for the remainder of the semester. The activity provided opportunities for a number of different types of interactions within the classroom. The structure of the activity was such that table partners worked together on all elements of the activity. I hoped that this would demonstrate the importance, to the students, to be in discourse as they were learning new math ideas, or solving problems in math class. I think it also demonstrated to students the way in which I perceive myself as a teacher. Instead of beginning the class with reading the course outline and giving notes at the front of the room, I acted as a guide through the exploration of the problem context. I had many opportunities to walk around the classroom and interact with pairs of students as they were working on the problem (I do not just set up the problem and then sit at my desk). I spent much of this time reassuring pairs that they were on the right track. Many of these initial interactions do not have names and individual attached to them, as I was just getting to know the students. I also spent much of this time trying to learn their names, and I had most of the names by the end of the week.

I took this week to begin building relationships with students in a variety of ways. The relationship-building process is one that is difficult to describe, partly because it happens in unique ways with each student. And I think it sometimes happens in ways that I do not notice. Even elements like the opening activity and my actions during that activity send messages to students about how I will interact with them throughout the course. Then there were moments, usually at the end of class when I was able to interact with individual students. One interaction I remember well was walking in from a fire evacuation with Susanne. She told me about the highlights from her summer and also

talked about deciding to take Consumer Math. However, not all the interactions were necessarily positive – Xxx [denotes student who was a non-participant], on several occasions, made decisions where I needed to correct inappropriate behaviour. And this is another element of the relationship-building, that I fulfill in some part the contract that the students have in their expectations of a teacher. It is difficult to balance that with an approach to relational being that is based on care. However, elements like having a seating plan ready on the first day of class demonstrates the responsibility I still have for the teaching and directing in the classroom. As well, cajoling students to remain on-task already began to occur in the first week of classes.

Interactive journals were another element in the course that support the development of relationships. During the first week, I provided prompts for two different interactive journals. In the first journal, the students described why they had selected Consumer Math, their goals, and strategies to reach their goals for the semester. In my response, I took the opportunity to affirm them for their choice in mathematics courses and interact with their goals and strategies for the course. Two of the students mentioned wanting to take Applied Math. I talked with Xxx and he left for Applied Math the next day. It was also the first opportunity I had to interact one-on-one with Karl, when we talked about the difference between Consumer Math and Applied Math and some of the monetary issues surrounding graphing calculators. The second journal focused on the nature of mathematics, and my response was more of an open dialogue to consider what mathematics is. My response left more questions for the students to consider, while interacting with their ideas. The journals provided a way to demonstrate to the students that I was interested in listening to each of them in the class. As a teacher, listening to

both of these journals allowed me to think about the students in my class in two different ways, as math learners and as math thinkers. It gave me opportunities to think about what the students were like, to consider the effectiveness of the problem solving activity, and plan for future learning activities.

As I went through the first week in the course with these students, some students naturally brought themselves and their personalities out. There were times for personal or whole class interactions that allowed me to get to know them well, and a little faster than other students. One student was Xxx. He had bright eyes and willingly participated in the learning activities. He would bring humour to different classroom situations. One memory stands out in my mind. It was Friday of the first week, and I mentioned several times what we would be doing "tomorrow". Xxx finally interjected that they were not coming to school tomorrow – and for the rest of the class it was the standing joke whenever I mentioned "tomorrow". Another student that stood out among the class was Lindsey. Every time I would make eye contact with Lindsey, as I was talking to the class, her face would light up with the biggest smile. And that began on the first day, when Lindsey and I did not know each other nor had we built any kind of relationship yet. But she seemed so willing and open to interact in some way, even as I was just talking to the whole class. It intrigued me, to think about the openness and willingness of these two students to interact with their teacher, and act in ways that I would take notice of them.

Week 2

We spent most of the second week of school in the computer lab. The purpose was for the students to be building skills for using spreadsheets, so that we could use spreadsheets for the rest of the course. This group of students was one of the best behaved groups I have ever taken into a computer lab. I find that the computer lab is always an awkward place to take a group of students. Although there is little structure in the room, I do bring some with us like learning with current table partners (at computers with their names on them). They were working quite diligently with their table partners at the computers and when directed to complete textbook assignments, they worked quietly. Even throughout this process, there were several students that needed constant reminders to focus on the task at hand. These were the beginning glimpses of students that were not willing to fully take part in the class and the first indication that some students were not fully interested in learning in the class.

One of my reflections in the field notes just popped out at me. I mentioned that "there are a few boys that I still get mixed up (they all hove brown spiky hair and round faces and are a little plump!)." Even though I was interacting with many of the students individually, or in pairs, in some ways the class still seemed to be a sea of students. As I look back, from the end of the semester, it almost seems humorous that I could not separate some of the students. They all seem so unique and individual, once I got to know them. Because I do not know the students that well, working in the computer lab is sometimes difficult as well. I began to notice difference among students, that the range

between various students' understanding and skills was quite large. Those observations still tended to be at the class level, rather than at the individual level.

As we moved back from the computer lab to the classroom setting, the interactions with students change somewhat. In the computer lab, students were constantly asking technical questions or questions about reading the instructions. There tended to be many instructions to interpret within a spreadsheet question – first, the problem context; second, the way in which the information should be set up on the spreadsheet; third, the information to be input into the spreadsheet; and fourth, the question that the students are to explore and answer. Even if I provided specific instructions for a question or assignment before the students work on it, they still asked many questions about the problems they were working on. The technical questions tended to be how to fill the columns, how to enter the formula, or why a row of number signs would appear instead of the numerical value. There were a few questions about how to create the formulas that they needed to use. The questions kept me (and my paraprofessional) so busy that I barely had time to move quickly from one pair to the next. However, in the classroom I found that I could interact with them about the content they were learning (a little more leisurely) or just about themselves.

Getting involved in the first activity of the Wages and Salaries unit allowed me to interact with groups of 4 to 5 students throughout the class. The first activity was letting these small groups of students become experts at one of the topics in the Manitoba Labour Board booklets. They did this by reading the information, coming to a consensus on the most important topics, make a poster to depict the information, and then doing a class presentation. I made a directed effort to sit down with each of the groups while they

were working on their posters. I used the content as a way to interact with them. I would begin by just listening to what they were talking about putting on their poster. If they were almost finished their poster, I would have them do a run-through of what they would tell the class when they were presenting the poster. Near the end of my time with each small group, I would ask them a question that was related to the content that they would need to think about in order to respond to. Doing this allowed me to notice some of the thinking they were doing individually and collectively. It often started a short conversation about the content on their poster.

As I interacted with the groups, I was learning more things about the students in my class. I learned about which students had jobs and which ones did not. Several of them had jobs already, and that is in part because many of the students in the class were Senior 3 students. I also began to notice negative attitudes forming in several of the boys in the class. There was one group in particular that did not see the value in the activity and were quite clear that they did not really want to do anything in this class. I found out, though, that Xxx worked at Domo and had experiences with many of the topics that their group was focusing on. As I interacted with Xxx and asked him about his job, the group came up with more ideas and specific examples to put on their poster. I think this interaction was a good example of listening to a student and also of building on students' experiences. Karl was the only exception in this group, and he remained very quiet and did not really interact with the rest of the students in the group and seemed passive. I felt like this group, and about half a dozen other boys were starting to push against school in general, and probably myself as an authority figure.

The idea of the presentations served several purposes. One of the important purposes for me was a sense of community building. I am always surprised near the end of the semester when one student does not know the names of a few of the other students in their class. And, I did not want this to be true of my class. So, as the groups presented, they stood at the front of the class and introduced each of themselves. They then presented the content, each group member taking an equal turn. It was one way to achieve another level of community building (aside from table partner work and small group work). It also provided an opportunity for the students to become experts at a topic and demonstrate their expertise to the class. It was a way, perhaps, of developing some confidence. As well, it situated the students as knowers, and "dispensers" of knowledge, rather than myself.

As I walked around the class and interacted with the students during the Labour Board activity, one question came up frequently. Students were questioning why we were doing this activity in math class. I really liked the idea that they were asking the question. It was not that they were necessarily being really thoughtful about the activity, but on some level they were starting to think about what was mathematical in our class. I let them know I thought it was a good question – and used that question to explore the mathematics in the activity. On the second day of the presentations, I had students pick among the mathematical processes which one they believed was best demonstrated in the Labour Board activity. The idea that the critical analysis of the activity came from their questions was important to me. It was also important to me that they began to explore and think about the mathematical processes in the course. To me, having student analyze the type of mathematical process in an activity was a way to approach ideas of

metacognition. It would signify a way that they could both think about the mathematics in an activity or an assignment and think about the mathematical thinking they were engaging in during the activity or assignment. What made me excited about this opportunity is that it came out of some of the wondering (although somewhat belligerent) of the students.

Week 3

This week signalled a change in how I thought about the class after school. In my field notes, there are many more examples of individual students, rather than small group or whole class observations for interactions. And, I began to notice specific things about particular students. This progression comes naturally, after I have learned all the names of the students and become more interested in getting to know them as learners, as students, and as individuals. One memory sticks out in my mind. It was a conversation, one day at the end of class, that I had with Daniel, Roger, and Xxx. We were talking about football and the positions that Daniel and Roger played on the school team. Xxx, and the other boys too, had a good laugh at me when I connected the ideas to math. Xxx's comment was, "You're really high on math, aren't you Mrs. McFeetors?" The moment was significant for me because of the positive interaction about Roger and Daniel as individuals, yet it demonstrated my belief that mathematics is all around us and can be used to describe our world. Another example was when the students were working on the first few pages of their payday project. For one part, they needed to fill in what kind of job they wanted to have in the future and some of the expenses they would

incur. I found out that Andrea wanted to be a flight attendant and Terri wanted to be social worker. These opportunities were important for me because I was learning about my students and being able to see them as unique individuals. By stopping them and asking why they wanted to aim for their careers or jobs, it also gave me an opportunity to listen and to show that I was interested.

Some of the more regular classroom routines were established in the third week of school, in part because we moved into the more formal unit of Wages and Salaries. One of the routines was mental math. Mental math occurred at the beginning of class. Students individually wrote down answers, without using calculators, to ten questions that were on the overhead. After they have completed the questions, they trade papers with someone around them and we mark the answers. Although interactions are limited during this process, I do incorporate some interactive element in the marking of the mental math. Instead of telling the students the answer, I ask students to tell me the answer from the paper they were marking. Along with reporting the answer to the class, I often asked them to explain how to arrive at the answer. It provides a learning opportunity during mental math, rather than just being an assessment and answer-only opportunity. This is important to me – teachable moments arose spontaneously from this activity. I used much of the same routine with giving notes and going through examples in class. This week, we looked at the topics of overtime and gross pay (either 8 hours per day or 40 hours per week). After explaining one example to the class, I had the students practice questions themselves. As we went through the examples on the overhead, I would prompt different students to tell me how to do specific steps. It provided for more

interaction and allowed me to notice some of the learning that is occurring or correct any misunderstanding.

As the students were practicing the questions, I took that time to wander around the classroom and answer questions. Sometimes that time was taken up by insisting students get out a pencil and some paper and their textbook. These were very frustrating moments with non-implementers. Other students, I would inquire into whether they were understanding or doing okay on the assignment. Either they would nod and keep on working, or they would ask a question. It was in working one-on-one with students around the classroom that my interactions allowed me to notice the cognition of some students. On the day that the students made a list of expenses that they would incur with their job, I noticed Xxx's among all the rest. He had decided he would like to be a rock star. As he thought of all his expenses, instead of writing it in a list he made a web of all of the expenses. It demonstrated to me some of the thinking he was doing, and the connections that he was forming among various expenses. On another day, the students were working on calculating gross pay with overtime. I stopped to help Cynthia for a while, who was not confident in her approach. We worked through one question together, as I guided her through. She brightened when she could calculate the second question on her own. She demonstrated to me, through this interaction, some of the difficulty she had in interpreting the question and showed improvement in knowing how to find the number of overtime hours.

However, the interactions between myself and the students are not always initiated by me. As I wandered around the room, I noticed that students were beginning to approach me and ask questions. Xxx would often call me over and ask me a question

about the assignment she was working on. Andrea would ask questions, often by walking over and interrupting the student I had been working with. These two example demonstrate something that I feel is very important. The students were noticing that I was willing to help them with their math questions, that I was approachable and that it helped to think through the questions with me. As I helped them, the focus was always on having the students tell me what they might do next. The interactions with students, while they are working, provide for times of unique conversations. One day, when I was trying to re-focus Xxx and Xxx, we began to talk about the mathematics that they were doing. The boys both entered into the conversation, with Xxx using mental math as a specific example of "basic, easy math". Through this conversation, Xxx and Xxx did not just tell me what they thought mathematics was all about. They also let me know more about themselves as students, in their expectations for topics and activities. I left this conversation understanding a little more about Xxx and Xxx.

I also noticed a change in some of the students during this third week of school. The students that had demonstrated a negative attitude began to change. For the first few weeks, their negativity played out in passivity and perhaps some muttering about the purpose of activities they were invited to engage in. They started to become much more vocal about their unwillingness to participate, and moved into being disruptive in general. Students like Xxx, Xxx, Xxx, and Xxx were the most vocal. They were becoming much more ardent non-implementers. I usually approached these students by squatting down beside them and talking with them quietly. Xxx and Xxx were difficult to talk to because I needed to keep reminding them to pay attention, even within a two minute conversation. I ended up having to keep Xxx after school one day to have an extended conversation

with him. We talked about what it means to learn math, and the need to be actively involved. One day during the week, I resorted to having the paraprofessional take four of the students out of the classroom to work with them, but their lack of respect for the paraprofessional escalated the situation and caused the principal to be involved. My interactions with the students in those circumstances are often not positive, and the outcome is not satisfactory for myself and the students.

We ended off the week by doing games analysis on Friday, with the students analyzing the game "Addit". I played one game with Xxx (who had been sleeping through the instructions) and the students began to notice at least one strategy. At the end of class, Xxx insisted on playing me because he thought he had figured out the winning strategy. He actually stayed after class to play me – and he won because he had figured out the strategy! I am not sure what changed from the day before, when I had to keep him after school. There was certainly some kind of relationship building occurring, and he was also engaged in a class activity. After I played Xxx, I noticed that Xxx also had stayed back after the class. He came up to me to tell me he had figured out the winning strategy, and told me what it was. He was proud. Xxx, as a student and individual, requires some understanding. Xxx had dropped out of school for about two years, and had actually mostly disappeared. He had made a brave decision to come back to high school, at 18, and to complete his diploma. It is a courageous act. These two interactions are significant for me, it was something that I had hoped would happen over the semester. Both Xxx and Xxx were intent on showing me that they had figured out the winning strategy for the game. They were significant moments to share with Xxx and Xxx. They

were moments where two students took an opportunity to let their teacher know that they could succeed in math class.

Week 4

Much of the fourth week was spent going through examples and then working on textbook assignments. There are certain skills that the students needed to develop, such as being able to convert from hours and minutes to just hours and to read time cards to find time worked. Except for the pay day project, the students had only opportunities to see, learn, and practice mathematical skills this week. It bothered me, but I also knew that the students needed to develop some skills, which means practice. But I struggled with student engagement during this week. It did not seem to matter whether the students were working on textbook assignments or the pay day project, though, their level of engagement was so low. I was concerned, in my reflections, that I had missed the intentions of my students. It was not a matter, though of missing intentions, but mismatched intentions between myself and many of the students in the class. Many of the disrupters and non-implementers were there to do nothing and get a credit. But my intention was for them to be thoughtful about the mathematical ideas that they were interacting with in class. It was very discouraging for me.

In regard to the textbook assignments, there were a couple good thinking and application questions at the end of each assignment, which I would always assign. I found, though, that by the time the students reached those questions, they had had enough of working on an assignment and they would just race through with little thought. This

frustrated me, and I found many of the students in the class doing this. As I look at the Consumer Math course, there is not a lot of rigorous mathematical ideas for the students to learn. Rather, the rigor in the course comes from the thinking and reasoning the students are invited to engage in. This thinking and reasoning is often using the skills they have been practicing and applying it to a real-world situation where a decision needs to be made. Often the question requires students to use calculations to support their decision, and to explain their thinking. It is frustrating, and I see these as thinking opportunities that the students do not engage in. At the same time, I began to notice that there were several students that were taking the time to work in class diligently. Students like Terri, Erin, Susanne, and Xxx would sit quietly and work diligently. Because of that, my interactions with them were more limited to observations as I walked around the room, redirecting and helping others.

I, again, took this time to walk around the room, redirecting students and helping other students. For the first time during the semester, Lindsey mentioned that she and Whitney were not sure what to do. That was an important interaction for me. Before this time, whenever I would ask how they were doing, Lindsey and Whitney would just smile and tell me everything was fine. When I marked their gross pay assignments, I noticed that was not necessarily the case. However, I felt that they needed to respond to my offers for support, rather than me deciding that they needed the extra support. It was part of the relationship-building process. There were a few other students that I noticed had difficulty on the gross pay assignment and I had offered them some extra help and then to resubmit the assignment. Daniel was the only student that took me up on the offer. He stayed after school one day and through our interactions, he demonstrated that he

understood the underlying idea of gross pay, but struggled with many of the specific steps.

There is another adult in the room, besides myself. Because I had a large class and Consumer Math students often need lots of help while working (and I have several non-funded students on the resource list), the resource department provided a paraprofessional for my class. The role of the paraprofessional is to answer students' questions and work with them one-on-one, along with assisting me in anyway he can (that includes doing some photocopying). I noticed during this week that he was helping Cynthia much of the time. I am sometimes envious of the role of the paraprofessional in the classroom. Much of my time, especially this week, was spent trying to get students started on assignments or stay focused on the assignment they were working on. The paraprofessional, though, ignores those issues of classroom management and has opportunities to sit down with individual students and help them. It would be at times like those that I would have opportunities to listen to the cognition of whichever student I was with. I did have an opportunity to do that with Lindsey this week, and I noticed that she did not understand the concept of multiplication, which made it very difficult for her to calculate gross pay. There are lots of multiplicative, and ratio-based, ideas in this course, and I was able to listen to Lindsey to see what kinds of multiplicative sense she did have. This interaction did affect the way I thought about teaching Lindsey, and it also affected future interactions with Lindsey. I often made a point, after that time, to spend some time helping Lindsey one-on-one with new ideas.

The class wrote its first test this week. Instead of testing at the end of each unit, I gave a half-period test every 5 concepts/skills. We spent the first half of the class

reviewing and then the students write the test. I have found that the students are more successful when they are focusing on just a few ideas (and then the portfolio serves as the end-of-unit assessment). I handed out a different test to every table partner. I marked the tests and when I returned them the next day I had the students write a reflection on the test. The prompt had them write about the hardest question they did well on – to encourage them to write about what they were thinking and to focus on what they had done well, what they had learned. I remember interacting with Cynthia when I returned the test – she was happy and proud of herself that she aced the test, something that had never happened for her in math class before. It was good to share that moment with her and it was an important moment to share with her, as a moment that might shape her future thoughts and feelings about mathematics and math class.

Week 5

My frustration with the non-implementers continued this week. Even tasks like test reflections are not getting completed, even though they have time in class and everyone else is working on it. I guess they just sat there and daydreamed. It is certainly part of my frustration of teaching Consumer Math. And other activities and assignments do not even get a glance from them. And of course, during those times, since they decided not to work on the tasks at hand, they spend their time chatting and distracting other students. However, the disruptive behaviour often subsided during the whole class instruction (they would doodle, though, instead of writing down the notes or examples). I found, starting this week, and throughout the rest of the semester, that times when the

students were copying down notes were moments when there was the greatest percentage of students on task. This idea bothers me immensely. It perpetuates a belief about learning mathematics that has dissonance with the way in which I believe mathematics should be learned (and taught). Perhaps it speaks to the didactic contract between students and teachers, and that I was fulfilling a part of the contract that satisfied them. I am certainly not comfortable with that as a teacher, and thought very hard in my preparations for this class of ways to have students actively involved, instead of passive students.

However, one of the things that strikes me, as I get to know the students better, is the wide range of ability and interest and studenting in the class. These observations come from reading through journals and interacting with students as I walk around the class during practice times. Xxx, who was often disruptive and exclaimed loudly that everything is so easy, had difficulty with basic arithmetic when I would work with him one-on-one. Cynthia seemed to struggle lots and take lots of time with each assignment, and when she came to class with her percent and pay stub assignments incomplete, it was a little difficult for me to understand. I felt that she could have asked a parent, in the evening for homework, how to interpret pay stubs. Then there is Karl who flew through every assignment that I would assign and did quite well on the first test. Whitney worked diligently in class and seemed to know how to do each of the assignments. And then there were many students in the middle of the range who seemed to learn while they were trying or others who learned while doing very little. I remember remarking that this was the widest range of students that I had ever taught in a room.

There were two interesting interactions this week that are worth making note of. The first interaction was with a single student, Lindsey. She had done poorly on her first test. In my writing back to her reflection I suggested that we could get together and go through the test and I could help her (but it was up to her). Part way through the period when I handed back the test reflections, Lindsey got my attention and said, "You know what you were talking about with this?" as she pulled out her test. She took me up on the offer, made arrangements, but unfortunately (because of her mom's work schedule) she never came by for the help. It is an example of the place of the interactive writing as a piece that helps build relationships with my students. The other interaction was a whole class interaction. We were going through some examples of net pay and there was a discrepancy as to what the deduction should be for CPP. The students became heated about backing up their answer and the class as a whole enjoyed the discussion around the discrepancy and looking up the deductions again. Earlier that class, Whitney had given a clear explanation of pay periods for a certain problem. I think the CPP and Whitney examples demonstrate that a community was forming somewhat in the classroom. There was opportunities for discussion as a whole class and hearing students' different views, and also a safe environment for students to answer questions and explain their solutions to the class. The emerging sense of community was important for me.

Even though I feel that the interactions that I have with the students are important, within the relational nature of teaching, there is the mathematics content that I wanted to engaged them in learning. One of my teaching goals for the semester was to integrate the use of spreadsheets more – to use it as a tool for learning and analysis, rather than as a topic and skill to be learned. At the end of the week, the students used spreadsheets to

analyze the percentages of government deductions. They worked in the computer lab with their table partners, and it was an activity that most of the students participated in. First, they needed to create formulas to find the percentage of different deductions, as well as net pay. Then, they filled in the spreadsheet for various amounts of gross pay, the dollar amounts of the deductions using a computer program. After they printed out the completed chart, they sat down and analyzed the values in the different columns – dollar amounts and percentages. I felt that the class, generally, was engaged in the activity. They were engaged in completing the spreadsheet, filling in the values. But for me, the importance came in the thinking they were doing with the spreadsheet afterwards. In order to answer the questions I had authored, they needed to analyze the percents and notice patterns in the columns of values. It was a moment in the course where I felt efficacious about an activity I had provided, in part because of the creation of the activity and in part because of their engagement.

October

Week 6

As I helped students this week, while they were working on textbook assignments, I began to understand a few of them as students a little better. Or maybe it just helped me think about learning. For the wage increase questions, I had given some brief notes and showed the class how to do two different examples. I then gave them a

few minutes to try two more examples and we went through them as a class. I then assigned some questions from the textbook and immediately began to filter around. I was surprised with Susanne, Lindsey, and Andrea. All three of these students did not have any idea how to begin the questions. They had no clue where to start or where they might look to get unstuck. I suggested looking at the examples we did as a class and following the steps, and offered to stay and help them with the first question. I felt like it was such a passive stance towards learning, with the students thinking, "The teacher needs to explain clearly and give good examples, but that will not be sufficient for my understanding. Rather, she needs to explain once more to me one-on-one how to do the questions, and then I will try." And these are students that have demonstrated to me earlier in the course that they would like to learn and get good marks (the emphasis on the latter) – they do not fit into a non-implementer categorization. But perhaps this is the outcome of traditional forms of teaching, that the students come to expect to be given the knowledge and skills, rather than construct the knowledge and understanding for themselves.

There were some students who were becoming much more difficult this week and I was reaching the end of my patience with them. I had to send Xxx down to the office again, and administration had a meeting with Xxx and his mother. Xxx skipped for most of a class, to hang out with some of his drug buddies. And Xxx's behaviour was trying in class. Even the other students in the class were beginning to make comments about their disgust with these students' behaviours and attitudes. All three students are quite vocal about their misgivings about the class and the course. Because so much of my time is focused on behavioural issues, and then some time with students that are really

struggling, I find that the quiet students that do not do anything are not getting much of my attention. It speaks to the nature of the composition of the class and the limits of my time with the students. Nonetheless, I am not happy that there are students like Xxx, Xxx, Xxx, and others that probably need some one-on-one attention and are not getting it. Balancing the needs of all the students in a large class is difficult.

On Friday, the students spent the class working on their portfolios. I had been explicit with the intentions and goals for the portfolio – to demonstrate to themselves and to me where they had been learning and improving in the unit. I described the portfolio as an opportunity for the student and I to celebrate what they had learned during the unit. The purpose is also to look at the learning processes during the unit – to see learning as something that is dynamic. Along with explaining the purposes, I also talked about the structure and details of the portfolio. There are four pieces that I specify including – a title page, a table of contents, a test, and an overview reflection. The students then must choose five other items. For each of the five items, the students needed to include an item reflection, which included what the piece was, what it demonstrated of their learning or improvement, and which one of the nine mathematical processes it represented and why. The overview reflection was to be a half page "story" about their journey through the unit. The communication was somewhat more one-directional with the portfolios, but the reflections were to sponsor students to begin to think metacognitively, about their thinking and learning during the unit. Although these portfolios are graded, I sometimes wrote little comments back to their reflections or on the overall product.

I spent some of the class observing how the students compiled their portfolios. Many of the students worked diligently on finding pieces from their binders. The

students approached the selection and reflection in two different ways, that I noticed. One approach was to complete all the selections and then after all items were in front of them, to write the reflections. The second approach was to write a reflection as each piece was selected. I am not sure what each approach might mean. I watched Erin with the most pleasure of any of the students that class. As she selected each item, she was also writing the individual reflection for the piece. She would complete the first two sentences (what the item is and what it shows about her learning) and then she would get up and walk across the room. I noticed that she would stand in front of the bulletin board with her item in hand, deciding which of the mathematical processes best suited the item. She did that for each of the items, and seemed to deliberate about which mathematical processes she would select for a particular item. To me, it demonstrated the thoughtfulness that I had intended that students put into the portfolios. She was engaged in doing more than just mathematics in math class, but thinking about what mathematics is. That is significant.

Week 7

One of the things that surprises me in the Consumer Math classes is the amount of time that it takes students to complete a textbook assignment. I began the week by working on a ratios and proportions assignment from the textbook. The assignments always take longer to complete that I estimate when I am preparing, and the time just seems to disappear for me as I am helping students. I found myself getting a little frustrated at the time it takes some students to complete the assignment. I find that I want

to provide enough time for students who are struggling to complete the assignment, and receive the help that the require. Cynthia would be a good example. But it makes it difficult balancing those students' needs with the work habits of others. I have several other students in the class, Xxx is a good example, that chose the course because they did not want to have the homework and thinking involved in Applied Math (even though that would have been a better choice for them). So, they end up racing through the assignment and then being disruptive, or they do almost nothing the whole time and finish it quickly in the last few minutes. I find it difficult to make the course rigorous enough for those students, yet within the reach of the students for which the course is intended.

I had an opportunity to notice and interact with several students this week because they needed some help. In class one day, I was able to guide Xxx through some questions using the Pythagorean Theorem. We noticed, together, a little arithmetic mistake he had made and worked on correcting that. It was one of the first times that I had a chance to work with Xxx alone. During the problem solving activity on Friday, I worked with Lindsey for a while. The problem relied on an understanding of multiplication, which is missing from Lindsey's sense making. So, within the context of the problem, we looked at several different meanings of multiplication. It was a strong moment to notice Lindsey's cognition. Several of the students were also struggling with similar triangles questions, and Andrea, Xxx, and Cynthia decided to stay after school one day for some extra help. I found out that Andrea and Xxx had been requesting help from others during the day already (a Senior 4 student and a resource teacher). Daniel

also stayed after class and worked with the paraprofessional – afterwards we talked about his football playing on the school team and were able to focus on Daniel as an individual.

Near the end of the week, students were required to hand in two different things for marks. The first item was their Wages and Salaries portfolio. I marked the portfolios on the weekend and there was a range of products. Because of the imminent report card, I received a portfolio from every student (the only time it happened the whole semester). I noticed the beginning of thinking about some big ideas, like how they were learning and what they were thinking for certain items. The one element that stuck out for me was the use of problem solving as a mathematical process. The definition of problem solving varied, even within one student's portfolio (Erin's comes to mind). However, the predominant view was problem solving as solving a problem, where a problem could be any question that they worked on (the question was a problem).

The second part of what students were handing in for marks were their missing tasks. My marks for the first report card were due the following Monday, so I handed out a list of missing tasks early in the week, and all the tasks were due on Friday (or a mark of 0 would stand). There was a flurry of finding missing assignments and journals and handing them in at the end of the week. I noticed that marks are still meaningful to these students and that they motivate the students to complete any tasks that are for marks. Even throughout the semester, marks were important to the students in indicating when they were successful or when they had learned.

On Friday, one of the most effective activities for the entire semester took place. This time, it was not about interactions between myself and a student or students, but it was about interactions among students. The activity was the "Crossing the River"

problem, and it became a problem that stood out for many of the students the rest of the semester. After I described the problem to the students, they jumped immediately into analyzing and trying to figure out the solution. There was a lot of animated discussion among the table pairs. One of the pairs that I remember best was Roger and Whitney. Both of these students had different ideas about how to solve the problem, and in conversations later, I found out that they had begun by using words, but the diagrams they drew were what was convinced and proved to each other how to solve the problem.

Another interesting pair that I helped was Cynthia and Nadine. They had been frustrated by the problem, but had made it to the second side of the problem sheet and were answering more complicated questions. The manner in which the two girls approached the problem was interesting. Nadine was trying to explain in words and use diagrams to figure out the harder questions. Meanwhile, Cynthia was using her fingers and a pen to simulate the movement of adults and children across the river. We even took a moment to talk about their approach to the problem, rather than just solving the problem. This activity, along with a similar triangles investigation earlier in the week, left me reflecting on a week that felt successful for me as a teacher. I felt efficacious about the opportunities I had provided and the engagement that I had noticed in most of the students (and their thinking and reasoning on "Crossing the River"). It was one of the first times in the semester when I felt efficacious.

As I reflected on my field notes that week (during the semester), I noticed five different types of interactions that I have with the students. The first one is guiding – when a student is having a problem and I spend a more significant amount of time helping them. I am not usually answering questions directly, but prompting. The second

one is clarifying – when a student asks a question about a question and it just needs to be clarified. I tend to answer these more directly and quickly. The third one is encouraging – when a student asks if her/his solution is correct. I look through the solution and make comments, sometimes I tell them to write down more of the steps. This is usually a quick interaction, too. They just need/want a pat on the back and to know they are on the right track. The fourth is redirecting focus – it is usually a quick statement, but frequently said to the same individuals (Xxx, Xxx, Xxx, Xxx, Xxx, Roger, to name a few prominent ones in my mind). The fifth is checking on how they are doing – which usually leads to one of the first three further interactions (or just stops there). I find the students are asking many questions or for help very often.

Week 8

The week began with a very strong interaction with Nadine. Nadine came to our class, from BC, in the sixth week of school. To catch up on the Wages and Salaries unit, I had provided a list of questions to complete from the textbook. She had completed everything except the wage increase questions, which seemed to be troublesome. We worked through the questions and also the idea of percents and fractions (which was the foundational mathematical concept in the lesson). I had an opportunity to notice how Nadine made sense of the percents and the wage increases. In fact, Nadine insisted that she be able to say the steps back to me and insisted that the questions and solutions make sense before she could complete the assignment. We also got to talk about her move

from BC to Manitoba and about the "Crossing the River" problem from Friday. It was a good opportunity to interact with Nadine as a learner and as an individual.

There was one whole-class interaction that is worth discussing, as a way to demonstrate some of the discussions that can occur because of the examples I provide. One of the examples the class was working on was to solve a right triangle (to find all the sides and angles). We had found all the angles and two of the sides, and were solving for the final leg of the triangle. When I asked for some ideas from the class, Roger brought up using the Pythagorean Theorem, Andrea mentioned we could use cos, and Xxx suggested using tan. All three methods would work to find the last side, so I split up the class and had different students try different methods. Afterwards, I had a student from each group walk through their solution as I wrote all three in parallel on the overhead. I thought it was an important interaction because it highlighted the variety of methods students could use to arrive at an answer. It was also important because the ideas of the students were each valued and compared by the class. It was an opportunity to indicate to the students that their ideas are important and that mathematics is not necessarily about a right way and a wrong way.

The students received their first report cards this week, an indication of how they were doing in the course using marks. The marks are another type of interaction, one I do not value highly, between a teacher and her students. Some students, like Cynthia, were very proud of their mark and their accomplishments in the course. I had the students complete an interactive writing about the report card – creating two report card comments of their own and describing why they decided to make the comments. They set new goals for the rest of the semester, and I had an opportunity to think with them as I

responded. I value highly the interactive writing as a place where each of the students is listened to closely, without the distractions and busyness of the classroom. As I was to find out later in the semester, just responding was enough for some students to know that I had listened and cared.

I seldom assign homework in this class. There are many battles to fight (or negative interactions) with these students, and if we were to fight the homework battle, neither the students nor I would come out with any satisfaction. So, most of the time there is ample opportunity to finish assignments in class. However, this week I did send a short trig assignment home for homework. Only about 5 or 6 students completed it, and I used this as an opportunity to talk about getting actively involved to learn (rather than being passive). In my initial field notes about the class, I connected the idea of resistance (in not completing the assignment) to the nature of the mathematical topic – trig. I am not completely sure where the connection lies, but this topic is much more abstract and related less to daily life than the wages and salaries unit. I also struggle to find activities that will make solving triangles meaningful, or for the ideas to make sense. My sense making of trig is functional, but the approach to trig in Consumer Math is ratio-based. I do certainly still struggle with providing opportunities for meaning-filled and engaging trig learning activities. With this passive learning at the back of my mind, even when the similar triangles investigation did not seem to sponsor sense-making, I still looked at my inadequacies (in the follow-up to the investigation) as an area for improvement, not stopping to consider the role of the students.

One interesting idea that I explored in my field notes was the idea of student. I noticed that the students, this week, were either enacting or not enacting their student

role. It became most apparent as they worked on assignments and handed them in and prepared for a test. There were some students who were actively studenting: Cynthia, Nadine, Andrea, Susanne (more than less), Whitney, Lindsey, Erin, Terri, Xxx, Xxx (sometimes), Karl, Xxx, and Xxx (maybe). Then there were others that are not: Xxx, Xxx (mostly), Xxx, Xxx, Xxx, Xxx, Xxx, and Xxx. There are a few names missing, partly because they did not fit into the either-or categorization. And by studenting, I mean showing up for class, attempting questions outside of class if required, working diligently in class, writing down examples and trying them during whole-class instruction, following along as well correct assignments. I find this frustrating some days. I know and understand that math and math class has been tough in the past for these students. And that this course is about a healing process for them, and some of them are taking advantage of that time and opportunity. But it remains a difficult task to teach students who do not want to be in class and who do not want to learn. It leaves me asking questions about what do we, as an educational system, do with these students? What are the best options for these students?

Week 9

Even though I have had several students leave the class (including Xxx, Xxx, and Xxx), I still continue to struggle with the negative attitudes of a couple of disruptive students. Xxx has continued to be difficult in class, only willing to participate the day after an administrator or guidance has spoken with him. He ended up being removed from the course during this week. Xxx also continues to be very difficult. He is still loud

and boisterous in class, identifying activities as "gay" and not willing to participate. I have had to get the principal involved several times over the past few weeks. He also seems to blame anyone else around him. Those around him would also include me, because I do not help him enough. I do not take these comments personally, but rather let them roll off me. For the student's sake and my sake, worrying about those comments and thinking about them further does not help either of us. However, I am frustrated with Xxx's attitude and comments. And as easy as it might have seemed to ignore him, his attention-seeking behaviour always drew me in to end his disruptions. As some of the other disrupters leave the class, Xxx seemed to be trying to fill their places.

However, even with the antics of some of the disruptive students, there are strong moments of community building still occurring in the classroom. At the beginning of the week, I had covered another teacher's class the previous period. So, I arrived to class about 30 seconds before the bell rang. All the students thought I was late and teased me. This came out of the fact that I was always in the classroom when the students walked in and made a conscious effort to say "Hi" personally to the students that walked in first (until the class was getting full and I needed to provide directions). Although it speaks to the routine the students were accustomed to, I think it also demonstrates the climate that I had worked hard to create in the classroom. Later on in the week, the class had a discussion about my age and my school (the Master's program). They were genuinely inquisitive and intrigued to find out some things about their teacher. It was important to me, and I think to them as well, that we are learning about each other – the reciprocity of the caring relationship.

I tried something new as an instructional technique this week – I showed a video! I had found a video that talked about using and showed the carpenters using the 3-4-5 and 6-8-10 rule for squaring up a foundation and a deck. I had the students watch about 10 minutes of the video and fill out a viewing form. The viewing form asked them to describe where the Pythagorean Theorem was used, how they knew it was being used, and the steps followed. Reading the students' responses afterwards gave me the clearest indicator I have ever seen of their sense-making of the Pythagorean Theorem. Some of the students could say the steps of how to use the Theorem, but struggled to explain how they knew the carpenters were using the Theorem. It was an excellent opportunity for me to notice their cognition, much more effective that having the students complete a Pythagorean Theorem question on a test. It demonstrated their understanding, rather than an ability to complete a specified skill.

As I finished off the week, I consider some curriculum-related ideas in my field notes. My thoughts were to remove the Trig unit completely, and place the Pythagorean Theorem (and perhaps similar triangles) in the Geometry unit later in the semester. Instead, I thought of replacing this unit with a pre-algebra, or arithmetic to algebra unit. Part of my reasoning was the strong response and level of success with the "Crossing the River" problem (which was an arithmetic to algebra activity). I also thought about the purpose of the Trig unit – and came to the conclusion that it might be to include some abstract symbol manipulation. If that was the case, then replacing it with arithmetic to algebra would be more effective in my mind. It would be more effective because students could make sense of what the symbols mean and represent within specific contexts. It would also be more effective because there are opportunities for rich

thinking to occur in an arithmetic to algebra unit. My considerations in the unit were not only about the students lack of involvement, but about the nature of the unit and what the purpose the unit is fulfilling (curricular issues).

Week 10

As the semester continues, there are numerous examples of interacting one-on-one with students throughout the classes. Although I categorized earlier the types of interactions, those interactions were all learning-based or school-based interactions. They were times when the students and I were in conversation about the mathematics they were learning (learning-based) or about what they should or could be doing (school-based). Those interactions were probably the most prolific conversations I had with students. One example from this week is listening to Cynthia work on reflections. Through her practice in class, she began to notice a pattern for right and left reflections. She could describe to me clearly her "trick" for a right reflection and her "trick" for a left reflection. It was one of the few times that she comfortably explained a mathematical idea or skill to me during the semester.

However, some of the interactions were also personal. For instance, this week with Xxx I talked about the car accident he had been in. We had an opportunity to talk about something other than school, and Xxx opened up and actually talked (which he did not do much of the rest of the semester, usually because he was napping in class). Both the learning-based and personal-based interactions were important for me as a teacher.

They were times when I could listen to the students as they talked to me, rather than reading what they had written to me in their journals or portfolios.

One of the big events of the week, at least for me, was my thesis advisor coming to the class to present the study to the students and ask for volunteers to participate. He did an excellent job, both with interacting with the students and with describing the study and extending an invitation. Thirteen students initially agreed to participate (although two later on did not bring parent forms back, so they were not included in the study), and I paused to wonder why they would extend themselves to participate. I wonder if it is curiosity, or my relationship with them, or the nature of the invitation, or …? Although the presentation and invitation did not directly affect my classroom practices, it still gave me an opportunity to observe my students. I am not sure why, but having a visitor in the classroom makes me look at my students in two different ways. I like to step back and wonder what an outside observer sees of my classroom and my students. But then I step back into being me, a teacher, their teacher, that is in a relationships with them. And I realize, even after tough days, that this is *my* class and each of these students is *my* students and that each of the students is so unique and particular. And I do see so much more than Ralph or any other outside observer can see (van Manen got it right!). I am feeling, even at this point in the semester, that I know so much about each student that it would be difficult to convey all of that to someone.

Appendix D

Erin's Narratives

Narrative 1

A Beginning for Erin's Story

I really enjoy reading your portfolios, Erin. You demonstrate lots of thoughtfulness about your learning in your item and overview reflections. I like best when you tell me what you learned or how you improved. I watched with pleasure while you worked on the wages portfolio – walking over to the bulletin board to match an item with a mathematical process. I wonder if you see any value in thinking about math in bigger ways than just arithmetic. I'm not sure, and I'm looking forward to listening to your opinion. Part of the reason the mathematical processes are there is not to just be familiar with them, but to get better at them. That's a pretty big idea! It made me wonder about how you could get better at a mathematical process. You've used the following mathematical processes so far this semester: problem solving, communication, patterns, organization and structure, and visualization. I found problem solving showed up the most, and it made me think about what problem solving is.

Right after you received your first report card, I asked you to re-evaluate your goals for the course in a journal. In journal 5, you wrote that when you don't understand something (like the trig), spending extra time and extra practice would help you

understand. I like that idea of understanding. You also related it back to your mark, and that working harder would "make my mark higher". I think you've been working really *hard* already this semester, Erin. I wonder if there is something more to the working, more than just working hard. What I thought was interesting is that the same idea came up in your short story about the Pythagorean Theorem. I posed a question in my response to you, and I'm still wondering what you think. Is being persistent what it is like to learn math?

In your test 2 reflection, you wrote about how you prepared for the test. You chose to focus on your daily learning and work habits, rather than studying the night before. It made me think about the importance of practicing in a timely manner. There's that idea of working hard, again! You chose to provide a different, strong reason for keeping up with assignments in class – that you could interact with someone else if you got stuck. I'm wondering if this idea could help me a little, to figure out what it means to interact with someone else during work time in class to learn well.

Narrative 2

Erin's Story: Giving Yourself Ways

In our last conversation, we spent some time talking about the difference between *working hard* and *working smart*. One of the ways that you described working smart was by "giving yourself ways of doing the questions and steps". When you and Lindsey and I were working on a similar triangles question in our conversation, I remember you stating, "Here's my trick" and you demonstrated how you remember to do cross multiplying. I wonder if that is an example of *giving yourself ways*. I wonder if *giving yourself ways* means doing some good thinking about the math idea you are learning. That would mean it is more than just listening to your teacher and practicing textbook questions. It made me think about whether you use *giving yourself ways* to be successful in math class. I think I might have found some examples.

In the spatial geometry unit, one of the ideas that you spent some time learning and practicing was reflecting figures. At the beginning of the topic, you found it a little tough. I remember a day when you and Lindsey were mixed up with horizontal and vertical reflections. In your portfolio overview, you mentioned that by "practicing them over and over each day, I learnt the special trick". I'd like to hear more about that special trick. Another unique method I noticed you used in class was converting feet and inches to centimetres. Instead of following the steps I had said in class, you made up your own method – is that one of your tricks? I wonder if these are examples, for you, of *working smart*. That is, I wonder if you were doing more than just practicing the questions,

especially when you make up your own tricks. I wonder what kind of good thinking you are doing to make up those tricks.

You have given me other opportunities, Erin, to notice some of the good thinking that you are doing about math this semester. When we were going over the *Can You Tile It?* activity (using tris, traps, rhombs, and hexes), you clearly explained to the class why traps could not cover a shape that was made of 10 tris. I thought your explanation of how many tris make up a trap demonstrated good thinking. On test 6, you also demonstrated good thinking when you completed the T-shirt question. I thought the calculations you used to show which combination of packages was least expensive demonstrated good reasoning. When you took the opportunity in journal 8 to tell me you thought you did some good thinking, I thought it was important that you picked that example and that you further explained your thinking. You talked about the steps you followed and I wondered if they were steps that you gave yourself. It also made me wonder if you notice when you are doing good math thinking and what might help you notice it.

Sometimes I have noticed that you would like me to just tell you how to do a question. I remember you demonstrating some frustration when working on fractal cards, the first time. When you called me over to help, I decided to guide you through the process instead of giving you the exact steps. I'm not sure how this fits in with you making your own tricks, and I'd like to hear more about it from you.

Narrative 3

Thinking Like a Math Learner *and* Math Thinker

Remember back to our last conversation, Erin? I had an opportunity to share with you some examples of your math learning. Those examples showed when you had been doing some good *math thinking*. There was the tiling activity. And there was the house floor plan. Do you remember what else I said? I wasn't sure how they fit into your story of being successful in math class. I put them in your last story, though, because I thought they might be important. Afterwards, I thought hard about what you and I said to each other. And I thought more about how you were successful in math class. And I think I might have figured out how those examples fit. They are examples of *thinking*. There were lots of opportunities for you to *think in math class*. And, there were times when you could do *different kinds of thinking*. One of the types of thinking is *math thinking*. I'd like to hear what you think that is. Another type of thinking is *learning thinking*. I'd like to hear what you think that is as well. I thought of those two types of thinking because of your final portfolio. When I read your final portfolio, two phrases stuck out. You talked about yourself as a *math learner*. You also described yourself as a *math thinker*. I wonder if you thought of yourself as a *math learner* and a *math thinker* at the beginning of the semester, or if something changed during the semester. I'm not sure. I'd like your help thinking about it.

You have given me opportunities, Erin, to notice some good *thinking you did with math*. When we were going over the "Can You Tile It?" activity, you clearly explained

to the class why traps could not cover a shape that was made of 10 tris. I thought your explanation of how many tris make up a trap demonstrated good *thinking with math.* For the cell phone activity, you told me you used the charts and graphs to make comparisons. I think that's another example of *using math to do some good thinking.* I wonder what good thinking you see there. In your final portfolio, you described some of the *thinking with math* you did. For the "Analyzing and Comparing Earnings" activity you said, "the person who was higher is making more money for that amount of hours. It shows I am a good math thinker". On test 6, you also demonstrated good *thinking with math* when you completed the T-shirt question. You made a good consumer decision based on calculations and reasoning. Can you help me with those examples?

But the T-shirt question also shows another kind of *math thinking*, *thinking about math.* You told me about how the thinking was in "figuring out the packages" and then deciding among the packages for the best buy. Instead of just telling me your *math thinking*, you were talking about where the math was in your solution. Each of your portfolios also demonstrated your *thinking about math.* I'd like to hear from you how it shows that kind of thinking. It made me wonder whether you usually looked for the type of math you were using. I wonder if you think it's important to *think about the math* that you are doing in order to be successful. With these examples, could you tell me more about the difference between *thinking with math* and *thinking about math*? One other example might be the "if math were an animal journal" – I wonder if it demonstrates how you are *thinking about math.*

But while you were doing math questions in class, you might also be thinking about other things. I'm not sure. I need your help to think about this. You do *think about math* and you do *think with math.* But I think you're doing *other thinking* as well. In our last conversation you mentioned that you look for a pattern among the questions you are practicing. And that pattern sometimes helps you *give yourself ways.* And giving yourself ways is when you are *making tricks.* You've told me about several of your tricks. One trick is how you cross-multiply. Another trick is how you complete left and right reflections. Another trick I noticed you do is converting feet and inches to centimetres. I wonder if *making tricks* is one way you show me you are *thinking while learning math.* How does it help you be successful in math class? I think these might be examples of *learning thinking*, rather than *math thinking.* What do you think?

There might be many *different ways of thinking* in math class. *Learning thinking* is a pretty complicated kind of *thinking.* But I've noticed you do some pretty complicated things in math class, Erin. So it seemed pretty natural for me to notice some *learning thinking* in your portfolios. I know that portfolios have been pretty important to you this semester. You told me so in your final portfolio overview, Erin. It let me know why you think the portfolios have helped you be successful (as well as something you are successful at). You said, "I improved in learning math … especially with the portfolios because it lets you look over and go over the assignments and have another look at them." That's a neat idea of *having another look.* I'd like to hear more about that. Your writing shows, I think, that you were *thinking about learning math.* And really, thinking about how you learn math best. Is this something that you added to your successful

learning strategies this year? You've also thought about your *approach to learning*. One example is learning to do reflections. You told me about your thinking when you wrote about "practicing them over and over each day". I've noticed that the portfolios were a chance for you to tell me your *thinking about learning math*. I wonder if this was an important part of your success this semester.

In our last conversation, we said things to each other about the good math thinking that you have been doing. I pointed out a few examples that I had noticed. One of them was more about your *thinking about thinking*. You took the opportunity in journal 8 (about the T-shirt test question) to tell me you thought you did some good thinking. I thought it was important that *you* picked that example and explained your thinking further. Writing the explanation required you to *think about your thinking* for that specific question.

Noticing good thinking means taking a step back. It means *having another look*. And it means *thinking about your thinking and learning*. And it's not always something that's easy to do. I was really excited to read the reflections in your final portfolio. You put a lot of care and thinking into those reflections. For items #1, 3, 4, and 5, you specifically told me that you saw some good thinking in the activity or assignment. That's why it was so important to place them in your final portfolio. I'm glad those were your best pieces. For items #2 and 6, you told me about strategies you used to learn math well. I wonder if you always noticed when you were doing *good thinking* in math class. Is *thinking about your thinking and learning* something that changed for you over the

semester? I wonder if that has something to do with being a *math thinker* and a *math learner*.

And just as a final note to your story, Erin. We've talked about some big ideas today for your success in math class. But there's also another way that you have been successful. I know that in the past, and even this year, attendance has been tough for you. But you made it! I remember one moment with pleasure. You told me you had been sick all day and had stayed home. Except, you came to math class because you felt you couldn't miss a class. I see that as a success for your attendance. I wonder what helped you succeed with attendance this year.