Delving into the Unexpected: A Reflective Self-Study

by

Anita J. Robb
B.Ed., University of Victoria, 1987

A Project Submitted in Partial Fulfillment
of the Requirements for the Degree of

MASTER OF EDUCATION

in the Department of Curriculum and Instruction

Abstract

Supervisory Committee
Dr. Jennifer S. Thom, Department of Curriculum and Instruction
Supervisor
Dr. Wm. Doll, Adjunct Professor, Curriculum and Instruction
Second Reader

This self reflective study investigates the conditions of unexpected emergence of mathematics learning in a grade one classroom. Recollected reflections of classroom events are described in five vignettes. Using the framework of temporality, sociality and place described by Clandinin and Connelly (2006) as necessary common places in narrative inquiry method, four common themes are identified throughout the vignettes: tensions, interactions, listening and interest. Examining the four common themes through hermeneutic interpretation lead to an interrogation of my underlying beliefs and assumptions about curriculum, mathematics teaching, and mathematics learning. Most importantly, this self study has given me an understanding of the kinds of conditions that make the emergence of unexpected mathematics possible, thereby informing my past and future mathematics teaching practice.

Table of Contents

Acknowledgments

I would like to acknowledge my supervisor Dr. Jennifer Thom for her support and guidance throughout the past three years in shaping this reflective self study. I thank her for challenging me every step of the way which has resulted in this project being purposeful, meaningful and rewarding to me as a teacher.

I have been fortunate to have Dr. Wm. Doll working with me as a committee member. His thought provoking questions and enlightening conversations about teaching and learning have indeed shaped my present and future thinking. Dr. Wm. Doll has introduced me to his four R's: Richness, Recursion, Relations, and Rigor as criteria for transforming and inspiriting curriculum.

To both Dr. Jennifer Thom and Dr. Wm. Doll thank you for guiding me to see with fresh eyes that which I saw, but did not see before.

Dedication

This project is dedicated to my husband Terry Robb for his unfaltering support, his energizing faith in me and his never ending patience.

I also want to dedicate this project to my sister, Robyn Gray for inspiring me to pursue a Master of Education Degree. I appreciate her genuine interest in this project and our many stimulating pedagogical conversations. I would like to express my gratitude to my brother in law, Michael Gray for being my computer support person.

Chapter 1: Introduction

Professional Context

I am currently a grade one classroom teacher responsible for teaching all areas of the curriculum. I have been a classroom teacher for 25 years. In addition to teaching grades one, two and three, I supervised numerous student teachers completing a final practicum. For the past two years I have been the numeracy support teacher and chairperson of our school based numeracy committee. I am deeply involved in professional development, especially in the areas of mathematics reform and curriculum implementation. I have facilitated *Math Makes Sense* workshops, problem solving workshops and hold the role of contact person for delivering new information about curriculum revisions and information from the Vancouver Island Numeracy Network. I use and train colleagues to use the BC Early Numeracy Project (K-1) which is designed to be used at the end of kindergarten or early grade one. This project includes assessments for teachers to identify areas of strength and weakness in students' number concept and development of number sense. The assessment is intended to inform teacher instruction, provides instructional strategies targeted for those students who may be at risk of not meeting grade level numeracy curriculum goals.

Encountering Tension

For about 10 years of my beginning teaching, my mathematics teaching practice was a replica of the traditional, teacher directed instruction, teacher as transmitter of

knowledge, mastery style practice. It was a reproduction of the way I had been taught mathematics in my childhood school experiences.

I attempted (ineffectively) to meet the vast number of prescribed mathematics curriculum goals and adhered to using school district mandated student mathematics texts and workbooks. This amounted to what I viewed as a rushed, superficial, covering of mathematics topics emphasizing memorization without understanding concepts or application to students' real life experiences. About ten years ago, I began questioning my beliefs in mathematics teaching practices as I tore out workbook pages that I deemed mundane and useless. Supporting my view, Patricia Clifford and Sharon Friesen (2003) state: "Many school textbooks and workbooks are organized to encourage mindless recitation. Most mathematics curricula are organized to support the notion that accuracy in computation equals excellence in understanding" (p. 27).

The paper-pencil worksheets were alien to the students' everyday lives in their real world. I began to dislike my teaching practice as the worksheet pages could often only be completed with step by step direct teacher instruction. I was perpetuating the way I had been taught as a child. Students' anxious looks during timed addition and subtraction speed drills (mastery of quick recall for addition and subtraction facts to 18) and the tearful faces when not understanding how to solve word problems on tests reminded me of my own mathematics experiences as a child. Even though it is now forty years later, several experiences resurface when I think about my childhood experiences and mathematics. These include: my grade five teacher throwing chalk at students who could not answer mathematic problems, the voice of a grade three teacher calling students "stupid" during mathematics class, the relief of finding answers at the end of textbooks to

check that I had the “right” answers to story problems that I did not understand and the humiliation of failing a mandatory grade 11 mathematics class. These were experiences I did not want to perpetuate. These childhood experiences coupled with my students’ experiences made me question my beliefs about knowing and learning mathematics.

A study conducted by Stephanie Smith, Marvin Smith, and Steven Williams (2005) revealed teachers’ mathematics teaching practices are unlikely to be problematized unless beliefs about knowing and learning mathematics are problematized first. They suggest problematic experiences occur when our habitual way of interacting with our environment is ineffective. For me, I felt my habitual mathematic teaching practices failed to connect curriculum to the interests of young children. This continued to be problematic for me and thus began my quest to investigate my concept of curriculum and to improve my mathematics teaching practices.

An Open Door: The Revised Mathematics Curriculum

Coinciding with my desire to change my mathematics teaching practices was the development of the revised 1995 British Columbia Mathematics Curriculum. The revised grade one mathematics curriculum was to be optionally implemented in the school year 2007-2008 and to be fully implemented in the school year 2008-2009. Particular mathematics objectives were moved to the grade two curriculum leaving fewer to be covered in the grade one year. I was pleased. With fewer objectives to meet and an emphasis placed on developing number concepts came the opportunity to develop in more depth student learning of early number concepts. The term, number concept, is also referenced with number sense, the ability to make sense of number.

Number Concept, Number Sense

Number sense is considered by many mathematics educators as the foundation for later mathematics understanding (Liedtke & Thom, 2008; NCTM, 2000; Reys, Lindquist, Lambdin & Smith, 2007; Van de Walle & Lovin, 2006). The grade one content strand for developing students' number concepts in the revised curriculum has increased and now comprises 65-75% of the grade one mathematics curriculum. This change is based on the WNCP CCF for K-9 Mathematics (Western and Northern Canadian Protocol Common Curriculum Framework for Kindergarten to Grade 9, 2006) which is influenced by the direction and reform suggested in the NCTM (National Council of Teachers of Mathematics, 2000). The WNCP CCF for K-9 Mathematics (2006) depicts the nature of mathematical concepts for focus in grades kindergarten through grade 9. Central to the entire document are the beliefs about students and mathematical learning:

> Students are curious, active learners with individual interests, abilities and needs. They come to the classrooms with varying knowledge, life experiences and backgrounds. A key component in successfully developing numeracy is making connections to these backgrounds and experiences. Students learn by attaching meaning to what they do and need to construct their own meaning of mathematics….The learning environment should value and respect all students' experiences and ways of thinking, so learners are comfortable taking intellectual risks, asking questions and posing conjectures. (p. 2)

Considering the emphasis placed on developing number concept and developing number sense in the grade one curriculum, it is necessary to clarify the term, number sense. Number sense is not a singular concept, but a collection of a number related ideas

developed over time on a continuum. The British Columbia Mathematics Grade One Integrated Resource Package (2007) states:

> A true sense of number goes well beyond the skills of simply counting, memorizing facts and the situational rote use of algorithms. Number sense develops when students connect numbers to real-life experiences, and use benchmarks and referents. This results in students who are computationally fluent, flexible with numbers and have intuition about numbers. The evolving number sense typically comes as a by-product of learning rather than through direct instruction. However, number sense can be developed by providing rich mathematical tasks that allow students to make connections. (p. 13)

The revised curriculum has directed teachers to spend more time on developing early number concept and number sense which hopefully will result in students being successful in their current and future mathematics ability.

An Open Space, a Divergence

At the beginning of the 2008-2009 school year I began implementing the newly mandated grade one mathematics curriculum. Parallel to this, my students and I began a year long planned science tree study, a tree we had adopted on our playground to care for and watch for seasonal changes. The tree became known as Murple the maple, a living part of our learning. During our study of Murple, the emergence of unexpected mathematical learning surfaced that I did not notice at the time. I first noticed mathematical learning occurring when the students spontaneously began playfully counting leaves, inventing counting strategies and discussing how they would keep track of the leaves they had collected.

Ironically, I almost missed this opportunity for mathematical learning from my students' real life experience while I busily incorporated new mathematics teaching strategies I had been learning at workshops, conferences and from my previous research about how children learn about mathematics. As I began paying attention to the emergence of the unexpected mathematic learning experiences it seemed as though students' ideas were bumping around, creating new ideas. I noticed that it continued to branch out, entwine and grow in a web like fashion. The events that occurred with the maple tree were similar to what Brent Davis, Dennis Sumara and Rebecca Luce-Kapler (2000) describe as a 'fractal tree' in which each event opens up new possibilities which in turn opens other "…divergent possibilities, in no particular direction – except, perhaps, toward the expansion of the space of the possible" (p. 203). What began as a planned year-long science study of caring for an adopted tree on our playground quickly led to unplanned mathematics learning.

Description of Reflective Self-Study

My recollected experiences of mathematics learning with my students and the tree are described in five vignettes. I interpret my experiences and look for conditions that shed light on the emergence of the students' unplanned mathematical learning. As a result, probing deeply into my experiences enabled me to develop an awareness of my past teaching practices and mindfulness for future possibilities. Further, I anticipate that sharing my reflections regarding the emergence of mathematics learning with colleagues at the school level and district professional development level will provoke me and others, to continue to develop a deeper understanding of this term, "real-life experience" (British Columbia Mathematics Grade One Integrated Resource Package, 2007, p. 13)

within the teaching and learning of mathematics and offer different, nontraditional, nonlinear ways of approaching the teaching of mathematics. My study may also help me as well as colleagues at the school level and district level frustrated with meeting the vast curriculum subject goals to notice that many of the prescribed learning outcomes can be met by occasioning and enriching unexpected experiences (traditionally called teachable moments).

Hopefully my study will give me the ability to share my understanding of my teaching practices and student learning when facilitating workshops for colleagues and when supervising future practicum student teachers. Ultimately, the benefits of this reflection and inquiry into my teaching experiences are already informing, directing, shifting, and thus, transforming my mathematics teaching practice.

Chapter 2: Method and Methodology

Narrative Inquiry

Narrative inquiry is both a method and a methodology. Narrative inquiry is concerned with a way of understanding experience. Narrative inquiry as a methodology allows me to study my experience as story. Narrative inquiry, however, is not only telling stories of my teaching practice, it is also a way of thinking about experience and how it impacts my teaching practice. D. Jean Clandinin et al. (2007) advocate teachers' narrative experiences told as story to be an ideal method for inquiry into one's own teaching practices:

> Stories ripe with possibility for inquiry, surround and envelope us as teachers and teacher educators. They are the woven fabric of school landscapes. Moving from telling stories of our teaching practices to narratively inquiring into our teaching practices situates teachers and teacher educators in the known and the familiar while it asks us to make the known and the familiar strange and open to new possibility. (p. 33)

Michael Connelly and D. Jean Clandinin (2006) make explicit three commonplaces of narrative inquiry; "temporality, sociality and place" (p.479-481) emphasizing narrative inquiry must simultaneously explore all three for interpretation of past experiences to be meaningful.

Temporality concerning my reflections includes a description of the events that happened at the time and a temporal history, a rendition of past events. Narrative inquirers interested in examining one's own teaching practice must perceive the sociality; circumstances of the institutional and social environment, personal desires, personal backgrounds, actions, reactions. Consideration of place or sequence of places is crucial for my narrative inquiry. According to Connelly & Clandinin (2006), place refers to the "concrete, physical and topological boundaries of place where the inquiry and events take place" (p. 481).

The reading of my reflective writing is intended to be nonlinear, moving around in four directions; "inward, outward, backward and forward" as described by Clandinin and Connelly (1994, p. 417). As I write *inward* I recognize my feelings, hopes and educational goals. As I write *outward* I recognize the physical setting of the experiences. As I write *backward* and *forward* I pay attention to my history and my teaching practices in past, present and future, my actions, reactions and my students' actions and reactions. Thus, the written structure of my narrative recollections is nested in the conceptual framework of temporality, sociality and place.

Criteria for a well written narrative involve notions of plausibility, authenticity and truthfulness as described by Connelly & Clandinin (1994, 1990, 2000) otherwise a self reflective study loses it potential as a way to find meaning, themes, common threads and tensions for self and as an invitation for readers to shape their thinking about their practices. Unlike empirical research methods which regard tools such as tests and measuring tools for validating research findings, Leonard Webster & Patricia Mertova (2007) state, " In narrative research a finding is significant if it is important … narrative

inquiry allows researchers to get an understanding of experience" (p. 5). Furthermore, Webster & Mertova (2007) state, "Narrative research does not claim to represent the exact 'truth', but rather aims for 'verisimilitude' — that the results have the appearance of truth or reality" (p. 4). Regarding accounts of recollective reflection in written form, van Manen (1990) explains:

> … experiential accounts or lived-experience descriptions-whether caught in oral or in written discourse-are never identical to lived experience itself. All recollections of experiences, reflections on experiences, taped interviews about experiences, or transcribed conversations about experiences are already *transformations* of those experiences. (p. 54)

Connelly and Clandinin (1990) caution the researcher using narrative as method to avoid construing the stories to meet self fulfilling needs. They also advise the researcher representing lifelike experience in narratives to be wary of falling into what they call "…the 'Hollywood plot', the plot where everything works out well in the end" (p. 10). John Willinsky (1989) critiques Connelly and Clandinin's narrative inquiry as research methodology and asks for a more extensive development in collaborative narrative stories. Willinsky (1989) challenges teacher researchers using narrative inquiry as research methodology to move beyond the retelling of stories by connecting the personal within the broader context of institutional and social environments.

Although Willinsky's advice is given to researchers in collaboration with teacher's telling their stories, it is of significant value for me to look beyond my

experiences as disconnected isolated events given the institutional and social context in which I am situated as a classroom teacher.

Qualitative Research

The nature of narrative inquiry that focuses on experiences originates in qualitative research. Qualitative research has become increasingly recognized in the landscape of education research. Qualitative research is open-ended and evolves as it develops (Creswell, 2007). It is sparked by a puzzling quest for meaning and deeper understanding of a single idea, experience or phenomenon. Hans-Georg Gadamer (2001) describes exactly how I became interested in pursuing this self-study, “Something awakens our interest – that is really what comes first” (p.50). The unexpected emergence of unanticipated mathematics learning puzzled and excited me, sparking an interest for further investigation.

Qualitative inquiry locates the observer in his/her context in which lies the interpretations of the researcher. My interpretations of what I examine, and events I choose to write about are influenced by my background, my prior understandings and my current situated context as a grade one classroom teacher. Qualitative research includes everyday lives and experiences, and the uncovering of new pedagogical praxis (Denzin & Lincoln, 2000). I acknowledge that my experiences are situated in a subjective and situational stance in that I give meaning to the experiences based on my interpretations and on my background experiences. In doing so, I also acknowledge that the same events may not be interpreted in the same manner by others. Max van Manen states: “…a good phenomenological description is collected by lived experience and recollects lived

experience – is validated by lived experience and it validates lived experience (p.27). van Manen (1990) suggests researching lived experience begins in the life world and can be viewed as two-fold; descriptions of lived experience and interpretation of this experience.

Reflection

Using reflection to uncover meaning and influence future action is advocated by Donald A. Schön (1983), van Manen (1991) and Connelly & Clandinin (1988). Teachers use reflection in action daily when dealing with immediate, on the spot situations or problems in their teaching lives, but rarely spend time on a different kind of reflection that is, reflection on action.

Reflection on action requires a stepping back to distance one's self in order to consider the meanings and significance embedded in one's experience. van Manen (1991) states, "As a result of recollective reflection we may become more experienced practitioners as teachers or parents because our lives have been enriched by reflective experiences that offered us new or deeper understanding" (p. 101). Also supporting reflection on action, Clark Moustakas (1994) states, "The act of perceiving, feeling, thinking, remembering, judging are embedded with meanings that are concealed and hidden from consciousness. The meanings must be recognized and drawn out" (p. 69). The reflective process on experience, recalling and describing experience to elucidate meaning from experience makes possible deeper exploration of meaning in experience.

Supporting the need for reflection to go beyond experiences as isolated disconnected events in order to elucidating deeper meanings, William Doll (1993) states:

> Reflection is taking experience and looking at it critically, variously, publicly: that is, connecting our experiences with others' experiences, building a network of experiences wherein past, present, and future are interrelated. Reflection steps back and examines past experiences in light of other connections and alternatives. It is a reconstruction of actions taken; it is a re-look at meanings made. (p. 141)

van Manen (1990) likens reflective restorying as a "poetizing activity" which is different than other research in that the central focus is the thinking and writing rather than the collection and analysis of results. This is an ideal approach to my self-study as it allows me to write and think about lived experiences and interpret my experiences as my inquiry unfolds.

Hermeneutic Interpretation

Interpretation of my reflections follows in what might be described as a hermeneutic tradition. Hermeneutic interpretation is complex and not simply concerned with searching for finding one final answer to an inquiry. Davis (1996) describes the work of hermeneutic interpretation:

> It is more interested in meaning, in understanding, and in application. More particularly, hermeneutics is concerned with investigating the conditions that make certain understandings possible. It asks not only, what is it that we think? but also, how is it that we have come to think this way?--- all with the view

> toward affecting how we act in the world. Hermeneutics is thus concerned with past, present, and projected understandings. (p. 18)

The emergence of unplanned mathematical learning came about in a way that I do not fully understand. However, it is in this revisiting of my past experiences I now have an understanding of how the emergence of unplanned mathematics learning occurred.

Chapter 3: Vignettes

Prologue

It is Spring and Murple's leaves are fully developed, adorning its branches, declaring its continuous life cycle. Murple the maple tree standing in our school yard reminds me of the mathematical learning experiences which seeded, budded and leafed during a year long science study of a tree. Every time I pass by the tree, my recollections surface. Students (now older) who were in that class still come up to me when I am on playground supervision and mention how they still watch Murple, the maple tree and they wonder if this year it has more than 1000 leaves.

First remembering the Leaf Collection experience and then, reflecting on it, I became consciously aware of an open space of divergence where rich mathematics learning emerged as students spontaneously and without any provocation on my part began collecting and counting leaves. It was at this time I did some mindful curriculum improvising as suggested by David Jardine (2003). Rather than following a preset, rigid curriculum plan, Jardine (2003) suggests mindful improvising as a way to value students' voices, slow down rather than hurrying up and getting on with the preset curriculum goals and accepting an open invitation for rich, real life learning.

Drawing from Doll (1993) I acknowledge that new beginnings merge from prior endings. It is however, necessary for me to begin my story somewhere in this continuous cycle of experiences. Following the common place of temporality, I reflect to the past and begin writing my recollections reflections in The Tree Adoption Vignette.

The Tree Adoption

It was the third week in September and a perfect weather day for the adoption of a tree I had decided we would care for and use as a year-long science study. Prior to the first week of school I sat at my desk in my classroom staring at a large blank piece of blank paper full of many boxes. Blank, except for headings on each column for the months of the school year, September through June, and along the side vertically, subject areas of the curriculum. One of my required preparations for the new school year was to submit a year-long overview of all curriculum subjects and objectives. Furthermore, I was required to meet the required number of minutes on each subject area per week. I stared at the large sheet of paper I had printed my year-long overview and curriculum subject goals the previous year. I recall feeling it was an exercise in futility as it seemed difficult to predict how much time or little time a concept might take to learn. I reminded myself that the mandated curriculum goals were a guide and that depending on the needs and interests of the students in my class, my overview could very well change. I resigned myself to the fact that I am a teacher employed to teach and implement the British Columbia curriculum and my administrator was employed to monitor the implementation. I had carefully examined the suggested grade one science curriculum topics and thought studying the life cycle of a local tree would be an interesting way to begin the school year. I thought choosing a tree on our playground would make the study meaningful and we would be able to observe it through the seasons.

I explained to the students that we were going on a walk around the school grounds to find one tree we would adopt for the year. We set off on a tree hunting expedition, circling the school yard several times with the intention of stopping, looking

and talking about each tree that students felt would be a good choice for our year long science study. The previous day I had read two of my favourite stories which in previous years had generated student interest in trees, caring about trees and seasonal change. *The Busy Year* (Lionni, 1992) tells a year long story of twin field mice Willie and Winnie who develop a friendship with Woody, a talking tree. Caring for the tree included giving Woody gifts of manure, putting out a fire that endangered Woody's life and noticing Woody's changes during the season. Woody the tree is alone without other tree friends when the mice come along to befriend her. Woody, Willie and Winnie become good friends. Another story, *The Star in the Apple Tree* (Linn et al., 1976) presents different types of trees in a forest boasting about their unique qualities, how animals depend on the trees and the importance of their seeds to ensure growth of new trees. On reflection and projecting forward to later vignettes, I notice these two stories influenced the students' choice in choosing a tree, created an emotional attachment with the tree and sparking continued interest in counting leaves.

Before school started that day I had taken a walk around the school yard to look at possible trees for our adoption. Of all the choices, I hoped the students would choose the oak tree near the front entrance of our school. I thought a deciduous tree rather than a coniferous tree would provide more changes for students to observe during the year. As we looked at the oak tree I found myself resisting making comments that would convince them to choose the oak tree. I knew from my teaching experiences if students have a choice they are more likely to feel ownership. I was struggling between wanting them to choose and making the choice for them. A few students wanted to choose the oak tree because it gave acorns for birds and squirrels. Our expedition led us to stop at a small red

maple tree located between the playground and the field area. Several students suggested the maple, as it was all alone without any tree friends and its leaves are the shape on the Canadian flag. As we continued on we stopped at a pine tree. Some students wanted to choose the pine tree because it would stay green in the winter and it was the biggest of all.

We circled the school yard one more time to make a choice between the three trees. Students decided that they would choose the maple tree because it had no friends near it just like Woody. The students wanted to be its friends, just like Willie and Winnie were friends with Woody. We sat around the tree on the soft grass and I asked students to think of a name for our maple tree. Woody, Reddy, Barky, Murple were suggested names along with students' own names. Murple was the favourite as they liked how Murple the maple sounded. We adopted our tree by holding hands skipping around the tree singing a welcome song that we had been singing in the classroom during the first two weeks of school to learn each others' names. The students were excited about adopting the maple tree and I liked the idea that they were interested in caring for it. I was excited about their enthusiasm and looked forward to the next few weeks with plans to begin an observational journal and sketches of our tree, Murple.

Murple Sketch

I gathered the students at the carpet and told them we were going outside to sit around Murple with our sketching books and draw Murple. I had preplanned we would keep a seasonal observation of our tree with drawings. Today would be our first sketch and we would print as many words as students could think of that either described the tree or described the parts of the tree. As we sat around Murple on the soft warm grass I

was glad I had not coerced students to choose the oak tree. If I had we would be sitting on concrete between the school building and the parking lot. This spot was comfortable and peaceful. I told the students we would sit around the tree for five minutes without talking and notice as many things as we could about the tree in that time. After five minutes of sketching I asked students to talk with the person sitting next to them about what they noticed and then each student would report out to the group what they noticed. Students said hundreds of leaves, hundreds of branches, skinny trunk, it was short, it was tall, little leaves and big leaves, a sort of gray trunk, the leaves were moving a little bit because of the wind, it has roots under the soil, it was getting warmth from the sun, it was giving us oxygen, it takes in air, it needs water, it is a living things. As I reflect on those silent minutes and the conversation afterward, I am reminded to be mindful of what Davis, Sumara, and Luce-Kapler (2008) say about good teaching, "…good teaching is not just about introducing children to unnoticed and unfamiliar aspects of the world, but also about helping them notice artifacts and practices that might have slipped into unconscious familiarity" (p. 214). I wonder how often students had ever just sat and looked at something familiar to them such as a tree for a length of time without interruption.

I realized from the conversation about the tree, students knew a lot more about trees than I had assumed. On one hand I was disappointed in myself that I had neglected to ask the students what they already knew about trees and on the other hand, I recall being perturbed that so much information had come out of our conversation, as I had planned to teach the already disclosed tree information in a science lesson the following day. I remember feeling that my next lesson was spoiled. I had fallen into the traditional spot of thinking that teaching is telling, students were receiving and that I was the keeper

of the knowledge. I now view the word spot as fitting, as I have since learned that in that spot, learning is limited to the diameter of the spot and does not expand beyond. How wrong I had been, in fact the next science lesson was valuable as I acknowledged many of them already knew a lot about trees. They eagerly identified the parts of trees on my tree charts and shared what they already knew about the functions of the roots, trunk, and leaves. They added that trees are plants and need soil, water and sunlight to live.

Leaf Collecting

I had been on playground supervision duty before the morning bell and noticed Murple's leaves were beginning to fall to the ground. I decided it was a perfect day to take my class outside and observe the seasonal changes of autumn and examine leaves. That afternoon we went outside and sat around Murple. I asked the students to pick up a leaf, touch it and look at it. I had planned this activity to facilitate a discussion about the function of leaves on the tree and what would happen to the leaves after they fell to the ground. The students seemed concerned with how many leaves were on the ground and if it hurt the tree when the leaves fell off. A discussion started about if it hurt the tree or not to loose leaves. A student replied that it is probably like when you loose a tooth and it hurts a little bit.

Some students began collecting the leaves on the ground. Soon they all began collecting leaves. They wanted to save Murple's leaves. In fact they wanted to save all the leaves on the ground. Some students asked if they could bring them into the classroom. I said yes. I asked, how many leaves do you think you have collected from the ground. One student said hundreds, some said thousands one student said millions, one said 150. Various answers followed. How many leaves are still on the tree I asked. Some

students guessed a hundred, others said a thousand, some said millions, some said billions and some said infinity. How can we find out I asked. Some students suggested that we bring them in everyday and count them until we had collected all of them. Students started gathering every leaf on the ground. It seemed a wonderful frenzy of leaf gathering. I could not bring myself to stop the students and redirect them back to my planned activity of observing a leaf followed by a discussion about how leaves compost and return back to the soil. I recall their exuberant happy faces, the gleeful, playful laughter and the kind sharing of leaves gathered by those who had plenty with those who had few.

Gathering back in the classroom in a circle at our carpet area I asked if they could think of a way to keep track of our leaf counting. In my mind I had thought we could make tallies of fives and tens to keep track on a chart paper. After some wait time, one student suggested we use popsicle sticks and count by ones like we do at our math calendar to keep track of each day we are at school. Other students agreed and thought this was a good idea. I commented I had not thought of doing that and what a grand idea. We put the leaves in the center of our circle and I asked each child to take one leaf and place it in front of where they were sitting. We continued around the circle until we counted all the leaves. We counted 57 leaves. As we counted together, the student with the popsicle stick idea was in charge of putting one stick at a time to represent each leaf into a container. There were 20 students sitting in the circle. This meant 17 students had 3 leaves and 3 students had 2 leaves. This was voiced as unfair by some students, however one clever thinker assured them that had we started going around the circle starting with a different person, it would be different people with only 2 leaves. He said we would need

60 leaves to make it fair and then we would each have 3 leaves. I asked this student to show us what he meant. The student proceeded to ask us to put the leaves back in a center pile and chose a different student in the circle to begin the picking up a leaf and start the counting. This resulted in different students having 3 leaves and different students having 2 leaves. This was repeated one more time. Some students responded, oh I see!, while some continued to think it unfair. I assured students that the leaves did not belong to any one person, that we had collected them together. One student responded that the leaves did not belong to us but that they really belonged to Murple.

I asked if we could count the 57 leaves in a different way. Some student said by fives, a few students suggested by tens, and one student suggested by twos. I was surprised that several students brought up the idea of skip counting. Shame on me for assuming that skip counting was a concept they had not experienced. From my background experience, students are far better at teaching their peers and peers are far better at learning as opposed to the teacher doing all the talking. As we counted by fives, popsicle sticks were grouped by fives while one student recorded our counting on a chart paper with tallies of fives.

When we counted by tens a student recorded each ten on chart paper by writing the numeral 10 as we piled leaves in groups of ten. I asked how many more we needed to make another ten if we had 7. Several students used their fingers and responded, 3. When I asked for another way, one student explained that you start at 60 and count backward to 57 (on our hundreds chart) and that is how many you get (3). This student proceeded to explain that he learned this by playing snakes and ladders (a board game) going backwards. Some students noticed that two fives made a ten. We talked about how there

were 7 leftover in our tens tally, 2 leftover in our fives tally and 1 leftover our twos tally. Some students were able to explain why the leftover remaining sticks was different in each case.

Students played with the number 57 through the context of the leaves. Students explored and identified patterns for the number 57. They played with patterns when grouping leaves by fives and tens; 2 groups of fives in one ten, 10 groups of five in 5 tens. Students played with the relationship of addition and subtraction when counting forward from 57 to 60 and backward from 60 to 57. Sharing (dividing) up the 57 leaves among 20 students in our circle they found there would always be 17 students with 3 leaves and 3 students with 2 leaves. They learned this did not change, however depending on who started the count, different students would end up with either 2 leaves or 3 leaves. Students found that dividing up 57 leaves among 20 students never ended up with equal shares. When students explored grouping leaves by twos, fives and tens to construct 57 they experienced there would always be leftover leaves regardless of the method of grouping.

Number sense was developing magnificently. The number 57 was explored through the context of the leaves in student's real life experiences and most importantly number sense was evolving as a by product of a rich mathematical task rather than through direct instruction.

Revelations

It was that afternoon that I experienced a sudden revelation. My preplanned science tree study had shifted to students excitedly and seriously doing mathematics. The

number concepts we had been practicing daily through direct instruction were unfolding in an unplanned, rich meaningful way.

In the several weeks following, students excitedly brought leaves into the classroom every day after recess to count in different ways, record and store in boxes. Each day we routinely repeated the first day activity of counting leaves by ones sitting in a circle, however it not seem repetitive, as each day there was a different number of leaves to count. Students wanted to be fair, therefore a different person in the circle would begin the count each day. We continued keeping track with popsicle sticks and tallies, grouping by fives and tens. Students enjoyed the challenge of finding out how many leaves were leftover when we grouped by fives and tens, and how many we needed to make the next five or ten. How excited students were, when on one occasion they had collect 40 leaves and each person had exactly two leaves during our circle counting. This activity became a regular part of our autumn days. They looked forward to this activity and asked to go outside to collect leaves several times a day. They viewed this as serious, important work. Every day there was a different number of leaves to count, therefore giving opportunity for me to ask different questions that gave rise to counting in different ways. They never seemed to tire of counting the leaves in different ways and recording number combinations on chart paper. Each day we recorded our count on a separate chart, counting on from the previous day. For every 100 leaves we counted we put them into a box. We counted back from 100 to 0 as we took the leaves out of the box. We counted forward from 0 to 100 as we put the leaves in the box. This went of for several weeks until we had 10 boxes of one hundred and were able to count by10s and 100s to 1000. This interest carried over to the students' center time as individuals or small groups

went to the boxes and recounted leaves to confirm there were 100 leaves. Other days I observed students counting by 100's, as they touched each box to confirm there were hundreds of leaves.

The following Monday, Murple was bare without any leaves to collect. I asked how many leaves were on Murple. Some students said 1000 because that is how many we collected. Some students disagreed and said there must be more because we were not at school to gather them on Saturday and Sunday and maybe the wind blew some away. It was then decided by the class, Murple must have had more than 1000 leaves. But we did not know how many more. Students wanted to save the boxes. I thought we needed to take them back outside. I was not able to convince students, the 1000 popsicle sticks represented Murple's leaves, therefore we did not need to save the leaves. We found room to store the boxes on a shelf in our cloakroom. I was glad students convinced me to save the leaves, as the leaves became an important contribution later in the 100th Day at School Vignette.

Tree Hugging

I decided to revisit some of the students' tree observations during our Murple Sketch in a mathematical context. I intended to use some of their observations to facilitate some measuring activities. We went outside to visit Murple and I reminded the students that the words, "skinny trunk" had been used by some of the students to describe Murple. Why did they think Murple's trunk was skinny? One student said because they could put their arms all the way around Maple like a hug. I had not anticipated this response. This student demonstrated a hug around Maple. This student mentioned she hugged Murple every day at recess so that Murple would not be lonely. I asked if they

thought they could hug all the way around other trees on the playground. Students responded yes, no and maybe. How can we find out? Students said they should go to trees and try hugging them. We organized ourselves in groups, some off to hug the pine trees and some went off to hug the oak trees.

Gathering back around Murple, we discussed their findings; the results were that no one could hug all the way around the pine trees, however everyone that tried could hug all the way around the oak trees and the maple tree. I asked if there was a different way to measure around the tree and introduced the word circumference. One student said a ruler. I sent him off to get a ruler and demonstrate. After several attempts it was decided the ruler could not bend around the tree without breaking. What else could we use I asked. One student suggested a measuring tape, adding that his dad had taught him how to use a measuring tape when they were building his tree fort. Thinking that I did not have ready access to a measuring tape, I asked if we could something else like a measuring tape. One student suggested a string. Groups of students went back to the oak tree, the pine tree, and the maple tree with strings to measure circumference. We took the strings into the classroom, labeled them, and ordered them from shortest to tallest; students determined Murple had the smallest circumference, the pine trees the largest circumferences and the oak trees circumferences were in between.

I reflected on another mathematical concept some students had noticed. Revisiting the conversation during the Murple Sketch; some students said that Murple was tall and some students said Murple was short. The following day we went outside again and sat around the tree. I reminded students that some of them had noticed Murple was short and others had noticed that Murple was tall. I asked students to explain their thinking.

Conversation led to students explaining size relationships; Murple was shorter than the cedar tree, the school, the telephone pole, the swings, and the basketball hoop. Others said that Murple was taller than the slide, themselves, the hockey net, and the swings.

Now I realize the concept of measurement (circumference) was occasioned by students interacting with each other, with me, and with their environment in a reciprocal, dynamic interaction, giving rise to students' creating their own meaning of measurement.

100th Day Celebration

We had been at school for 100 days. Celebrating 100 days at school is a traditionally a big event in kindergarten and grade one. At our morning calendar we had been recording days at school on paper and with popsicle sticks by ones, then grouped into tens in the same way we grouped pennies and dimes until we reached 100 to represent 100 days at school. I asked students to bring a collection of 100 items to school for counting and displaying on our 100^{th} day celebration. Each student showed their collection and explained how they had counted to 100. Some responses were; by ones, two, fives, tens, or my mother did it for me. Our display table became full with all sorts of interesting collections such as; rocks, popcorn kernels, stickers, pieces of gum, Hot Wheels cars, a house built with 100 Lego pieces, candies, shells, nails.

One sad looking student announced he had forgotten to bring his collection of 100. I suggested he look around the classroom for something to count and display. Another student piped up and suggested he should use Murple's box of 100 leaves. We brought out one box of Murple's leaves that had been stored on a shelf in the cloakroom. It was the largest collection. I had planned to use the students' collections to explore the

concept of mass. Now we had another collection, a collection that the students had collectively collected. Some students were sure that because Murple's box of leaves was the largest collection, it must be the heaviest collection of 100. Other students disagreed. We used Murple's box of 100 leaves as a referent and we grouped the collections as heavier than the Murple's leaves, lighter than the leaves or about the same. Students excitedly reported that some little things are heavy and some big things are light, in other words students were creating their own understanding of mass.

Epilogue

In the following months there were many occasions for us to return to the mathematical learning experiences we had with Murple.

When we learned about patterns on the hundreds chart and practiced skip counting by fives, twos and tens students referred to our charts of tallies and numerals representing Murple's leaves. Using the tallies, we related this counting to skip counting on the number line. We continued the circle sharing structure created with Murple's leaves when counting other objects. Students called it the "number sharing game". We kept a time line of Murple with monthly photographs. We designated one bulletin board in our classroom to keep as Murple's wall for the entire school year. It became full of science work and mathematics work. An unforgettable moment for me was when students said they had been doing science and fun math all year with Murple.

Following the 100^{th} day celebration at school we put the leaves back into the ground to provide nutrients for the soil that Murple needed to stay healthy. Students continued caring for Murple by visiting it at recess to make sure other students were not hurting it. They selected worms from our worm farm to put in her soil around her trunk.

Those were special days when they first noticed Murple's buds in early spring and leaves growing in late spring. They wondered how many leaves would Murple have this year.

Chapter 4: Interpretation of Reflections

After repeatedly examining my recollective vignettes within the framework of temporality, sociality, and place, four common themes surface throughout the vignettes; tensions, listening, interest and interactions. As I write about these complex intertwined common themes, I endeavour to keep in mind the description Davis (1996) offers for the work of hermeneutic interpretation. He states: “In brief, then, hermeneutics is the art of interpretation. It is interested in meaning, in understanding, and in application. More particularly, hermeneutics is concerned with investigating the conditions that make certain understandings possible” (p. 18).

Tensions

Glaring in the forefront is the tension I feel now and have felt in the past between the mandated prescribed curriculum and the curriculum as lived within the place of school. I disliked and presently dislike being forced to make a year long overview wherein each subject is unrelated, like separate, isolated objects to be prepared, brought into the classroom, taught for a limited time, and then put away like clothes put away in a closet and brought out next year for the appropriate season. In my view, a year-long overview and the prescribed curriculum have a similar blueprint; columns with square and rectangular shaped boxes full of many words describing distinct skills to be mastered, goals to be met, and assessments to determine if goals are met. My interpretation of the planned curriculum is synonymous with: “From the first grade on, curriculum is considered in terms of units arranged in linear order. Learning, itself, is defined in terms of number of units covered, mastered, accumulated” (Doll, 1993, p. 38).

Throughout my 25 years of teaching I have repeatedly witnessed curriculums come and go, some slightly revised, others completely overhauled. This could explain the apathetic nature of teachers toward mandated curriculums, and the phrase “seen that, done that” is reiterated by teachers in their curriculum discussions.

I applaud the revisions made in the grade one mathematics curriculum partly because it gives me in a strange, contradictory way, permission in a mandated context to change my teaching practice and move in a direction that matches my belief in the way children learn. I believe children learn in situations meaningful to their real life, making connections to prior background knowledge, experimenting, exploring, and talking with each other.

The Tree Adoption Vignette begins with obvious frustration and tension I felt between the curriculum to be implemented and the real lived curriculum of children. This tension has been forefront in my prior experiences of teaching mathematics. For example, when I felt frustrated completing page after page of mathematics workbook pages that did not match how I felt children learn and how I wanted to teach. Acknowledging my tension, I must also take into account it was the preplanned study of a tree that made it possible for subsequent unplanned actions, experiences and unexpected emergence of mathematical learning to happen.

The metaphor tug of war (with a linear rope) is a good one to describe this felt tension. I am in the middle of a tug a war holding the rope in the middle and being pulled from one end to the other. One end of the rope is the curriculum to implemented and at the other end, the lived curriculum. In reading the work of curriculum theorist, Ted Aoki (2005) I can choose to view this tension in a different way. Aoki suggests that it is

possible for teachers be attentive to the curriculum-as-plan in conjunction with the curriculum-as-lived experience with students. Aoki's point is not to overcome the tension one feels, but to dwell in the midst of it. Rather than focus on the separate, opposite ends of the tug a war rope there can be a "third space" (as described by Aoki 2005), the in between, a nonlinear turbulent site where the curriculum as planned and curriculum as lived can both exist. Aoki (2003) explains this notion of a "third space", he states: "In our curricular landscape, it is a space that knows planned curriculum and live(d) curriculum. It is a site wherein the interplay is the creative production of newness, where newness can come into being. It is an inspirited site of being and becoming" (p. 420).

Embedded in my concept of curriculum as planned is the concept of curriculum to be implemented in the traditional thinking that implementing means teaching as transmitter of knowledge and orchestrating activities in a controlled way. I believe this concept of teaching was formulated in my childhood, in my teacher training days and continued for many years of my teaching as I diligently followed mandated curriculum guides, prescribed textbooks, and mandatory workbooks.

Several more sites of tension arise. I wanted the students to choose the tree, yet found myself wanting to make the choice for them. I wanted students to study the parts of a leaf, yet resisted redirecting them in the midst of their playful leaf counting. I was disturbed when students disclosed what I wanted to teach them in the next lesson. I wanted to tell students the best way to count the leaves. When I did not tell them, students invented their own ways to count leaves.

Paying attention to real life experiences (such as my experience) when teaching, matches what some curriculum theorists and mathematics educators propose that all

educators facilitate curriculum as lived, meaningful experience and slow pedagogical pace to embrace deeper cultural and ecological understanding of human/world relationships (Aoki, 2005; Jardine, Clifford & Friesen, 2003). Concurring with the thought of curriculum being intertwined with human/world experiences, Thomas Romberg and James Kaput (1999) purport that school mathematics should be viewed as, "…a human activity that reflects the work of mathematicians" (p. 5).

Interactions

The Leaf Collecting Vignette recollects a planned activity to examine a leaf to learn about the function of the leaf for the tree that became a playful gathering and counting of leaves. It seemed in an instant the group had moved from sitting, looking at a leaf to actively gathering and counting leaves that subsequently led to the emergence of rich mathematics learning.

In the past, I have only been able to explain the emergence of mathematical learning in my experience as ideas bumping around creating new mathematical ideas. Thomas Kieren (1995) offers a more complex version of my superficial description:

> It is important to realize that any action of the students is not instructed, in the sense of being caused by the environment or by the teacher, but determined by the students' own histories of action. But at the same time these student actions occur in a sphere of possibilities which is fully implicated in and can be observed to co-determine the learning of the children. (p. 10)

My notion of interaction in the past has been predominately as interaction between two people or one person with the environment, rather than the interactions of all persons, all individual histories, and environment at the present time. Presenting me

with a different understanding of interactions, Kieran (1996) emphasizes the reciprocity of interactions in a *Missing Fractions Mystery* vignette:

> Thus the learning and the teaching are not clearly distinct but are better thought of as reciprocal in nature. The children's mathematical actions were occasioned by the teacher acts but those teacher actions were in turn occasioned by the children's mathematical activity. This reciprocity was not a simple 'back and forth' activity. This reciprocal teaching/learning occurred in a complex web with each person's actions resulting in new possibilities for all of the others. (p. 10)

The notion of reciprocal occasioning gives me a deeper understanding of the complex web of interactions within my experiences. It was not only the students interacting with the environment, or the students and me interacting with the environment, or the students interacting with each other. The complexities included the identities and histories of each student, my identity and history, all of us in context, intertwined in an environment, moving, dynamic, fluid, continually reorganizing our individual and collective structures bringing forth an occasion for new mathematical knowledge to co-emerge (Maturana & Varela, 1987).

Viewing my experiences from this perspective I realize it is impossible to recreate (as I once thought I could) or duplicate these same experiences. Unlike teaching and learning that is thought to be sequential and linear, teaching and learning in this perspective is constantly reorganizing within the individual, within the collective, within the environment reshaping all at the same, and the constantly co-adapting of interacting parts similar to what Davis, Sumara, and Luce-Kapler (2008) describe as "a structural dance"

(p. 58). The metaphor, “structural dance” is convenient for me to imagine it as a dance constantly moving, negotiating, never still. The structures’ periphery can not be viewed as limiting boundaries, but rather as flexible. The dancing elements (students’ orientations students’ responses, students’ actions, teachers’ orientations, teacher’s responses teacher’s actions, artifacts, environment) in the “structural dance” move according to the interactions, opening places for the creation of new possibilities. Davis, Sumara, and Luce-Kapler (2008) link the word structure to its original meaning: “Linked to *strew* and *construe*, *structure* is used to describe how certain forms (eg., living and knowing ones) arise in ways that cannot be predetermined, but that they aren’t entirely random” (p. 59).

This “structural dance” not only explains why I can not replicate this experience, but explains also, why in past years, trying to duplicate a great teaching and learning experience never resulted in the same way even if it was the same planned lesson, the same subject and the grade level. Each new group of students brings fresh, new, unique identities and histories different from the year before. I am also different because of my experiences in previous year.

Kieren (1995) provides a description that also helps me to look deeper into my previous description of emergence of mathematical learning. The mathematical learning was clearly, not determined by the tree, the leaves, the teacher (me), the students, or the histories of my students, but rather the *“INTER-ACTION”* of all in a reciprocal action. Kieren explains his deliberate emphasis of the word *INTERACTION*. He explains, “This is done to highlight action (by individuals) as the heart of mathematical cognition while

not ignoring, but even highlighting, the role of the environment and the artifacts, actions and persons in it" (p. 7).

Adding to the notion of reciprocal interaction as a key for learning, Doll (1993) contributes another element, the element of conflict. Conflict is necessary to generate emergence of the new. Doll states, "…we need to realize that much of human learning comes from this interaction-via the conflicts that create the dilemmas which generate growth" (p. 120). It was a dilemma I faced when students moved away from my plan of looking at the function of leaves to gathering leaves. The dilemma of finding an agreed upon way to count leaves, the conflict of fairness during the counting by ones in a circle, the dilemma of how to measure Murple, the conflict between myself and the students wanting to save the 10 boxes of leaves were examples of conflict within reciprocal social interactions. These conflicts generated further occasions for mathematical learning.

Listening

I notice throughout my vignettes when I shifted my role from teacher as transmitter of knowledge I became the learner along with the students. When I talked less and really listened to students and their conversations I noticed the bringing forth and unfolding of new mathematical ideas. Supporting this observation Doll (2005) states, "Conversation creates a space where together we see what none of us could see alone" (p. 269).

Stepping back and listening is not something I have consciously practiced in the teaching of mathematics. Davis (1997) proposes that attentiveness by mathematics teachers may help teachers better understand their mathematics teaching practice. Davis (1996) presents three modes of attending; evaluative, interpretive, and hermeneutic

listening. Davis (1996) presents listening as attending to what is being said (by students) and, emphasizes the modes as not mutually distinct, but each enacted in the others. Davis (1996) describes evaluative listening in the following way:

> Within the mathematics classroom, this manner of listening is manifested in the detached, evaluative stance of the teacher who deviates little from intended plans, in whose classroom student contributions are judged as either right or wrong (and thus have little impact on lesson trajectories), and for whom listening is primarily the responsibility of the learner. (p.52)

In this mode the teacher is deliberately listening for a correct response and will likely result in the teacher responding right or wrong to the student. This negates participation of students who feels they don't know the correct answer.

Moving beyond evaluative listening, interpretive listening involves attempting to get at what the student is thinking or in other words make sense of what the student is thinking. This means the teacher is listening differently; not simply listening for predetermined right or wrong answers, but prompting and questioning, listening for evidence demonstrating understanding of mathematical concepts. The teacher is also hoping an explanation by a student will promote other students to fit or reshape their own understanding. In a sense this listening is deliberate in that the teacher is listening for ways students are making sense of a concept. The teacher encourages multiple ideas rather than one response, therefore inviting and promoting participation. Davis (1996) describes interpretive listening in the following way:

> Teachers have been encouraged to attempt to get at what learners are thinking, and so a need has arisen to present opportunities for more elaborate

> demonstrations and articulations by students. All of this is based on the realization that the teacher and learner alike are actively constructing conceptualizations: the learner constructs the mathematics; the teacher constructs the learner. As such, the teacher is compelled to move away from an 'evaluative listening' and toward an 'interpretive listening' in order to open up spaces for re-presentation and revision of ideas – to *access* subjective sense rather than to merely *access* what has been learned. (p. 52)

In some instances I can pinpoint my shift from evaluative listening to interpretive listening. This shift occurred when gathering back in the classroom in a circle at our carpet area I asked if students could think of a way to keep track of our leaf counting. In my mind I had thought we could make tallies of fives and tens to keep track on a chart paper. In my mind I had one preset idea I was listening for, however, I did not tell the students we were going to keep track of the number of leaves with tallies of fives and tens. I now realize the importance of not telling the students how we would keep track, rather I remained quiet, and the students came up with counting by ones in our circle. This may not have occurred had I directed the way I had thought we should count. The student who responded to the voice of others feelings of unfairness because they did not have the same number of leaves may not have had the opportunity to show an abstract idea in a concrete way. If I had not really listened to students' feeling of unfairness, I may not have been prompted to ask that student to show us what he meant. This is perhaps what Davis (1996) means when he says the *modes* are not unconnected, but *enacted* in the others.

This notion of modes enacted in the others is evident when I asked how many more leaves we needed to make another ten if we had 7. Several students used their fingers and responded, 3. Three was the answer I looked for (evaluative listening). When I asked the students to explain in a different way I shifted from evaluative to interpretative listening. I listened for representations or revisions of the first response. I was surprised with the explanation of counting backward from 60 to 57 on the hundreds chart. This student said he knew this way from playing snakes and ladders. This shift from evaluative thinking to interpretative thinking gave the individual student an opportunity to explain his thinking. I wanted this student to explain his thinking with the hope other students would realize there was more than one way to solve a problem and would revise their already existing ideas, thus constructing new ideas.

Davis (1996) suggests that in the context of the mathematics teaching, evaluative listening and interpretive listening create "…an irreconcilable split between the role of the teacher and the role of the student" (p. 53). This is because the teacher and the student remain in their separate roles. In evaluative listening the teacher is separate from the student in a detached manner unable to deviate from the present plan and the students are judged right or wrong. In interpretive listening, the teacher is reaching out, rather than taking in wherein the students remain in an autonomous role. Davis (1996) describes a third mode of attending which conciliates the role of the teacher with the role of the student leading to the unfolding of unplanned, unexpected, unknown possibilities:

> Hermeneutic listening is an imaginative participation in the formation and the transformation of experience through an on-going interrogation of the taken-for-granted and the prejudices that frame perceptions and actions. The focus is on the

> dynamic interdependence of agent and setting, thought and action, knowledge and knower, self and other, individual and collective-rather than on autonomous constitution or construction. (p.53)

In some attending to students, I can pinpoint my hermeneutic listening when I really attended to the children's interest in collecting Murples' leaves. Although not my intended plan (which was to examine leaves) I followed the divergence and excitement of the students collecting leaves and asked, how many leaves do you think there are? One student said hundreds, some said thousands one student said millions, one said 150. Various answers followed. I did not respond if the answers were right or wrong, close, or outlandish. I now realize listening does not always require a response. No response sheds me from the traditional teacher role, giving a space for students to feel important in the collective group. Although the students' responses gave me an idea of the reasonableness of their estimations, I was not judging their competence at estimating. How many leaves are still on the tree I asked. Some students guessed a hundred, others said a thousand, some said millions, and some said billions and some said infinity.

Listening hermeneutically to their varied responses engendered their collective curiosity about the number of leaves. How can we find out I asked. These opened ended questions did lead to the unfolding of subsequent unexpected mathematical learning. It led to counting 57 leaves in different ways and the curious interest to continue collecting and counting leaves in different combinations.

In my early years of teaching I relied heavily on using evaluative listening, which reflected my teacher as transmitter teaching practice. In the past few years I have shifted to interpretative listening as my teacher as transmitter style shifted to a getting at what

students are thinking. I believe this shift in practice as a result of my focus in the last few years. I have attended *Math Makes Sense* workshops, implemented the *Math Makes Sense* mathematics program (promoted in my school district), and participated in problem solving workshops all of which focus on students developing number concept and number sense. All are based on the premise that students must construct their own meaning by relating new experiences to previous experiences; children actively construct their knowledge by doing; they do not simply absorb the ideas shown to them, that children fit new knowledge into their own existing knowledge structures and that when children understand concepts they may be able to apply them to new situations.

Hermeneutic listening involves a particular response ability from the teacher. It requires a shift from the conception of teaching as telling or facilitating and that knowledge is constructed by students alone. This shift in thinking can engender a "…dynamic interdependence of agent and setting, thought and action, knowledge and knower, self and other, individual and collective-rather than on autonomous constitution or construction" (Davis, 1996, p. 53).

Interest

Five and six year olds come to school curious and creative bringing with them many interests and background experiences. Articulating what educators tend to overlook, van Manen (1991) states:

> Children are not empty vessels who come to school merely to be filled with curricular content by means of special instruction methods. Moreover, children who come to school come from somewhere. Teachers need to have some sense of what it is that children bring with them, what defines their present understandings,

> mood emotional state, and readiness to deal with the subject matter and the world of school. (p. 7)

My students brought past and present understanding about trees from their background experiences. They brought experiences such as the student who had used a measuring tape, experiences counting in different ways, ideas such as storing the leaves in boxes, emotional feelings such as Murple hurting when it lost it leaves (like loosing a tooth), hugging the tree and caring for the tree. These experiences in addition to the possible influence of the two stories I chose to read, *The Busy Year* (Lionni, 1992) and *The Star in the Apple Tree* (Linn et al., 1976) may have precluded students' interest in Murple.

The Busy Year (Lionni, 1992) tells a year long story of twin field mice, Willie and Winnie who develop a friendship with Woody, a talking tree. Caring for the tree included giving Woody gifts of manure, putting out a fire that endangered Woody's life and noticing Woody's changes during each season. Woody the tree is alone without other tree friends when the mice come along to befriend her. Woody, Willie and Winnie become good friends. Another story *The Star in the Apple Tree* (Linn et al., 1976) presents various species of trees in a forest boasting about their unique beauty, how animals depend on the trees and importance of seeds spreading to ensure the growth of new trees.

Caring for a living being, having friends and being kind being fair, and sharing are highly important in the lives of five and six year olds. In listening and discussing the stories students identified their values with the themes in the stories. They wanted Murple to have friends, they cared for her by giving her hugs, they protected Murple at recess, they gave her some soil, and worms from the worm farm to provide rich soil. They

worried that it hurt Murple when it lost leaves. They saved her leaves much like five and six year olds like to save rocks, teeth, shells; those things that are dear and special.

The place, the forest like outdoor setting of our playground generated experiences that my not have otherwise occurred. My intended plans took a different course several times outside of the classroom allowing for the unfolding of mathematical experiences that may have not occurred within the four walls of a classroom. I am not suggesting that mathematical learning can not happen within the classroom however this experience, my childhood experiences and past teaching experiences lead me to believe that outdoor field trips (forests, beaches, marshes, lakes) can set a stage for learning that is of interest to the child. van Manen (1991) explains the word *interest* and emphasizes *interest* as fundamental for learning:

> But interest is not a state of mind that can be requisitioned or produced upon request. Interest is rather a word that describes a person's way of being in the world. To be interested in something is to stand in the midst *(inter esse)* of something, to take part in, to maintain a caring relation to something. To be interested is to be intensely present to something or somebody. (p. 196)

Being interested in the tree, developing a caring relationship with the tree and a way of being in the world with the tree gives me understanding why the students were so keen and serious the tree and the about mathematical learning with Murple's leaves. I had marveled and wondered about the continued year-long *interest* in the tree such as referring to the tree during later mathematics learning and when a student had forgotten his 100th day collection and another student suggested Murple's box of 100 leaves.

What led me to choose a tree to study? Moving back to my past childhood experiences, I recognize my lifelong interest in trees. Choosing a tree to observe rather than a different local plant or an animal in our local environment (as suggested in the grade one science curriculum) was influenced by my interest in and my prior experiences with trees (at the time of planning I had not made this connection).

I can trace my passion for trees to my early childhood; climbing trees, tree swings, tree forts, birds, and nests, fruit trees and sitting under the shade of a tree reading books. My childhood was spent living in rural areas and farms. My earliest experiences with trees were when I was very young, perhaps four or five years old. I spent summer holidays at my grandmother's ranch in northern Manitoba. Her log cabin was located on the banks of the Birch River. I loved listening to the birch leaves tinkle in the soft wind meshing with the sound of the river. I loved to touch and smell the soft inside of the birch bark baskets my Cree father made for me. Those experiences were repeated every summer holiday of my childhood. My interaction with trees continued within the yards of my childhood and the hiking expeditions into my adulthood.

As I think about my interest and attraction to trees I have a regretful thought. I had neglected to ask students about their relationships or past experiences with trees that particular afternoon however it is only in the present that I see this, and it is in the future that I can remember to ask students about their interests and background experiences with any topic that arises.

Returning to the notion of interest (van Manen, 1991) I realize it was my interest in how mathematics learning emerged that started this inquiry. As I mentioned earlier, Gadamer (2001) describes exactly how I became interested in pursuing this reflective

self-study. “Something awakens our interest – that is really what comes first” (p.50). It was my interest that precluded my recursive reflective inquiry. It was the interest in how the emergence of mathematics occurred that interested me. It is a subject that matters to me. I care about children. I care about teaching. It matters to me that children have a voice. It matters to me that children are valued for themselves. It matters to me that children enjoy learning.

“What happens when we fail to understand that there exist a primordial connection between learning and interest?” (van Manen, 1991, p. 197). Students become disengaged, disconnected bored, and develop a disinterest in school and unfortunately learning. I can recall one instance that haunts me. Feeling rushed to cover the topic of greater than > and less < than symbols (which was a curriculum goal at the time), I told students the pointy end of the symbol points to the smaller number and the open end of the symbol faces the larger number. Following this explanation, (teacher as transmitter) students completed a fill in the blank worksheet. This was done in one quick lesson without any interest in, or understanding what the symbols meant. Fortunately this curriculum goal has been removed from the grade one mathematics curriculum. And fortunately, I choose not to teach that way.

I recall a time when mathematics learning was occasioned (with great student interest) during the sharing (dividing) of worms in our earthworm farm. We had 30 earthworms in our soil farm. We were studying about earthworms being little soil engineers digesting compost and making nutritious soil. Two other classes wanted earthworms to make a farm. We agreed to share the earthworms that meant we had to figure out how to share them equally. We counted them in different ways and grouped

them in different ways until we had three equal groups of ten. The students cared about the earthworms and it was of utmost importance that the sharing be fair. The students' interest in the worms and their interest in being fair precluded the occasioning of exploring the number 30 being a count for the worms. The number 30 represented worms in their world and they experienced ways to construct and deconstruct the number 30. The student's interest in Murple precluded the learning about 57 in different in different ways other than just a count. The number 57 described their world. They were interested in the amount of leaves on the tree and falling to the ground. They cared about Murple. Murple had become important to them. They were interested in 57. Fifty-seven described Murple's leaves.

Linking children's interest to place makes me realize that students' freeness, playfulness, imagination and creativity seems more permissible outdoors rather than in the classroom where they are often sitting in desks, following routines and expectations. Remembering the jubilant, merry, playful students collecting and counting leaves, the hugging and measuring trees, students sitting in a circle talking about mathematical ideas was magical in contrast to some previous experiences of unhappy students sitting at desks trying to complete worksheets full mathematic computations. Returning to the question van Manen (1991) posed; "What happens when we fail to understand that there exist a primordial connection between learning and interest?" (p. 197) Unfortunately I believe a dislike for school and for learning will develop. Further more Friesen & Clifford (2003) call into question what can happen in the suppressive structure of school life within four walls:

> The generous, expansive, and exciting ways children know the world outside the school become cramped and penurious within its walls. The banquet of experiences that feeds all their senses, touches their hearts, and moves their souls shrinks to an anorexic diet of activities, drills, and worksheets. (p. 95)

Stemming from this view, Friesen & Clifford (2003) ask us to examine the following questions; "What can happen in schools when teachers take seriously the power and the right of children to name and to shape their experiences of the world? And what does imaginative engagement have to do with that power and right" (p. 94). I believe valuing and utilizing the students' interests would be a step in the right direction in replenishing the anorexic banquet of experience as describe above by Friesen and Clifford. (p. 95).

Chapter 5: Conversations Informing Present and Future Teaching Practice

A Personal Conversation with Pedagogy

Jardine (2006) states: “It is not simply that pedagogy can be one of the themes of interpretive inquiry. Rather, interpretation is pedagogic at its very heart” (p. 152). My interpretation of my reflections brings to surface many aspects of my teaching, all of which are enfolded in my pedagogy. It is as van Manen (1991) states: “Life stories prompt pedagogical reflection (p. 48).

What exactly is pedagogy? Aoki (2005) asks us to remember “…*pedagogy* comes from the Greek words *agogue*, to lead, and *pedae*, children…” (p. 213) further emphasizing: “Such a leading entails at times a letting go that allows a letting be in students’ own becoming” (p. 213). This statement is a powerful reminder. Allowing children to become their own being demands pedagogical watchfulness for those times to let go of being the leader (person in charge). Leading in this context abolishes the traditional notion of the teacher as power of authority or as “the know it all” or as “…the person who always knows the way” rather it is “a responsible responding to students” (Aoki, 2005, p.213).

Knowing when to let go was pivotal in my experience. It was the letting go of preplanned science activity, which precluded and enabled students to be in their world, collecting, saving, and counting leaves. It was letting go of my preconceived notions and assumptions that the students were not ready to learn specific mathematic concepts, letting go of my wanting to tell students the answers, and making decisions for them. In

my act of letting go, I lead by letting the students explore their mathematics and in doing so, explore, and enrich their mathematical understandings.

I realize now that this form of leading by letting requires a particular presence and attention of the teacher. This kind of presence is not about a teacher standing in the classroom overseeing and directing the class and the mathematics. Being present means actively being in the moment, interpreting interactions, and responding with students. Doing so demands a kind of attention that is more complex than simply using your eyes to see and your ears to hear to what is going on in the lesson. Davis (1996) states: "Listening is thus a capacity which is founded upon hearing but which goes beyond hearing. It is orienting (we listen *to* something) and orientated (we listen *for* something). Hearing, in contrast, lacks such intentionality" (p. 46). Similarly, seeing is orientated and intentional. Davis (1996) states:

> *Seeing* is the sensory capacity; *looking* is the intentional action through which particular 'objects' are pulled into focus (brought forward). Hearing and seeing, the sensory capacities to draw something out of that background of experience, to focus on it, and to bring it into our selves-that is, to listen and to look-that enables our perceptions. (Davis, 1996, p. 46)

Contrasting with evaluative and interpretive forms of listening where the former focuses on assessing the correctness of a response and the latter, learning of the thinking that gave rise to it, hermeneutic listening, as Davis (1996) states: "… is more negotiatory, engaging, and messy, involving the hearer and the heard in a shared project" (p. 53). In The Leaf Collecting Vignette we negotiated a way to keep track of counting leaves. The students' idea to count by ones using popsicle sticks as we do at the math calendar to

keep track of days at school (background experience) was brought forth. I had not thought of that idea. A reciprocal exchange of ideas between students and me, students with students occurred. It was not one quick solution. Other students liked the student's idea. We were engaged in a shared project. The conversation of the fair sharing of leaves involved interpreting what the students meant by unfair, exchanging ideas in a reciprocal manner between me and the student and the student with students. This gave rise to explore mathematical understanding of fair shares and unfair shares of the number 57 through the context of the leaves.

Being present and attentive requires a focus on active engagement, the dynamic reciprocal interaction between teacher and students, students and teacher, the reciprocal exchange of ideas, and a constant interpretation of the events within the context of the teaching and learning situation.

The notion of pedagogy has been loosely associated with curriculum implementation, instruction, and teaching (Aoki, 2005; van Manen, 1991). Pedagogy is the way in which I conduct my daily lived life in the classroom as a teacher with students in their daily lived life. It is the way I create the learning environment, it is the way I respond or don't respond to a student, it is what I choose to teach or not teach, it is how I chose to teach, it is being sensitive to young children's emotions and interests, it is recognizing the context from which the children come into my care. Elaborating my notion of pedagogy, van Manen (1991) states: "Pedagogy refers only to those types of actions and interactions intentionally (though not always deliberately or consciously) engaged in by an adult and a child, directed toward the child's positive being and becoming" (p. 18).

My pedagogy is rooted in my past experiences, beliefs about curriculum, teaching, and how children learn. For example, in the past my pedagogy has reflected an orientation toward learning as predetermined knowledge to be acquired, motivation, delivery, mastery of skills taught. This method of teaching was the way I had been taught as a child, the way in which I was trained as a teacher, and the way I taught for many years. In recent years my pedagogy has shifted away from this predetermined, rigid style of teaching, as it does not match the way in which I believe children learn. It is through pedagogical reflection that I decide why my teaching was successful or not successful and what changes I will make. van Manen states, “In our pedagogical living with children nothing is ever completely foreseeable, predictable, planable, manageable. And it is usually not until afterwards that we have the opportunity to think reflectively through the significance of the situation”. (1991, p. 113)

A Personal Conversation with the Planned Curriculum and the Lived Curriculum

I no longer view the planned curriculum as a rigid set of particular, separate items to cover and teach, but rather as a guide. The tension has not vanished. I now perceive it differently. This tension as not an obstacle to overcome but rather, a necessary agent for growth. Aoki (1991) offers a comfortable way to think about this tension. He invites me to dwell on the *bridge* (as described by Aoki 1991) in the midst of the planned curriculum and the lived curriculum. In (not on) this site I can welcome and invite detours, divergence, openness that arises within my daily lived life with the daily lived lives of my students. This does not mean that I will not plan for teaching and learning, but plan for

and anticipate possibilities. I can be ready with the plan, yet keep it flexible such as van Manen (1991) suggests:

> Looking ahead to plan lessons or deciding how to act in pedagogical situations is a *sine qua non* for good teaching. Teachers who do not plan ahead will not be ready for teaching. Through planning and thinking things out beforehand we make ourselves pedagogically available to children in a meaningful way. It is impractical not to plan. But we need to see as well that curious consequences flow from planning when this planned instructional program becomes too fixed, too inflexible, too prescriptive for life with children. For one thing, inflexible planning may freeze the body of knowledge that is otherwise dynamic, vibrant and alive. Such planning tends to reduce to a scheme what is otherwise a rich multifaceted subject matter. (p. 103).

In regard to lesson planning, Davis, Sumara, and Luce-Kapler (2008) suggest approaching lesson planning as a "thought experiment" (p. 221). Just as an experiment yields unpredictable, anticipated results, the teacher can think about lesson planning as an "…occasion to think through some of the possibilities for particular activities with particular students in particular contexts" (p. 21).

I no longer see the blueprint of the planned curriculum guides with separate boxes giving the impression that each mathematics concept is a separate isolated skill to be covered in a sequential manner. My experience gives me a different perspective of that previous conceived as a confining blueprint. I see the lines between each mathematics concept as permeable and possible to explore given the occasion. I can move around, in, through, and beyond the mathematics curriculum as the opportunity arises. For example,

the interest of my students to find out how many leaves Murple had, led to counting to 100 and on to 1000. Counting forward and backward from 100 is listed as a mathematics curriculum goal, however students went beyond. This could be why some students coming to grade one think that numbers stop at 100. The concept of the number 57 represented in different ways unfolded as did the concept of other numbers each day we counted a new collection of leaves. The interest in how skinny or fat Murple's trunk was, led to measuring activities. Measurement is presented as a separate strand in the mathematics curriculum; however the unfolding of events allowed us to occasion measuring trees rather than measurement as an isolated, disconnected mathematics concept. A natural integration of mathematics concepts unfolded from our interactions. In fact a natural integration of mathematics, science, ecology, and social responsibility unfolded from our interactions.

In moving beyond curriculum in the modernist paradigm toward a curriculum as transformative postmodern paradigm, Doll (1993) states:

> In considering curriculum as a transformative process, we will need to view curriculum as more than a series of contingent units-to see it as a mixed and multivariate integration of rich, open-ended experiences; as a complex mosaic ever shifting its center of attraction as we shift ours. (p. 38)

My previous feeling of curriculum topics being brought into the classroom, taught as isolated subjects and put away like clothes in the closet has shifted to the possibilities of bring out the clothes (topics) to be revisited many times over.

Revisiting Murple's leaves (like clothes out of the closet) in the context of mathematics provided rich connections later when we used the leaves for skip counting,

finding number patterns weighing, addition and subtraction activities. I can look at the teaching and learning of mathematical concepts differently. Rather than viewing mathematics concepts as separate skills to be mastered individually, I can "…approach them as locations for exploration" (Davis, p. 373).

A Personal Conversation with Mathematics

Numbers are a way for children to experience their world. The concrete experience of counting 57 leaves evolved into an inquiry about the number 57, bringing forth the concepts of skip counting (by twos, fives, tens), sharing (dividing) of leaves in different ways and the concepts of counting forward and counting backward (relationship of addition and subtraction) from 60 to 57. The abstract nature of number provided infinite possibilities, which were explored by students. The abstract nature of 57 became a reality through the context of the leaves. In this experience the children's thinking of number was not taught to them through direct instruction but rather, it was borne through their experience. Now I realize it was the dynamic interaction between students and me, not *in* or *on*, but *with* the environment, reciprocally exchanging ideas that gave rise to students creating their own meaning for the concepts of number and measurement.

My experience of the mathematical learning that emerged makes me question my past practices and my past view of how mathematical knowledge is acquired.

Davis (1996) describes precisely the teacher group I have been part of in the past. Davis (1996) states:

> Typical of many teachers (including myself until only very recently) [also me], Wendy had not previously thought to look beyond the curriculum guides or her own schooling for an understanding of mathematics….She was thus somewhat

> taken aback when first presented with the possibilities that mathematical knowledge might be incomplete, dynamic, fallible, and not universally or objectively true. (p.116)

Prevailing thoughts about how students acquire knowledge may not serve the nature of mathematics. Davis, Sumura, and Luce-Kapler (2008) describe how knowledge is thought to be acquired through four metaphors; object, food, edifice and fluid. In fact the words "acquiring knowledge" suggest that knowledge is an object outside of the mind and body, to be found or discovered or to be put into the individual, resulting in the individual possessing the knowledge.

Admittedly, I identify with the four metaphors which I have previously thought knowledge to be acquired; "Knowledge-as-object…acquires insight, grasps a concept, exchanges ideas, tosses out thoughts" or "…knowledge as food…digest an idea, ruminate raw data, food for thought, appetite for learning…" or "…knowledge as edifice…the basics, build on ideas, solid foundations, construct knowledge…" or "knowledge as liquid…flow of ideas, drowning in details, immersed in thought, thirsting for knowledge, soaking up information" (p. 57). I am not suggesting the prevailing notions of acquiring knowledge cannot be successful, however they are very different in comparison with my experience where students' mathematical understanding emerged from occasioning mathematics in the context of the leaves and the notion of knowing as "events of constant co-adaptation of interacting parts-an ongoing structural dance" (Davis, Sumara & Luce-Kapler, 2008, p. 58).

This different perspective gives me a new mindset about how children learn in general and specifically how they might learn mathematics. This different way of

thinking about knowledge will be valuable in my present and future teaching practice. I am now consciously aware of the four prevailing notions of knowledge as previously described by Davis, Sumara & Luce-Kapler, (2008). I am shifting farther away from the teacher as transmitter of knowledge thinking and completely away from viewing mathematical concepts as distinct items for mastery.

The nature of mathematics, as possessing qualities of connections, relationships, flexibility, patterns, and ambiguity, does not allow me to view mathematic concepts as distinct items for mastery. In past mathematics teaching I geared activities toward students making connections and finding patterns, however not with the depth which occurred with my students as described in the Leaf Collecting Vignette.

Students have some inherent knowing of mathematics depending on their prior experiences. The students who had understanding of how many more leaves were needed to have 60 and 57 was 3 less than 60 may have developed understanding and ability to visualize number from playing the snakes and ladders board game. The students who suggested grouping leaves by twos, fives, and tens may have had prior understandings of this concept from their kindergarten year or in their experiences at home or interactions with friends. The students who estimated words such as hundreds, thousands, millions billions and infinity had prior experiences with these words. Therefore, it is essential to recognize that students' background experiences can open up new possibilities for learning.

A different number of leaves were gathered every day giving rise for students to use the structures they had developed playing with 57. Different numbers allowed for the students to investigate the different patterns and combinations with unpredictable results.

I view my role as teacher differently. I can stage the setting (posed problem or materials). I can anticipate for a variety of student responses. I can position my self in the classroom as an engaged participant rather than as facilitor. I can step back and listen to their conversations. I can ask particular questions that change and reshape students thinking. I can listen differently (hermeneutic). I can respond to student's responses to open a space for new ideas. I can follow a twisting path different from my preset plans. I can view mathematic problems not as problems to be fixed, but as mathematical openings for unexpected possibilities. In this way a location for mathematics learning to occur can be occasioned by "bringing forth together a shared world of mathematical significance". (Kieren, 1995, p. 10).

A Personal Conversation with the Mathematics Curriculum

Revisiting the British Columbia Mathematics Grade One Integrated Resource Package (2007) I notice that my students did all that is stated and beyond. The British Columbia Mathematics Grade One Integrated Resource Package (2007) states:

> A true sense of number goes well beyond the skills of simply counting, memorizing facts and the situational rote use of algorithms. Number sense develops when students connect numbers to real-life experiences, and use benchmarks and referents. This results in students who are computationally fluent, flexible with numbers and have intuition about numbers. The evolving number sense typically comes as a by-product of learning rather than through direct instruction. However, number sense can be developed by providing rich mathematical tasks that allow students to make connections. (p. 13)

I am pleased with the development of the new British Columbia Mathematics Grade One Integrated Resource Package (2007), however “providing” implies that some how tasks are presented and students will develop number sense. I now believe that “providing rich mathematical tasks” needs to include dynamic, reciprocal interaction between the students, the teacher and their environment. I believe that number sense develops when students explore number by playing with numbers in many different combinations and patterns. For example, students used benchmarks and referents (fives and tens). Students were flexible with numbers. In the first leaf counting students explored different ways to represent 57. On subsequent days students explored patterns, relationships with different numbers through the context of the leaves. Students were developing an intuition about numbers (100, 200, 300, 400, 500, 600, 700, 800, 900 and 1000) through the context of the leaves.

Concluding Conversation

For me, self-reflection as a narrative inquiry has been a rewarding experience. Self-reflection requires a self-facing, honest, deep critical introspection and outward inspection of the larger context in which I am situated. Sometimes startling, sometimes confirming, sometimes humiliating, sometimes pleasing, sometimes loathsome, yet revealing and informative. Hermeneutic interpretation involved interrogating my personal beliefs and assumptions, my teaching practices and my pedagogy. It has made me place a deeper attention on events that I previously reflected on in a superficial shallow manner.

My interpretations of my reflections have not given me final definitive answers or a conclusion of right or wrong. Rather, I have new understandings and alternatives for my

present and future mathematics teaching practice. As I act differently, I think differently, thus finding my thinking (theory) and my acting (practice) inseparable. As I position myself differently in the classroom, I become the learner alongside *with* my students, rather than teacher as forefront. Therefore, I find teaching and learning inseparable.

A poignant reminder articulating a desire to continue transforming my mathematics teaching practice is concisely stated in the following; “Teaching is not how to control what happens, but how to participate mindfully in the unfolding of possibilities. Teaching isn’t *done.* Teaching is lived as one encounters self and other, individual and collective, past and future, actual and possible” (Davis, Sumara and Luce-Kapler, 2008, p. 226).

My written self-reflections now come to an end. However, “As John Dewey pointed out every ending is a new beginning, every beginning emerges from a prior ending” (Doll, 1993, p. 178). It is a new beginning for me, as I continue my interest to understand the ambiguities of mathematics, practice hermeneutic listening and open up spaces for unexpected rich mathematical learning.

References

Aoki, T. (2005) [1991]). Five Curriculum Memos and a Note for the Next Half-Century. In Pinar, W. F. & Irwin, R. L. (Eds.). *Curriculum in a new key: the collected works of Ted T. Aoki.* Mahwah, NJ: Lawrence Erlbaum.

Aoki T. (2005 [1993]. Legitimating Live Curriculum: Toward a Curricular Landscape. In Multiplicity. In Pinar, W. F. & Irwin, R. L. (Eds.). *Curriculum in a new key:the collected works of Ted T. Aoki.* Mahwah, NJ: Lawrence Erlbaum.

Aoki, T. (2005 [1996]). Narrative and Narration in Curricular Spaces. In Pinar, W. F. & Irwin, R. L. (Eds.). *Curriculum in a new key: the collected works of Ted T. Aoki.* Mahwah, NJ: Lawrence Erlbaum.

Aoki T. (2005 [1993]. Legitimizing Live Curriculum: Toward a Curricular Landscape. In Pinar, W. & Irwin, R.. (Eds.). *Curriculum in a new key: the collected works of Ted T. Aoki.* Mahwah, NJ: Lawrence Erlbaum.

Clandinin, D. J. & Connelly, F. M. (1994). Personal Experience Methods. In Denzin, N., Lincoln, Y. (Eds.). *Handbook of qualitative research.* Thousand Oaks, CA: Sage

Clandinin, D. J. & Connelly, F. M. (2000). *Narrative inquiry: Experience and story in qualitative research.* San Francisco: Jossey-Bass.

Clandinin, D. J., Pushor, D., Murray Orr, A. (2007). Navigating Sites for Narrative Inquiry. *Journal of Teacher Education 58*(1).. doi:10.1177/0022487106296218

Clifford, P. & Friesen, S. (2003). A Curious Plan: Managing on the Twelfth. In Clifford P., Friesen, S & Jardine, D. *Back to the basics of teaching and learning: Thinking the world together.* Mahwah, NJ: Lawrence Erlbaum.

Connelly, F. M. & Clandinin, D. J. (1990). Stories of Experience and Narrative Inquiry. *Educational Researcher, 19*(2). doi:10.3102/0013189X019005002

Connelly, F. M. & Clandinin, D. J. (2006). Narrative Inquiry. In Green, L.; Camilli, G.; Elmore, P. (Eds.) *Handbook of complementary methods in education research* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches. (2nd ed).* Thousand Oaks, CA: Sage.

Davis, B. (1996). *Teaching mathematics: Toward a sound alternative.* NY: Garland.

Davis, B. (1997). Listening for Differences: An Evolving Conception of Mathematics Teaching. *Journal for Research in Mathematics Education*, [On-line], *28*(3) 355-376. Retrieved from http://www.jstor.org/stable/749785

Davis, B., Sumara, D. & Luce-Kapler, R. (2000). *Engaging minds: Learning and teaching in a complex world* (2nd ed.). NJ: Lawrence Erlbaum.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *Handbook of qualitative research (2nd ed.).*Thousand Oaks, CA: Sage.

Doll, W. E. (1993). *A post-modern perspective on curriculum.* NY: Teachers College Press.

Fennema, T. A & Kaput, J. J., Romberg, T. (1999). Mathematics Worth Teaching, Mathematics Worth Understanding. In Fennema, E., & Romberg, T. (Eds.). *Mathematics classrooms that promote understanding.* NJ: Lawrence Erlbaum.

Gadamer, H. G. (2001*). Gadamer in conversation: Reflections and commentary (R. Palmer, Trans.).* New Haven, CT: Yale University Press.

Jardine, D., Clifford, P. & Friesen, S. (2003). *Back to the basics of teaching and learning; Thinking the world together.* NY: Lawrence Erlbaum.

Jardine, D. W., Friesen, S. & Clifford, P. (2006). The Fecundity of the Individual Case. In Davis, J., Friesen S. & Clifford, P. *Curriculum in abundance*. Mahwah, NJ: Lawrence Erlbaum.

Kieren, T. E. (1995). *Teaching in the mathematics (in the-middle): Enactivist view on learning and teaching mathematics*. Retrieved from http://ioncmaste.ca/homepage/discussion_papers/Kieran, %201995.pdf

Liedtke, W., & Thom, J. S. (2008). *Making mathematics meaningful: for children ages 4 –7.* Victoria, BC, Canada: Trafford.

Linn, R., Bruce, M., Donaldson, D., Ellis, J., Saunders, A. Trischuk, J. (1976). (eds.). The Star in the Apple Tree. *Rainbow letters.* Toronto, Canada: Holt Rinehart.

Lionni, L. (1992). *The busy year.* NY: Alfred A. Anopf.

Maturana, R. & Varela, F. (1987). *The tree of knowledge: the biological roots of human understanding.* Boston: Shambahala.

Ministry of Education, Province of British Columbia (2007*). Mathematics Grade 1: Integrated Resource Package 2007*. Victoria, Canada.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics.* Reston, VA: Author.

Reys, R., Lindquist, M.., Lambdin, D. & Smith, N. (2007). *Helping children learn mathematics*(8th ed.). NJ: John Wiley & Sons.

Schön, D. (1983). *The reflective practioner: How professionals think in action.* NY: Basic Books.

Smith, S. Z., Smith, M. E. & Williams, S. R. (2005). Elaborating a Change Process Model for Elementary Mathematics Teachers' Beliefs and Practices. *Current Issues in Education*. [On-line], http://cie.ed.asu.edu/volume8/index.html

Van de Walle, J. A. (1990). In *The national council of teachers of mathematics.* Reston, VA.

Van de Walle, J. A. & Louvin, L. H. (2006). *Teaching Student-Centered Mathematics Grades K-3 (The Van De Walle Professional Mathematics Series vol.1).* Boston: Pearson Education.

van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy*. NY: State of University of New York Press.

van Manen, M. (1991). *The tact of teaching: the meaning of pedagogical thoughtfulness.* NY: State University of New York Press.

Webster, L. & Mertova, P. (2007). *Using narrative inquiry as a research method: An introduction to using critical event narrative analysis in research on learning and teaching.* NY: Routledge.

Western and Northern Canadian Protocol Common Curriculum Framework. (2006). Alberta Education, Alberta, Canada: Author.

Willinsky, J. (1989). Getting personal and practical with personal practical knowledge. *Curriculum Inquiry*, *19*(3), 247-264. Retrieved from http://www.jstor.org/stable/1179416