PERSONAL NARRATIVES AND CONSTRUCTIVISM IN TEACHER EDUCATION

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PERSONAL NARRATIVES AND CONSTRUCTIVISM IN TEACHER EDUCATION

This study pairs two conceptual frameworks in order to study preservice teachers and their pedagogical development. First, I used the personal narrative framework Carter and Doyle (1996) developed to identify and examine personal narratives preservice teachers bring with them into teacher education. Second, I applied the meta-analysis Dangel and Guyton (2003) provided on constructivism as a vehicle to describe how preservice teachers were being taught in teacher education, including their field experiences.

Using a qualitative ethnography, I followed thirty preservice teachers through a methods course collecting weekly reflections that were guided by various topics that were relevant to the particular weeks' learning opportunities. Included in these were; personal narratives, questions they had about education, expectations for field experience, connections to reading from the text, actual field experiences, and learning in a constructivist teacher education classroom. The purpose of this study was to chronicle the process preservice teachers embark on as they begin to construct their own pedagogy making the transition from students to interns and how this process can be used to further teacher education.

My findings suggest that teacher educators should access preservice teachers' prior experiences as expressed in personal narratives as a foundation with which to build teacher education. Additionally, preservice teachers' written questions about education should be thoughtfully examined and used as a vehicle with which to build part of the course, also enabling preservice teachers the ability to go back and authentically assess their learning at the semester's end. The importance of field experiences cannot be underestimated, however, even the most didactic experiences provide preservice teachers with invaluable knowledge, namely the negative effects of prepackaged, scripted curricula programs. The final finding was that using the teacher educators' real-world experiences in the elementary school classroom provides preservice teachers with an up-close and personal view of education that validates the authenticity of the teacher educator.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

Chapter One

Introduction

My journey in education began after the birth of my two children. The experiences I had with my own children ignited my desire to teach young children in a public school classroom, so in 1983, I enrolled in a graduate level program to obtain my elementary certificate and master's degree. This degree eventually led to fourteen years of teaching. During my teaching years, I was continually amazed by the concepts young children learned and the developmental milestones they achieved in such a short time in the classroom.

As I listened deeply to children, I continued to be fascinated by their astute grasp of their world and how they connected their experiences to other phenomena as they began to build their knowledge base during their primary school years. My observations of children's logical thinking and their ability to bridge what they had experienced in early settings to new situations indicated that their experiences were as unique as the children themselves. Over and over again, I witnessed individual children's reasoning, which seemed to be based on their various prior experiences. I began to note that their continuously developing cognitive processes allowed them to create their own particular ways to adjust to the context of learning. Regardless of differences in prior experiences and their ways of adjusting, it became clear to me that what they needed in their early school years was time to continue their exploratory journey in an enriched school and classroom. As the supportive experiences deepened, I and other sensitive teachers were broadened, it seemed that children's perseverance with

contextualized learning advanced them to higher levels of learning. As I continued to listen to children and watch them more and more closely each year I taught, I realized that understanding the children themselves (rather than any formal, standardized curriculum) were the key to effective teaching. By listening carefully to the children over those fourteen years, I began to know how to facilitate and scaffold their learning and provide the responsive environment which they needed to grow.

Imaginative and Generative Growth in the Classroom

For many years I was given a wide creative berth as a teacher in my classroom, enabling me to develop curriculum for my class in a progressive, nontraditional manner. I collaborated with several colleagues with similar ideas as we developed many integrated teaching units. We were all interested in providing open, but stimulating learning environments that encouraged young children to be actively engaged in learning. We collaborating teachers preferred to try different creative models of learning within our classrooms. Children might be scattered throughout the room working on various projects, each one at a different level of learning.

During my years of teaching in public school, however, I witnessed a number of different teaching styles, which I judged to be effective and ineffective. The tide began to turn as these young teachers whom I had worked so closely with began to have families and leave their classrooms. For some reason, many of the teachers who replaced my innovative colleagues were more entrenched in traditional, didactic, academically-focused methodology. Many were returning to the classroom after raising their own children, so it may be that they had been

educated in the more traditional model of education. They put their classroom desks in rows and expected the children to work independently and silently. But some younger teachers used traditional styles (that was much like I had been educated as a child during the 1960's). Standing in front of the classroom, they expected children to sit quietly at their desks and listen to them.

My experiences with teachers caused me to question why some educators believed certain things about children and teaching, hence practiced teaching in one way, while others used far different styles within their classes. Factoring in my own preferences for a progressive and responsive way of working with children, I began to informally question my colleagues and observe them teach in an attempt to discern why they used different pedagogical styles.

As I continued to observe while I was still teaching, I saw confused student teachers become frustrated in their placements with fundamentally traditional teachers. Student teachers informed me that the behaviors of these supervising teachers contradicted what they had learned in their teacher education programs. In contrast, when preservice teachers would walk by my room, and I invited them to come into my classroom to look around, the repeating theme of their comments was, "Oh, this is how we were taught in our education classes." These comments about their progressive preservice teacher education programs made me wonder why many newer teachers were not able to combine the theoretical ideals they had heard about in their educational classes with their educational practice and their students when they began teaching. I wondered if it had to do with the disconnect between what they were taught and how they were taught. I

suspected that they were likely to teach in the traditional ways they had been taught in during their teacher education.

The Times They are a Changing

During my years as a primary teacher, I continued to seek innovative university-based curriculum courses or professional development workshops during the summers to hone my craft. In addition, I continuously tried new techniques to keep my teaching fresh. Most of these courses reinforced the importance of inquiry and constructivist-based curriculum. When I tried new constructivist strategies in my classrooms, I found that students did become engaged in meaningful, authentic learning. They also showed more enthusiasm about their learning. Furthermore, as a teacher I was stimulated by doing things differently. However, eventually a focus on high-stakes tests and standards began to dominate at the onset of the accountability movement. Politicians and legislators were operating more and more as gatekeepers of education and they preferred high stakes test-drive curriculum to progressive curriculum. This meant that teachers were forced to narrow their curricular focus and limit their teaching styles to prepare children for standardized tests. It was then that I decided to leave elementary public education. I could not stand to teach "to the test" after I had witnessed the exuberant learning my students found when engaged in meaningful, real-world learning.

As I considered going to graduate school, I found that my original questions about the origins and impact of diverse teaching styles still lingered. I continued to ask how it was that some teachers were able to create an interactive learning atmosphere with children moving around the room actively engaged in

many activities, while others had the children in their classroom silently working individually at their desks on rote tasks for most of the day. What experiences and ideas did these teachers bring with them that ended up with what I felt to be such sterile, limiting classrooms? What contributed to how they decided to teach this way?

I decided an appropriate way to answer my questions was by going to graduate school to become a teacher educator. My reasons were two-fold. First, I could use innovative methods in my work with preservice teachers and have some impact upon teacher education and ultimately classroom instruction. Second, I could begin to earnestly search for answers to how and why teachers become who they are. I could begin my quest for understanding effective instruction by studying students of education.

Self-Knowledge and Recognition

Initially, I did much self-seeking regarding my own practice and realized how powerfully my personal history informed my pedagogy. Recalling my past learning experiences as a young child was enlightening. Many of my classrooms were traditional and I often was bored in school. But outside of school, actively handling real objects, observing, and creating my own meanings became central to my learning. Whether it was the countless hours exploring my grandparents' woods during vacation or the joy of spending my formative years beside a creek, both experiences created a curiosity and love of nature that still are with me. What I learned through this freedom to explore was transferred to my philosophy of education and my understanding of how to engage children in exciting learning.

Adding to the message about the nature of learning that I gleaned from these out-of-school experiences was my time in the fifth and sixth grade with a teacher who strongly believed in children's constructing their own meanings. We learned "new math" and how to follow the stock market. Because he was not one to allow an opportunity to go by without having us actively engaged in constructing meaning, this teacher actually allowed and encouraged us to pass notes to each other during the school day. The only caveat was that the notes had to be written in Braille. He had a small Braille-writer for the class to share. Needless to say by the end of sixth grade, there were thirty children who could decipher Braille pretty well. Intensely interested in this learning by doing and learning through challenges, my course as a progressive, constructivist educator was charted. Later on in my schooling, my joy in the hands-on type courses (i.e., art classes, sewing classes, and science labs) sealed my sense that a creative, active approach was best for learning. Looking back to analyze the key components of my education, I realize that my favorite classes had been very "hands-on" and "minds-on." They had also been classes that encouraged social interaction and collaboration. My own preference for active and interactive learning started a significant pattern of teaching and learning that emerged strongly when I was in a teaching position and could determine the nature of the classrooms where I taught. As I began my doctoral degree, my focus continued to be on the practical application of my coursework, integrating it with the practice of teaching and its relevance to the education of teachers.

Theoretical Perspective of Education

The focus of this dissertation research on constructivist teaching and learning, and I seek to explain how preservice teachers in methods courses form their initial educational philosophy orientation within the field of education and how that philosophy relates to their ideas about their classroom practice. I explore the philosophies that preservice teachers bring to the field of education through examining their personal narratives. I look at how these are formulated, changed, and enhanced through field experiences and teacher education courses. I speculate about how their initial ideas about teaching and the pedagogy they encounter in teacher education eventually impact their teaching.

My position and perspective are similar to the ideas of John Dewey. A strong constructivist, Dewey's work is central to my own current philosophical position. Belief in children's natural curiosity, the importance of their experiences in the world, the process of creating curriculum around children, as well as teachers' reflective thinking and inquiry are among the concepts that Dewey espoused that resonate with my own ideas about teaching practice. Moreover, I believe these principles are valid regardless of the age of the students. Beginning with the learner's prior knowledge and experience seems to be a natural way to engage children further in any subject matter, area of knowledge, or skill acquisition. This learner-centered aspect of Dewey's philosophy seems fundamental to me.

Experiential Learning

While honoring children's individuality and uniqueness, experiential learning was the cornerstone of Dewey's (1938) educational philosophy. Dewey

believed children learned from their own curiosity when a child-centered curriculum was geared to their interests (Flinders & Thornton, 1997). Dewey (1933) used the term "whole-heartedness" to describe natural learning. As Dewey (1933) states:

> When a person is absorbed, the subject carries him on. Questions occur to him spontaneously; a flood of suggestions pour in on him; further inquiries and readings are indicated and followed. (p. 31)

Through my years of parenting and teaching, I have watched children gravitate toward objects, creatures, and phenomena that relate to their interests. Learning, a natural process inherent to human beings, begins once a child's curiosity is aroused. When the teacher builds on this curiosity, children become genuinely engrossed in learning, which emerges as the spontaneous bi-product of a rich environment in which children can experiment and build on what they already know to make sense of their world. Dewey (1938) believed his view of education to be more natural than the didactic teacher-and curriculum-centered learning that dominated schools at his time. Child-centered instruction recognized children's interest as central to their intellectual and social development and growth. He criticized the traditional academically oriented curriculum's artificiality that ultimately veered away from natural connections to children's interests and often was oriented toward cumbersome complexity that was not linked to natural settings so was unlikely to be useful in children's everyday lives. Contending that the gap between adults and children's knowledge was wide, Dewey (1938) stated "the [traditional] methods of learning and of behaving are foreign to the existing capacities of the young" (p. 19). Dewey

considered it essential to link his educational theory to school practice. For that reason, he was heavily involved in the University of Chicago Lab School, a school that continues to this day.

Dewey's (1938) emphasis on responsive learning environments, the interactions between teachers who were simultaneously active learners and facilitators of students' learning, as well as the use of practical and inherently interesting subject matter ring true to me. When a rich environment is the medium for all to engage in situational, contextualized, and social learning, children's self-construction of new meaning intersects with their prior knowledge on a deep, personal level; experiences are blended with new ones. Dewey summed it up this way: "Education must be conceived as a continuing reconstruction of experience; that the process and the goal of education are one and the same thing" (cited in Flinders & Thornton, 1997, p. 21).

Dewey had an adverse reaction to traditional top-down mandates that imposed, "adult standards, subject-matter, and methods" for developing children who he felt lacked fully formed minds (1938, p. 18-19). Dewey was aware that children learn and process information far differently from adults. He felt that children needed to make relevant connections to their physical world in order to learn. Passive learning, which involved children submissively sitting at their desks listening to teachers, seemed unnatural to Dewey. Because Dewey strongly believed that experiences occur contextually rather than in a vacuum, he recommended that teachers were to be more of a guide for children, helping them connect new ideas to previous experiences. This thinking about the role of

teachers continues to flourish today and it is in accordance with children's, but also adults' learning (Barth, 2001).

Based on my own experience, I believe the creation of a democratic society where children learn to live and interact productively, should begin in the classroom. When children learn to creatively grow together in a fruitful environment, which is gently guided by a knowledgeable teacher, a community can emerge in which individuals are valued, respected, and learn to treat others in supportive ways (Kovalik, 1997). According to Palmer (1998) "To educate is to guide students on an inner journey toward more truthful ways of seeing and being in the world" (p. 6).

Personified Representations

I have attempted to clarify the importance that my personal narrative and experience played in my development as an educator to show how these closely intertwine with my current constructivist theoretical point of view concerning education. My general observations of classrooms and my experiences as a classroom teacher led to my interest in the development of preservice teachers. These personal and professional interconnections are strong. Palmer (1998) states:

> I have worked with countless teachers, and many of them have confirmed my own experience: as important as methods may be, the most practical thing we can achieve in any kind of work is insight into what is happening inside us as we do it. The more familiar we are with our inner terrain, the more surefooted our teaching-and living-becomes. (p. 5)

Palmer beckons teachers to examine what has transpired in their lives so that they may understand more fully the lives they continue to live and the ways they teach. Others suggest that this understanding begins with recounting past experiences in order to become cognizant of who they are as teachers (Knowles & Holt-Reynolds, 1991; Richardson, 1996).

Teachers are composed of experiences that make up their individual pasts, each history is as unique as they are (Knowles & Holt-Reynolds, 1991; Richardson, 1996). Children's early experiences are particularly powerful (Carter & Doyle, 1996). I remember childhood experiences according to where my family was living. My father's career took us to five cities and towns in Indiana by the time I was five. Then, my first five grades were spent in five different states in the Midwest, the South, and on the East Coast. We made a total of ten moves by the time I was ten. Scholars contend that episodes, events, and anecdotes from teachers' pasts build their personal outlooks and ways of teaching (Knowles & Holt-Reynolds;1991, Richardson, 1996). Incidents are never isolated, but rather are contextualized within the fabric of teachers' lives (Woods, 1987). This notion of the importance of context certainly makes sense to me. For example, while learning fourth-grade state history in Virginia, (I had only lived for a month in Virginia before starting school and had spent most of my life in the Midwest), my teacher began speaking of events in Virginia's past as well as the geography of a region that I had not experienced or seen. It was difficult for me to relate to what she was explaining. Students who had seen the mountains, ocean, and hilly topography of the state were at a distinct advantage compared to me, a child from the Midwest.

As teachers participate in life's events, practicing and observing what happens in the world, teachers emerge with particular reminiscences, recountings, and memories (Knowles & Holt-Reynolds, 1991; Richardson, 1996). Because of my transient childhood experiences, I was especially sensitive to new students entering my classroom when I taught elementary school. Students spend much of their time informally learning by observing, thus my welcoming actions toward new students were noted by the other children in our class. They followed my lead by embracing new students. For example, when a new student arrived from Hawaii mid-year, we looked on the United States map in order for the class to see how the islands were surrounded by an ocean and understand the distance between Hawaii and the Midwest. The new student, in turn, told us about making "sand angels" which my students could relate to because they made "snow angels." Lortie (1975) calls this phenomenon in which students gain knowledge about teaching through their own experiences in the classroom an "apprenticeship of observation" (p.61). Lortie maintains that what preservice teachers know is "based on their own individual personalities rather than pedagogical principles" (p.62). Furthermore, individual observations lead to individual theories about learning. Holt-Reynolds (1992) labels these "lay theories" maintaining that all students possess beliefs about teaching based on their own extensive interpersonal experiences in the classroom and their individual interpretations of what they see. Thus, preservice teachers have personal narratives, which continually evolve as they are exposed to new situations (Knowles & Holt-Reynolds, 1991).

Personal Narratives

Ideas about teaching are based on layer after layer of classroom experiences. These become what Bullough and Stokes (1994) and Richardson (1996) call preservice teachers' individualized personal narratives. These narratives are rich in detail and form the beginning conceptualization of education (Knowles & Holt-Reynolds, 1991). Students retell their personal narratives, adding to them as they grow in experience, recounting, memorizing, and building in content (Knowles & Holt-Reynolds, 1991).

Layers of my personal narratives continue to be clearly delineated in my mind because I associated classrooms with the state I lived in at the time. I remember certain events and even my interpretations of them. Some were funny, some serious. Examples of serious times began when my family moved to the deep south where restrooms and drinking fountains were labeled to indicate who could and could not use them based on the color of people's skin. Segregated facilities did not exist in the Midwest, therefore my family had never seen them before and was at a loss to try to explain them to an eight-year-old child. As a nine–year-old, in Virginia, I watched from the hilly school playground as smoke poured out of my house and partially burned while I was at recess. Being new to the school, I did not know the teacher on recess duty and stood there paralyzed by fear and unable to move. While lining up to go inside from recess, the teacher on duty spotted the fire, and we listened to the sirens and then watched as the volunteer fire trucks roared in to extinguish the fire. This incident triggered another of my educational principles. I believe teachers should make sure school is a comfortable and safe place. It was not always that place for me. More solemn

times were to continue through the ensuing turmoil of the 1960's. Each event triggered distinctive emotions, internal dialogues, conversations with others, and debates that affected me for years to come and shaped my own personal and professional narratives.

Each narrative is idiosyncratic, a product of what happened to the storyteller and a representation of the hermeneutic tradition (Richardson, 1996). Students build on what they know to be personally true, and preservice teachers are no exception- they have their own strongly conceived personal narratives (Bullough & Stokes, 1994; Holt-Reynolds, 1992; Richardson, 1996). My early school memories have endured after many years of being a student as well as years of being a teacher. Preservice teachers' classroom experiences as students are much more recent than my own and likely to be even more clearly remembered (Knowles & Holt-Reynolds, 1991). I was convinced that preservice teachers' personal narratives were influential in their development as teachers, hence incorporated them into my dissertation study.

Construction of Pedagogy

According to Carter and Doyle (1996), preservice teachers begin to construct their pedagogy of education based on their own experiences as students, which, in turn, influence the decisions they make during their own teaching practice. As experiences in the field continue for preservice teachers, personal narratives are recounted and sometimes considered to be truthful and relevant.

Yet teacher educators know that in terms of consistency with educational principles, some of these personal narratives about teaching may lead to flawed

teaching practices. Hence, preservice teachers must learn to understand the nature and origins of their beliefs and attempt to bring these personal implicit theories in line with more idealistic theories about teaching and learning. Teacher educators can pursue a knowledge of preservice teachers' personal narratives through open discussion about their reflections, beliefs and preconceptions; that is, through dialogue. Bullough and Stokes (1994) conclude that a working relationship among preservice teachers and teacher educators allow the formers' implicit beliefs to become explicit. Speaking to preservice teachers' beliefs, Holt-Reynolds (1992) states:

> Their arguments are coherent, cohesive, and clearly grounded in their personal histories. By exploring specific arguments preservice teachers use for supporting their decisions about the potential value of specific principles, we stand to learn much about the effects of the rationales we use as we attempt to establish the importance of the principles we hope to teach. (p. 338)

Cole and Knowles (1993) stress, "Teacher practice is idiosyncratic" and express "a way of knowing" that has been deeply embedded throughout preservice teachers' lives with experiences from home, school, and community (p. 474). Thus guided reflections or beliefs offer a method for openly addressing preservice teachers' beliefs within the context of teacher education. Such discussions can lead to ways that teacher educators can strengthen their knowledge of preservice teachers and their experiences as a way to counteract those that interfere with effective, teaching practices (Carter & Doyle, 1996).

Sometimes this reflective, dialogic approach to teacher education is called inquiry learning.

The Reflective Component of Inquiry Learning

As preservice teachers begin to learn through inquiry in their teacher education classes, the reflective process of internal dialogue is initiated (Cole & Knowles, 1993). Woods (1987) labels this inquiry, or reflection on belief and practice, a "living, experiential, processual, flexible, creative, compilation of insights, memories, information, associations, and articulations" (p. 121). I have so far indicated that my own explication of my experiences as a student and teacher indicate the importance of reflection as a critical tool for learning to teach effectively. Dewey (1933) valued reflective thinking and believed that when teachers encountered difficult experiences that did not go as planned, they were presented with the natural opportunity to begin reflective inquiry as to what happened and why. If they were dissatisfied with a teaching event, they were likely to be open to consider alternative approaches as well as alternative philosophies about education.

Accordingly, as an elementary teacher, and then a teacher educator, I learned that when I begin a topic in an area of study with students, I engage in what might be called an "ongoing debate in my mind" about whether the children know what we are talking about or even have had any experience with it. (Recall my experiential gaps when I was to learn about Virginia after I had recently been transplanted from the Midwest.) At the same time, I begin eliciting information about their experiences and about current prior knowledge. My own reflection continued while my eyes sweep the students' faces to see glimmers of recognition

about our topic. Consequently, if there are blank stares, the conversation in my head focuses on searching for connections the students can make to what we are learning. When children's eyes light up and they readily respond, my reflective self continues to monitor the events taking place in the classroom as I continually seek to make sense of what is happening regarding their learning.

The above paragraph describes a teacher who is simultaneously an active learner. I believe that teachers who are active learners can best facilitate students' learning. The most adept facilitators learn to question what is happening in the learning environment while it is occurring. They also immediately modify their instruction according to what they observe while they teach. Reflective thinking while teaching allows a teacher to examine and evaluate whether a concept is understood or misunderstood by students. They can gauge whether additional time is needed for students to learn and can embellish on the lesson and extend it. I cannot imagine teaching without the reflective dialogue that helps me re-group mentally when students need a different approach. I am pleased to spot the "a-ha" moments that inspire me to refine my techniques and enhance classroom learning.

Summary of Introduction

Palmer (1998) declares that we teach who and what we are. This is true for me; I am unable to separate who I am and what I believe from my teaching because they are intricately connected. Through years of introspection and critical reflection, I believe that I have learned to become an effective teacher. My past experiences, both in and out of school, enabled me to flourish as a learner and thus, also as a teacher. Interactive, authentic, real world learning

engaged my interest and curiosity. I have successfully analyzed my own learning situations to sharpen my teaching techniques. My personal narratives have become both multi-layered and informed as I have continued my journey into education as a constructivist teacher. The more experience I had with children in the classroom, the more entrenched my strong Deweyian beliefs became. Given my close identification with Dewey and his major precepts about experiential learning, reflective inquiry, commingling theory with practice, and initiating democracy in school, my position became firmly aligned with Dewey in the field of education.

The overview of certain literature in this introductory chapter developed the important role that personal experiences play as preservice teachers begin their educational training (Carter & Doyle, 1996; Knowles & Holt-Reynolds, 1991; Richardson, 1996). Linking Lortie's (1975) "apprenticeship of observation" (p. 61), Knowles and Holt-Reynolds (1991) maintain that many layers of classroom experience create personal narratives that are richly detailed and begin the preservice teachers' conceptual development as teachers.

Preservice teachers initially rely on their past student experiences without much discernment in relation to teacher education (Carter and Doyle, 1996). These researchers add that construction of knowledge becomes crucial for teacher educators to kindle preservice teachers' re-examination of their personal narratives. As preservice teachers revisit and revise their personal narratives, they continue build their construction of pedagogy (Carter & Doyle, 1996; Knowles & Holt-Reynolds, 1991). While this knowledge is developing, construction of pedagogy is generated through reflections, internal dialogue, and

discourse. Bullough and Stokes (1994) acknowledge that teacher educator relationships with preservice teachers are an essential element to their development as teachers. This begins the conversation teacher educators ought to be having with preservice teachers. The next chapter details my review of literature concerning personal narratives and constuctivism in education.

Chapter Two

Review of Literature

Stepping into a classroom to begin a new school year is an exciting experience and one that never fails to inspire me. The minute I walk into a room full of children, I begin to see the existence of all sorts of new possibilities. I have come to appreciate the fact that children enter school with their individual personalities, which combined with my own prior experiences will result in an interesting new year. The challenge of creating a stimulating learning environment and building community relationships with a new group of children is exhilarating. Senge (2002) elaborates:

> If you are learning in a classroom, what you understand is determined by how you understand things, who you are, and what you already know as much as by what is covered, and by how and by whom it is delivered. (p. 1)

I have come to savor the diverse personal narratives that will come together in my classroom community. I know that students of all ages, with their prior life experiences, are as important to learning as is the teacher's form of instruction. However, I also know that the teacher's form of instruction will have a major impact on students. This dissertation is about the coming together of personal narratives about schooling and the development of ideas about constructivist teaching and learning.

Conceptual Framework

My conceptual framework is based on Carter and Doyle's (1996) research, which utilized preservice teachers' personal narratives as a basis for their

learning in teacher education. Additionally, my conceptual framework entails principles of constructivisim in teacher education as articulated by Dangel and Guyton (2003). Together, personal narratives about schooling and constructivist ideas about learning serve as the vehicle that enables preservice teachers to develop a construction of pedagogy which enables them to begin to create whom they will be as teachers (Carter & Doyle, 1996; Holt-Reynolds, 1992; Knowles & Holt-Reynolds, 1991).

I begin this review of literature by discussing personal narratives and how they affect preservice teachers entering teacher education. The second and third parts review constructivism: where it originated, what it entails, and outcomes of research studies focusing on constructivist practices.

Personalized Accounts of Teachers' Lives

"Teaching is a complex and personal phenomenon" (Cole, 1990, p. 12). Prior experiences involving childhood, family, and school life form the basis for the personal narratives that have profound influences on teachers' lives (Martinez, 1998). The continuous telling of personal stories is a way that people organize their lives (Connelly & Clandinin, 1990). Carter and Doyle (1996) suggest that people "live storied lives" (p. 123). Children begin to appreciate literature by listening to the stories read to them. These stories function as a way to help children, and eventually adults, make sense of the world. In education, these stories or personal narratives are the basis on which preservice teachers understand actual events that have happened in their educational lives (Connelly & Clandinin, 1990). Carter and Doyle believe that personal narratives should be the focal point of teacher education because teachers' prior experiences, and the

stories preservice teachers form based on their experiences, influence the choices they make as future teachers. These scholars further maintain that learning to teach is a deeply personal process in which preservice teachers' identities and life stories are intricately laced together. Similarly, Cole (1990) describes an understanding of personal narratives as a way of identifying and articulating the uniqueness of individual preservice teachers because no two people have experienced the same events. Palmer (1998) describes the reasons for listening to personal narratives:

> We must honor both the little stories of our lives and the big stories of the disciplines... It is a hard tension to hold- not only because academia discredits the little story but also because the little stories are the ones the students feel most comfortable with. (p. 80)

Palmer asserts that academia discounts the value of the personal narrative and elaborates on this rejection with the explanation that neither preservice teachers nor their teacher educators understand the significance of personal narratives. Martinez (1998) concurs that practical knowledge is ignored by traditional researchers, yet others contend that because preservice teachers are unable to understand the importance of their past experiences, much less articulate how powerfully they influence their lives, it behooves teacher educators to investigate the storied lives preservice teachers bring with them to teacher education (Carter & Doyle, 1996; Connelly & Clandinin, 1990; Cole, 1990; Lauer, 1998; Palmer, 1998). For this reason Sarason (2004) recommends that aspects of learning contexts that were effective in students' lives be examined.

Epistemology and Authentic Voice

Teachers' interests can come to light through personal narratives (Connelly & Clandinin, 1990). When, as learners, preservice teachers begin to link their knowledge to their own lives, their knowledge can be reshaped to reveal new patterns of thinking about the profession (Woods, 1987). Interestingly, writing these personal narratives enables preservice teachers to "view themselves not just as knowledge consumers (as in traditional education) but as knowledge producers" (Smith & Latosi-Sawin, 2000, p. 2). Smith and Latosi-Sawin maintain, this process allows preservice teachers to merge their pasts as students with their thinking about schooling to find their authentic voices as teachers. Furthermore, when preservice teachers explicate their personal narratives, they tend to reconsider past experiences in a new way that enhances their teacher knowledge (Goodfellow & Summ, 2000). This enables preservice teachers to develop new conceptual representations, which in turn offer " a transformative pathway through which preservice teachers learn to teach" (Goodfellow & Summ, p. 7). Therefore, it is important that preservice teachers learn to reflect on thinking that influences their interpretations of their past experiences. Life experiences have shaped preservice teachers' development of "attitudes, ideals, and ambitions" (Cole, 1990, p. 203). Furthermore, preservice teachers tend to collect eclectic generalizations and suppositions that encompass their own prejudices (Clark as cited in Schoonmaker, 1998). Martinez (1998) states that teachers enter their teacher education coursework with "prior experiences of schooling and of life, [sic] the preconceptions, values, morals, and beliefs that

student teachers bring to teacher education programmes will profoundly influence their learning" (p. 6).

Personal narratives are both a phenomenon and a methodology (Connelly & Clandinin, 1990). In other words, narrative research is a method to study personal narratives. Brownlee, Purdie, and Boulton-Lewis (2001) believe it is particularly important to do narrative research that considers the nature of the beliefs that preservice teachers bring to teacher education. They maintain that college students' beliefs are intimately linked to what preservice teachers will accomplish in the college classroom and in their own future classrooms. Depending on how they are understood and influenced, personal narratives have the capacity to maintain teachers' practice or transform it in compelling ways (Carter & Doyle, 1996). In emphasizing the importance of understanding the genesis and current understanding of preservice teachers' beliefs, Knowles and Holt-Reynolds (1991) claim that preservice teachers' personal narratives develop into their pedagogical thinking. Therefore, to influence their pedagogy, teacher educators must first influence preservice teachers' personal narratives about education.

In examining the time frames in narratives, Carr (cited in Connelly & Clandinin, 1999) believes that the past holds significance for the experiences of preservice teachers, the present represents the current values of preservice teachers, and the future expresses the intentionality of preservice teachers. Looked at through this sequential lens, it is important to recognize that preservice teachers are continually interpreting the experiences they have had in the past. Unfortunately, preservice teachers may lack the knowledge necessary to

interpret the past in informed ways (Palmer, 1998). As Cole (1994) notes, preservice teachers' conceptualizations are often based on misperceptions. Tacit knowledge becomes explicitly stated in personal narratives (Bullough with Stokes, 1994). Cole (1994) found that when personal narratives were articulated, so were preservice teachers' own preconceptions and their misperceptions. Carter and Doyle (1996) allow that if teacher educators do not examine preservice teachers' personal narratives, then these novice teachers will retain misperceptions and "perpetuate conventional practice," hence traditional didactic teacher-pupil interactions will prevail (p. 129). Palmer notes, "When we deny or disparage the knower's inner life, as is the objectivist's habit, we have no capacity to intuit, let alone inhabit, the inwardness of the known" (p. 106). Thus, recognition of preservice teachers' epistemologies seems key to understanding where they begin their teacher education and the prior knowledge that can serve as a stepping-stone to improve their understanding of education and their teaching practice (Holt-Reynolds, 1992).

The concept of "personal narratives" is currently popular. Narratives are also referred to as teachers' stories or belief systems. An important idea connected with these terms is that the ideas in the stories are often tacit- not explicit- so preservice teachers are not fully conscious of the narratives' meanings or their impact on practice. However, these implicit meanings do emerge and intrude on current and future learning. They are resilient and hence, resistant to change. A related term, epistemology (ways of viewing the world) is also closely related to the ideas of story-telling and personal narratives. Because I am situating my dissertation study in the current literature about teacher narrative, I

will mainly refer to this concept. I do recognize the similarity to other concepts used by scholars related to teachers' belief systems.

The Influences of Prior Knowledge

Preservice teachers draw on their memories of previous teachers, students, and instructional methods they formed as younger students to filter the knowledge posed by teacher educators in their college courses. If past experiences of preservice teachers are left unexamined, the new knowledge may erroneously be misconstrued or misused in terms of what is known as better forms of teacher practice. For example, according to Knowles and Holt-Reynolds (1991), when teacher educators introduce new material, oftentimes:

> Faces of preservice teachers suddenly come to life, they interrupt to tell about an experience in school that they now see as a near-match point they hear us trying to make. The memories they reveal are as apt to be negative examples, counter evidence. (p. 90)

Knowles and Holt-Reynolds allow that preservice "teachers' thinking directly predicts their practice" (p. 95) and not surprisingly, that personal narratives characterize their decision-making. Observations from past experiences form theories of education that dictate preservice teachers' future practice, whether intentional or not (Bulterman-Bos, Terwel, Verloop, & Wardekker, 2002). Therefore, it is critical that robustness and limitations of preservice personal narratives are acknowledged as a "data source" for constructing pedagogy (Holt-Reynolds, 1992, p. 345). If these narratives and the dilemmas of preservice teachers' pasts are left unexamined, preservice teachers tend to revert back to their past experiences as students to solve what look to be

similar problems, which reifies traditional practices in education (Carter & Doyle, 1996).

Giving preservice teachers a platform to acknowledge and comprehend the genesis of their heretofore unexamined personal narratives offers them an avenue to make sense of their wide experiential background within their communities, schools, families, and friends (Knowles & Holt-Reynolds, 1991). Since these experiences continue to build throughout the preservice teachers' lives in teacher education and coursework, Knowles and Holt-Reynolds (1991) suggest offering instructors clues about how to translate discourse into educational practice.

When research of preservice teachers' thinking evolves into looking at teachers' practice, Cole and Knowles (1993) relate the focus shifts to "the reorientation of teacher development research" (p. 476) involving the epistemology of both personal and pragmatic perspectives. These representations occur as personal histories, recollections, and narratives. Without this restructuring of teacher education, preservice teachers may finish their studies without ever focusing on what they believe about learning and teaching (Vacc & Bright, 1999). Therefore, when beginning coursework for preservice teachers, it is important to consider the uniqueness of the individual as well as the group so that teacher educators can respond appropriately to meet the needs of preservice teachers (Richardson, 1996).

Ways Teacher Educators Can Intervene

Knowles and Holt-Reynolds (1991) assertion about preservice teachers interrupting teacher educators with their own experiences, indicates powerful

information about preservice teachers' memories and should use this too as a basis for discussion about whether they believe what is being discussed in college classrooms will "work in real classrooms" (p. 90). Connelly and Clandinin (1990) offer the helpful reminder that teacher educators need to be especially mindful when circumstances involving personal narratives arise with preservice teachers, as it is an opportune time to help them reconstruct their narratives. Because the analysis of school memories is such a robust and rich way to deconstruct teaching and learning, Smith and Latosi-Sawin (2000) believe this approach provides an excellent instructional device for teacher educators.

One purpose of using personal narratives in teacher education is to encourage preservice teachers to reflect on their past experiences and connect them to their learning (Brownlee et. al., 2001; Bullough with Stokes, 1994). Connelly and Clandinin (1990) note, "Education is the construction and reconstruction of personal and social stories" (p. 2). Utilizing analysis of personal narratives is way to encourage this reconstruction of long-held, but counter-productive, beliefs. Schoonmaker (1998) believes that intentionally examining personal narratives in a conscious way assists preservice teachers with this reconstruction. Adding to Schoonmaker's advice, Knowles and Holt-Reynolds (1991) believe the "relationship between classroom practice and personal history" (p. 94) among preservice teachers needs to be thoughtfully examined.

At this juncture, it is important for me to assert that teaching about constructivism (defined later in this chapter) in teacher education is an important way to reshape preservice teachers' narratives and assist in their building a pedagogy conducive to child-centered learning. Hence, beliefs that undermine a

constructivist understanding that preservice teachers bring to their teacher education must be addressed while they are learning appropriate theoretical content because if these initial beliefs are ignored, preservice teachers will continue to hold them and they will interfere with effective child-centered practice (Brownlee & Dart, 1998). The analysis of personal narratives is a method that can be used to link new knowledge to preservice teachers from their prior experiences (Carter & Doyle, 1996). Some scholars recommend ways to get teachers to examine their beliefs. An awareness or examination of preservice teachers' experiences and beliefs can be made explicit through use of reflective writing (Brownlee et. al, 2001). Reflective writing can actively address the negative implications of current beliefs and also can serve as a vehicle for preservice teachers to express their authentic voices (Knowles & Holt-Reynolds, 1991). For example, preservice teachers tend to begin their teacher education with more traditional conventions of teaching, such as relying on didactic practices of providing knowledge even though they know about cooperative grouping of children as an instructional strategy (Lin, Taylor, Gorrell, Hazareesingh, Carlson, Asche, 1999). Lortie (1975) comments that society in general has paid very little attention to the investment in teacher education, believing that "anyone can teach" (p. 62); hence, pedagogical research has been largely ignored. Preservice teachers learn to teach through imitative practice, their intuition, and individual personalities rather than pedagogical principles (Lortie, 1975).

Therefore, teacher educators need to influence preservice teachers' pedagogy. Knowles and Holt-Reynolds (1991) found it critical for teacher

educators to clearly label and deliberately discuss practices modeled in their classrooms. Otherwise, preservice teachers too often attributed specific instructional strategies as bi-products of what was happening in the classroom, instead of understanding the pedagogy occurring (Knowles & Holt-Reynolds, 1991).

Since preservice teachers rely so heavily on their past experiences and memories of practices that we, as teacher educators, do not wish them to continue, it is imperative that another avenue is provided for preservice teachers to view education. Such an avenue is constructivism, which is described in the next section.

Constructivism

Constructivism is a way of learning and knowing about the world; (Gillespie, 2002b, p. 3). "It is an active process of knowledge construction." Gillespie further notes that constructivism:

> As a process of activating our prior knowledge related to a topic we want to learn about...using this information and our thinking processes to monitor, develop, and alter our understanding and integrating our current experiences with our past experiences. (2000b, p. 3)

Several twentieth century prominent educators, including Dewey, Piaget, and Vygotsky have been connected to the idea of constructivism. What follows is a brief synopsis of the connect in beween each and constructivism.

Dewey as a Constructivist

Livingston (2003) makes the case that since Dewey believed knowledge was constructed, this indeed makes Dewey a constructivist. Dewey (1933) himself acknowledges:

> Every living creature, while it is awake, is in constant interaction with its surroundings. It is engaged in a process of give and take, of doing something to objects around it and receiving back something from them- impressions, stimuli. (p. 36)

Brooks and Brooks (1999) also identify Dewey as a constructivist because of the value he placed on children's curiosity and ability to explore as they learn. True to Dewey's beliefs about learning and teaching, each of us connects and synthesizes new ideas and thoughts as we learn. This is especially important for early childhood teachers to understand. Dewey felt that any assumptions teachers made about young children and their lives should be carefully questioned, due to the fact children learn in such concrete ways that build on their previous experiences (see Livingston, 2003).

The philosophy of education of the University of North Dakota's teacher education department, is according to Zidon and Greves (2002, p. 4), "marked by a Deweyan perspective of learner-centered pedagogy and construction of beliefs about the nature of learning," which resonates with constructivist ideals.
It would seem Dewey was the first prominent educator to impart a constructivist approach to education. His child-centered description of education and his belief that learning is constructed in a social environment would situate him in the constructivist camp.

Piaget as a Constructivist

Other researchers label Piaget as one who developed constructivism (Gales & Yan, 2001). Kirova and Ambika (2002, p. 5) echo this assumption when they state that Piaget created the theory of cognitive development that establishes the framework for constructivism, the theory that maintains that children interact and explore within their environment to construct knowledge. In other words, the active learning Piaget acclaimed as crucial for children to learn is synonymous with constructivism (Kirova & Ambika, 2002). Thus Dewey and Piaget laid essential groundwork for constructivism. However, most literature attributes constructivism to Vygotsky, who is discussed in the next section.

Vygotsky and Constructivism

Vygotsky believed children learned when they were presented with constructs they were familiar with and those that were slightly beyond their reach, which he described as "the zone of proximal development" (Kirova & Ambika, 2002, p. 6). Learning occurs as children in social situations discuss what they already know, and as they construct knowledge and conjecture on what they are about to discover. This learning must take place in an interesting, active, naturalistic learning environment where children can be challenged to go beyond their current thinking.

Critical to this learning is children's ability to share and explain what is happening with their own learning. In this way mimicry is avoided and the child's understanding is truly present (Kirova & Ambika, 2002). This explanation takes the child's learning to a deeper level so it can become internalized (Gillespie,

2002b, p. 6). Thus Dewey, Piaget, and Vygotsky formed a solid foundation for constructivism building our educational strategies.

Constructivist Research

Over the last twenty years, many researchers have studied constructivism in an effort to pinpoint findings that can help teacher educators prepare preservice teachers to use constructivist techniques in their own classrooms. This next section details such studies, beginning with teachers' personal meanings while working with children, early childhood findings, elementary school research, and constructivism in teacher education programs.

Discovering Personal Meaning in Mathematics

Hackenberg and Lawler (2002) did research in mathematics teaching and found that when teachers try to help children understand mathematical concepts, the teachers' own mathematical understanding and knowledge impact what and how their students learn. Both teacher and student are learning as constructivists. This process involves each learner having an impact on the other learners, thus deepening each of their levels of personal understanding (Hackenberg & Lawler, p. 11). The result is that students obtain greater confidence in their mathematical ability and knowledge of mathematics, which in turn empowers their learning (Hackenberg & Lawler, p. 11). Thus mathematics begins to have personal meaning to these students and teachers, rather than existing as an isolated subject with worksheets.

Early Childhood Findings

Complementing Hackenberg and Lawler's (2002) work are the findings of Kirova and Bhargava (2002), which indicate that children's mathematical

knowledge while in preschool, kindergarten, first grade, and second grade (commonly thought of as early childhood in terms of education) grows exponentially. As early childhood teachers come to know how these children learn, they realize that mathematics exists in children's worlds in many contexts. Young children process learning through experiences and social learning. It is important for early childhood educators to construct a learning environment that promotes children's interacting and talking with each other as they interact with materials (Kirova & Bhargava).

Rosberg (2003) found the delineation between work and play for children to be artificial; that is, children do not distinguish between what we as adults would consider work and play. Children are fueled by curiosity, creativity, experimentation, and social interaction. She further adds that children have been learning about physics, life sciences, and many mathematical strands such as geometry, algebraic thinking, data and probability, number sense, and measurement through stimulating kindergarten environments for years. As any parent can attest, preschool children experience the same exuberance and joy folding laundry and sweeping the kitchen floor as they do playing with their toys. For this reason, it is important to observe young children at whatever they are doing because learning occurs constantly. Kirova and Bhargava (2002) suggest that informal conversations, engaging activities, and active learning revolving around general principles of mathematics encourage young children's learning; snack time and play time become as important to learning experiences as activities provided in centers do. Therefore, the environments of young children must be set up to capture their interests in order to facilitate learning.

Elementary School Research

Elementary school research also complements findings in early childhood constructivism research. Data collected from thirty-four public schools during the 2001-2002 school year was funded by Washington School Research Center. Abbott and Fouts (2003) report in this empirical study conducted in 669 classrooms among multiple grade levels, the higher the socioeconomic population the school served, the more constructivist learning which they term, "powerful teaching and learning" (p. 5) is implemented. To put this another way, the lower the income level of the families served by the schools surveyed, the more "less intellectually demanding instruction" (Abbotts & Fouts, 2003, p. 5) is employed. Abbott and Fouts found 17 % of classroom lessons observed showed "strong constructivist teaching" (p. 7) whereas 50 % showed little, if any, constructivist teaching. Furthermore, Abbots and Fouts found that constructivist teaching took place within classes that taught integrated instruction and alternative schools rather than traditional schools or classrooms. The ramifications of this are notable. Children in lower income families are exposed to less constructivism curriculum than wealthier children in more affluent schools. Abbott and Fouts claim that the fallout from this disparity is important because children who experience constructivist teaching methods achieve 3-4 % more academic success than children learning in more didactic ways. Therefore, it seems logical that if equity in education is to be achieved and the so called "achievement gap" reduced, one method to accomplish this is through constructivist learning for all children, no matter which income bracket they fall

under. "Learning as construction, rather than instruction" (Imel, 2003, p. 4) seems to sum up this philosophy.

TIMSS

Data from a well-known and highly respected study known as the Third International Mathematics and Science Study (TIMSS) were analyzed by Gales and Yan (2001). Although the data they report are limited to education in the United States, they represent 527 teachers and 10,970 students and compares constructivism to more traditional mathematics education.

According to the Gales and Yan study, several characteristics are reflected in constructivist teachers. First, the teachers' own philosophy of mathematics embody three key elements: creative thinking, an understanding of the real-world use of mathematics, and the ability to justify reasons supporting solutions. Second, what teachers believe about mathematics is important to constructivist practice. Teachers in the study who followed a constructivist path found they were able to explain, structure, and guide situations occurring in real life for their students. Additionally, these teachers could present situations and problems in a more formal method using mathematics. The third finding Gales and Yan report represents the instructional practices of constructivist teachers as they relate to student work and thinking. Content is covered in such a way that students' interest is piqued and they have available the multiple solutions possible in constructivism. Students are responsible for deciding how they will approach these situations. Constructivist teachers plan for students to work together cooperatively in pairs or small groups as well as independently on these projects because of the complicated thinking required to solve the problems. One method

of recording this process is to keep a log of the students' findings, as these projects are long-term and not readily completed. This also allows teachers to document the learning process. In addition, content is covered by a variety of methods especially important to constructivism. Students show mathematical relationships through many visual means such as equations, graphs, charts, tables, and drawings. Thus creativity, real problem solving, and multiple instructional strategies are continually used in the constructivist classroom as seen by the TIMSS study.

Colleges and Constructivism

Mc Clure, Johnson, and Jackson (2003) report in their study of colleges that constructivism is making its way into college classrooms in a variety of disciplines. They cite these reasons for the change: first constructivism insures the use of 'best practices' where common practices from elementary school matriculate to middle school, high school, and finally the college level particularly with regard to students' learning styles. These incorporate more hands-on learning, inquiry, cooperative groups, problem solving, projects, and real-world learning geared to a wide variety of learners (Zemelman, Daniels, & Hyde, 1998). Second, the Mc Clure et. al. study (at Saint Mary's University in Minnesota) utilizes standards designed by national councils in mathematics, social studies, English, and science teachers that embrace and support constructivist learning for optimum student engagement. Education courses at universities advocate constructivism as seen in the following two studies.

A study done at Central Missouri State University found constructivist teachers encourage students to think for themselves and learn more

independently (Aldrich & Thomas, 2002). This, in turn, cultivates deeper thinking from students as teachers challenge them with open-ended discussions. These discussions enable students to explain their thinking by using real-world experiences, which build constructivist pedagogy in preservice teachers. They emphasize that because of the "back to basics" momentum and people's misunderstanding of constructivism as a "soft" curriculum with too much student empowerment, it is especially important that constructivism is truly understood as a strong pedagogical tool.

Researchers at Wright State University in Ohio conducted a study of constructivism connecting science to education for preservice teachers (Cole, Ryan, & James, 2003). Again, this study defined 'best practice' as a way of learning science through a constructivist method with an inquiry approach. These researchers found that many elementary preservice teachers had not learned through investigation or inquiry themselves as children. Without this constructivist intervention preservice teachers cannot be expected to teach using a method in which they have never participated, and thus the critical importance of constructivist teacher education is cemented.

Constructivism in Teacher Education

As preservice teachers begin to craft their pedagogy, it is imperative for them to have many first-hand encounters with constructivist learning, both as learners and as planners because these experiences influence their thinking and actions in the classroom (Hart, 2002). Considering preservice teachers' extensive past experiences in classrooms where they typically have not participated in constructivist learning, Hart further emphasizes the importance of constructivist

experiences. Knowles and Holt-Reynolds (1991) underscore the need for preservice teacher education to develop alternatives and new experiences upon which future practitioners can hone their craft. Reorienting teacher education, according to Knowles and Holt-Reynolds (1991) is a linchpin that must be:

> Thoughtfully structured to optimize the chance they will encounter the principles we want them to incorporate into their future practice, not as principles passed on orally by 'experts' but as principles they discover experientially from student perspectives. (p. 103)

Therefore, teacher educators must provide preservice teachers with constructivist learning experiences to model meaningful learning. "Issues of process rather than content" exemplify Knowles' and Holt-Reynolds' (1991, p. 102) method of helping preservice teachers construct their pedagogy. Teacher educators' roles do not seem to decide what preservice teachers should know, "so much as struggle with questions about how they come to know" (Knowles & Holt-Reynolds, 1991, p. 102). Martinez (1998) elaborates, "Programmes should insist upon small group discussion and debate of the intellectual, emotional, political, and ethical dilemmas that construct education" (p. 7). Additionally Zazkis (1999) calls for teacher educators to implement activities that bring to the forefront preservice teachers' "emotional and intellectual dissonance...and the possible benefits for teaching in facing this dissonance and finding equilibrium" (p. 11). Preservice teachers need the actual experience and tension involved in building their own pedagogy with constructivism, and teacher educators must supply this environment for learning.

Lastly, constructivism cannot be ignored by teacher educators because it is their responsibility to model and showcase this powerful way of learning to preservice teachers who may not have experienced it in their own educations (Aldrich & Thomas, 2002). Nowhere is this more apparent today than in the disconnect between teacher educators and the high-stakes accountability movement the federal government is using to drive curriculum. While teacher educators are modeling many instructional strategies to serve all learners, including high expectations, scaffolding, in-depth learning with critical thinking, and knowing the students well (Ladson-Billings, 1995, as cited in Van de Walle, 2004), Hillard (2004) contends that urban schools are being inundated by "large-scale standardized commercial programs...minimum competency school reform packages" (p. 29) which produce the opposite result - low level learning. Delpit (2004) adds that teachers forced to use prepackaged, scripted, lock-step programs which reinforce rote memorization may see some gains in young children, but these are quickly overridden when critical thinking is needed for further learning in more advanced grade levels. Delpit believes that the misguided focus on scripted "basic skills" curriculum in actuality slows the education in which poor children are learning because critical thinking is not taught. Therefore, children may appear to show learning in the primary years, but this is totally offset in later grades. Delpit further believes that in order to motivate children, a dynamic must exist in which teachers capture children's attention with interesting and creative connections to the children's lives so that they can master critical thinking and deep problem-solving. If we do not teach preservice teachers about these consequences and show them the importance of

in-depth instruction and learning, then the achievement gap will continue between lower socio-economic students and higher socio-economic students (Delpit, 2004). Katz (2004) echoes these sentiments with young children, citing long-term benefits are not achieved when scripted curricula are used to educate children. "Real learning is much bigger than anything that can be packaged and prescribed" (Hansen, 2004, p. 115), hence, it is essential for teacher educators to engage preservice teachers in problem-solving, discourse, and pedagogy in order that they will know how to think and make sense of the best methods to use in their own classrooms with their own individual students from year to year (Hansen, 2004).

Dewey (1933) perhaps sums it up best, " All genuine education *terminates* in discipline, but it *proceeds* by engaging the mind in activities worthwhile for their own sake" (p. 87). Many conflicting thoughts, complex ideas, ambiguities, tensions, and conversations operate within preservice teachers; it is our responsibility as teacher educators to allow these to surface (Palmer, 1998).

Relationship Between Constructivism and Culturally Relevant Pedagogy

Related to ideas of epistemology and intuitive knowledge are ideas about teaching K-12 students in culturally relevant ways where " we must have schools and teachers that seek to learn about and respect the culture, communities, and the intellectual and historical legacies of their students" (Delpit, 2004, p. 71). Hilliard (2004) comments that the inequalities of services between "children of privilege and those provided to children who live in the most challenging circumstances" (p. 27) are not readily apparent. Thus teachers need to be mindful

to connect their pedagogy and curriculum with students' unique backgrounds and learning styles.

In addition to incorporating preservice teachers' personalized accounts of the world as a teacher education approach, teacher educators must model to preservice teachers the "very principles that we are teaching them to employ" (Holt-Reynolds, 1992, p. 347) especially regarding diversity and multicultural education. Holt-Reynolds goes on to note the significance of developing methods in which preservice teachers can express their beliefs through their personal narratives. Critical conversations about these personal narratives should be encouraged so teacher educators can understand preservice teachers' beliefs and open the door to new and changed perceptions (Holt-Reynolds, 1992). Again, this is especially important in the context of diverse student populations. In turn, when they begin to teach, teachers educated through analyses of personal narratives will know how to use such techniques in their own classrooms.

Many universities are following constructivist curriculum, yet key changes are necessary for preservice teachers to actually experience professors' modeling constructivist pedagogy (Cole et. al., 2003). Several specific instructional strategies necessary to implement constructivism are described in the next section.

Common Components of Constructivism

Dangel and Guyton (2003) conducted complete surveys of both literature concerning studies within teacher education that promote constructivism from 1990-2003 and thirty-five studies from constructivist classrooms. The elements that emerged from this meta-analysis were a learner-centered environment,

cohort grouping, reflection, extensive field experiences, collaborative learning, relevant problem solving, authentic assessment, and action research. Each will be discussed on its own merits as a culmination of Dangel and Guyton's (2003) extensive constructivist research findings.

Learner-Centered Environment

Teacher educators realize that preservice teachers learn more deeply when their interests are taken into consideration. Providing a learner-centered environment in which preservice teachers take ownership for their learning is critical (Dangel & Guyton, 2003). This increases the responsibility of teacher educators to extract prior knowledge from preservice teachers so that learning can take place in a more meaningful fashion. Shifting from the traditional role of teacher to that of facilitator becomes imperative for teacher educators. Additionally, Dangel and Guyton believe the obligation of teacher educators is providing a safe climate where preservice teachers feel comfortable taking risks, discussing opinions, and working collaboratively. Thus, any focus that establishes a learning-centered environment for preservice teachers enables meaningful learning to take place, something preservice teachers must experience and then learn to develop as teachers.

Cohort Groups

One feature of a learner-centered environment is based on the premise that learning is a social process, where small groups can discuss issues and learn together. Dangel and Guyton's (2003) survey of literature found that rather than supporting preservice teachers' taking classes with a larger student population, constructivist theory contends preservice teachers should begin their teacher

education together in smaller groups or clusters and continue taking the same curriculum classes within this cohort. Courses are laid out in a particular order that builds a shared knowledge base for preservice teachers. Preservice teachers are able to scaffold each other's learning in this shared coursework because they have formed a cohesive learning community in which they feel more comfortable reflecting, collaborating, and problem-solving. Cohort groups in a learner-centered environment are the first constructs in building a constructivist environment for preservice teachers to begin to learn their craft.

Reflection

Labeled as the "glue" which holds teacher education together, reflection plays a critical role in constructivist teacher education (Dangel & Guyton, 2003). Preservice teachers write about their experiences, both prior and present, including those in teacher education and field experiences. Readings from texts and thoughts or concerns they have pertaining to education are relevant topics for reflection. This reflective process enables learners, Dangel and Guyton posit, to integrate new and perhaps disparate experiences with prior knowledge and beliefs that preservice teachers bring into their coursework. In turn, teacher educators can respond individually to preservice teachers' thoughts on a more personal level and address individual concerns. Additionally, authentic assessment (which will be addressed later) is impossible without the reflective process that preservice teachers bring into their teacher education, again reinforcing the cohesive aspect of reflection. Furthermore, reflection is seen as a stepping-stone for preservice teachers' professional development, beginning a process that enables all teachers to continue learning from their practice. Because

learning to think critically and examine prior beliefs about education is part of reflection, reflection is used as a basic tool to construct pedagogy for preservice teachers.

Extensive Field Experiences

In conjunction with teacher education courses in preparing preservice teachers for their profession, field experiences are considered imperative for constructivist learning (Dangel & Guyton, 2003). A number of teacher education programs place preservice teachers in field placements each semester to broaden their learning horizons. These experiences build on previous experiences and culminate with student teaching, enabling preservice teachers the opportunity to have many scaffolded or layered levels of learning experiences with support from teacher educators and cooperating teachers. Naturally, the more field experiences preservice teachers participate in, the more diverse teaching styles they witness; this enables them to build their construction of pedagogy. Authentic experiences in the field aid preservice teachers in creating new learning.

Collaborative Learning

Preservice teachers participate in projects with each other to collaborate and share in the learning process. In small groups this interaction and discussion enables them to learn about education differently (Dangel & Guyton, 2003). These small groups provide a forum where preservice teachers can try on ideas and juxtapose their thoughts within a safe network of their peers. Differing perspectives, as well as both the roles of listener and speaker, enhance new skills for preservice teachers that will be invaluable in their educational careers. Critiquing several instructional strategies and learning models allow preservice

teachers the ability to look beyond what experiences they have had as students and heretofore accepted as legitimate practice (Schoonmaker, 1998). Dangel and Guyton found that respecting each other and each other's different ideas, opinions, experiences, and knowledge will help tune preservice teachers into the many ways children express themselves while learning. Accordingly, teacher educators design problems for preservice teachers to solve collaboratively as a method to strengthen their knowledge and understanding of education.

Relevant Problem-Solving

Challenging preservice teachers with problem-solving activities allow preservice teachers to construct new ways of learning (Hart, 2002). Dangel and Guyton (2003) found that teacher educators are responsible for setting up contextually relevant problems and situations for preservice teachers to explore and settle with each other. A key aspect of these problems is their importance and connection to the real world that preservice teachers are experiencing. Without this connection these problems are seen as meaningless by preservice teachers. Open-ended problems and situations requiring complex thoughts and multiple solutions are essential to model for preservice teachers so that they might understand the importance of such problem-solving in their own classrooms. When creating relevant problems and situations for preservice teachers, it is important to remember to insure that they wrestle with concepts and ideas. Learning- true deep, meaningful learning causes disequilibrium which is desirable for preservice teachers to experience while in teacher education, so that we, as teacher educators can scaffold their process. Accordingly, this struggle will allow preservice teachers to restructure their own knowledge base, which is the

key to constructivism. This problem-solving should allow preservice teachers hands-on experiences that create disequilibrium with their own learning. Hart (2002) and Holt-Reynolds (1992) believe that stimulating conceptual examination during problem-solving enables preservice teachers to reflect on what they previously knew and allows them to construct new meanings within their pedagogy. Holt-Reynolds (1992) further continues that when preservice teachers begin practicing their craft, if all does not go as expected, they rely on a-theoretical and reactive ways of teaching, and Knowles and Holt-Reynolds (1991) assert that the importance of problem-solving in teacher education is shown.

Dangel and Guyton (2003) found that holistic conceptions and contextual knowledge should anchor curriculum for preservice teachers so that they may see the interconnectedness and value of learning globally. Relevant problem-solving is something we, as teacher educators, want to ingrain and model for preservice teachers, in order that they can bring this practice into their classrooms.

Authentic Assessment

A critical component of constructivist teacher education is the use of authentic assessment (Dangel & Gutyon, 2003). When constructivism is utilized as the cornerstone of teacher education, assessment must take on a different form, instead of the traditional end of semester projects and tests. Due to the use of collaborative learning, extensive field experiences, and relevant problem-solving, portfolios are one option. "The process of documenting one's growth over time," Dangel and Guyton (p. 10) found to be a key element in teacher education. Reflections written by preservice teachers during the semester provide authentic assessment. Additionally, teacher educators' carefully written comments serve as

feedback from which preservice teachers can learn in a truly constructivist manner.

Action Research

The final component that Dangel and Guyton's (2003) extensive survey of research uncovered is the importance of action research. Preservice teachers accumulate numerous experiences and participate in discourse throughout their education. Utilizing information gathered from several sources and compiling it into useful data would be a logical outcome for teacher educators and preservice teachers, and this is the foundation of action research. As preservice teachers begin to base decisions on these data, they initiate a practice commonly called action research. Action research is a culmination of preservice teachers' reflections about education in a learner-centered environment utilizing collaborative learning, relevant problem-solving, and prior experiences both in the field and in teacher education and serves to further their understanding of the educational process.

Summary of Review of Literature

Our pasts influence all of us, and nowhere is this more apparent than in teacher education. Given that traditional-aged preservice teachers have spent the majority of their lives in classrooms, their ideas of school life are firmly entrenched (Lortie, 1975). One method for preservice teachers to reveal their own past histories is through personal narratives (Carter & Doyle, 1996). These personal narratives allow past experiences to come to light so preservice teachers can acknowledge them (Bullough with Stokes, 1994; Cole, 1990; Holt-Reynolds,

1992; Knowles & Holt-Reynolds, 1991) and find their authentic voices (Smith & Lotosi-Sawin, 2000).

Additionally, as these personal narratives are acknowledged, they can also be reevaluated and examined through a more critical perspective (Woods, 1987) rather than in an imaginary context where they may be misconstrued (Holt-Reynolds, 1992). These preconceptions preservice teachers bring to teacher education are important to address so initial beliefs (Brownlee & Dart, 1998) and tacit knowledge can be examined (Bullough with Stokes, 1994). Preservice teachers need to be mindful of the population they serve, connecting their pedagogy and curriculum with student's unique backgrounds and learning styles (Delpit, 2004). Likewise, teacher educators should be mindful of preservice teachers and their divergent backgrounds to insure their needs are met (Richardson, 1996).

Since preservice teachers bring more traditional models of education with them into teacher education, it is critical for teacher educators to label these didactic practices and model alternative ways to teach (Knowles & Holt-Reynolds, 1991). One intervention method teacher educators can use is the strategies employed by constructivism where preservice teachers are interactive and engaged with their own learning (Jarrett, 1998). Preservice teachers need to experience learning in this manner to become aware of its benefits (Knowles & Holt-Reynolds, 1991). This in turn will allow preservice teachers the opportunity to plan how they can use constructivism in their own classrooms (Hart, 2002).

Initiators of Constructivism

Some researchers attribute the emergence of constructivism to Dewey over a century ago. Because of his child-centered approach, Dewey believed children learned from their environments in a naturalistic setting. This was far different from the rote learning occurring at the time that more traditional models of education promoted. Therefore, Dewey's theories seem to fall under the concept of constructivism because they were built on personal experience and learning (Livingston, 2003).

Others attribute constructivism to Piaget based on his beliefs that children were active learners, interacting with their environment cognitively (Kirova & Ambika, 2002). Finally, Vygotsky is also credited with constructivism because of his "zone of proximal development" theory (Kirova & Ambika), where children construct meaning from situations that are just slightly beyond their current knowledge and build on this. These conjectures of prominent educators and psychologists underscore the importance constructivism plays in the field of education today, and this continues to be a widely studied area in current research.

Multiple Constructivist Studies

Teachers' own pedagogical beliefs are critical to implementing constructivism in their classrooms (Carter & Doyle, 1996; Dangel & Guyton, 2003; Holt-Reynolds, 1992; Knowles & Holt-Reynolds, 1991). Dangel and Guyton found that constructivist studies reviewed ranged from early childhood through college-aged students. Additionally the main focus of these constructivist studies were mostly in the disciplines of mathematics and science. Regardless of the ages

of the students, constructivist practices strengthened their understanding of both science and mathematics.This solidifies the concept that preservice teachers must have constructivism in their own education to pass it along to their students (Aldrich & Thomas, 2002; Cole, Ryan, & James, 2003; Knowles & Holt-Reynolds, 1991; Mc Clure, Johnson, & Jackson, 2003). Therefore, teacher education must implement constructivism for preservice teachers.

Specific Practices of Constructivism

Eight commonly found practices were extracted out of the exhaustive survey of literature that Dangel and Guyton (2003) researched from 1990 – 2003 and thirty-five studies of constructivism. These protocols consist of learner-centered environment where preservice teachers take ownership of their learning; cohort groups where preservice teachers learn and work together in their coursework; reflection, the "glue" connecting this new learning; extensive field experiences where preservice teachers have ample time to learn in real classroom settings; collaborative learning where preservice teachers explore concepts together; relevant problem-solving where preservice teachers are given real life problems to work out and explain; authentic assessment where preservice teachers examine their own learning and growth; and finally, action research where preservice teachers begin to make decisions based on the evidence they have gathered throughout their learning experiences.

Purpose for Research

The purpose for this research study is to document preservice teachers' journeys into teacher education by revealing the personal narratives they bring into their methods' cohort, how these personal narratives affect preservice

teachers and their practice, and examining the thought processes preservice teachers experience as they develop their construction of pedagogy through constructivist course work and their field experiences.

Research Questions

My research questions are: What are preservice teachers' personal narratives and how do they influence their perspectives of teacher education? What thought processes do preservice teachers go through as they experience constructivist learning in mathematics? How does this impact them as they begin to build their individual pedagogies? What thought processes do preservice teachers go through as they spend a day a week in a field experience setting? How does this impact them as they begin to build their individual pedagogies? How can we, as teacher educators, use preservice teachers' personal narratives and constructivism to link preservice teachers' theory to the practice their craft?

Chapter 3

Research Methods

"Teachers' voices need to be heard" (S. Nieto, personal communication, March 30, 2004). I would add to Nieto's assertion that among the voices needing to be heard are those of preservice teachers. Qualitative methodology involving reflective writing – as I use in this study- allows the authentic voices of preservice teacher participants to emerge in ways similar to those in Chatterji's study (2002). In this study I provide rich descriptions and summaries of preservice teacher narratives and experiences. These provide a venue for their voices to emerge as I follow their journey through constructivist teacher education methods courses and field experiences in school.

One purpose of this study is to expose and examine the past educational experiences preservice teachers have had and how they have translated these experiences into personal narratives. Knowles and Holt-Reynolds (1991) found, these personal narratives, in turn, are brought into teacher education courses as preservice teachers begin to learn and study specific domain knowledge and methodology. The particular domain I wish to pursue is the personal narratives preservice teachers bring into teacher education from their prior mathematics learning experiences. I am interested in how these prior experiences impact preservice teachers' approach to learning mathematics in teacher education. Second, I wanted to follow preservice teachers' learning processes during teacher education, focusing on two aspects: what occurs in field experiences and what happens in their methods coursework in the teacher education classroom. Both of these are examined through reflective writing. I am interested in the thoughts

and analyses preservice teachers carry through to process their learning and begin to shift their belief system as they build their own pedagogy for student teaching.

The research design used in this study is divided into the following major sections: description of the setting and participants, data collection methods, analysis of preservice teachers' reflections, and trustworthiness of data.

Setting and Participants

I conducted my research at a large tier one university in the Midwest. The participants in my study were students in my mathematics methods course. Thirty Caucasian females between the ages of 20 and 22 years old completing their junior year in education were members of my class. These were Early Childhood majors, primarily in-state students, which met weekly for a two and one half hour session. Given the length of this class, it was a perfect opportunity for preservice teachers to participate in a constructivist learning environment. It also served instructionally as a time for preservice teachers to witness the flow and modeling of many activities with the accompanying transitions between activities that occur in a constructivist classroom.

Activities in Math Lab

Creating a learner-centered environment is essential to establishing constructivism in the classroom (Dangel & Guyton, 2003). Since I wanted preservice teachers to know mathematics in an experiential manner, I created a learner-centered environment. This meant rescheduling our classes so they could be in the math lab. This lab has large tables, which are conducive to group work, and is outfitted with every conceivable manuipulative that is needed to

supplement the learning of mathematics. These include: pattern blocks, colored counters, dice, unifix cubes, snap cubes, wooden three dimensional blocks, fraction bars, color tiles, Cuisenaire rods, geoboards and rubber bands, scales, measurement tools for both volume and length, base 10 blocks, fraction circles, calculators, and abacuses.

Large white magnetic boards covered the front of the lab: an overhead projector with translucent overhead manipulatives and video equipment were standard equipment in the math lab. Multiple copies of K-12 math textbooks from various publishers lined the walls, and a complete set of videos depicting best math practices were situated in this lab. All I needed to supply was a large roll of butcher paper, colored markers, post-its, and plenty of energy.

To engage preservice teachers during our first class in the math lab, I laid out a wide variety of manipulatives on each table, so that when they came in and were seated waiting for class to begin, they could experiment and play. Also waiting for them was a graph, which consisted of a large piece of butcher paper with each month written on it. Each preservice teacher wrote her name on a post-it note and placed it in the monthly column labeling her birthday.

Classes continued to be participatory and structured differently for several reasons, including my desire to model constructivist teaching and to keep engagement high. Variety and active participation were essential to maintaining this engagement because we met as the last class at the end of the school week, a situation which simulated the conditions under which preservice teachers will eventually encounter as they work with their own students during full school days.

Cohort Groups

The teacher education program at the university embraced cohort grouping. The early childhood major juniors I taught had been together for a year and a half in other blocks of courses. In their junior year of methods courses, they were in Block III, together in classes also. During this semester, all of the juniors took the following methods courses: math, literacy, science, social studies, curriculum and instruction, and early intervention. Five of these six classes met once per week for two and one-half hour time blocks. These were the final formal courses preservice teachers would take as Block IV, their senior year in Early Childhood was an entire year of student teaching in three different placements. Thus, the cohort grouping which Dangel and Guyton (2003) found in their review of literature to be an integral part of constructivism was practiced within this program.

Field Experience Placement

Preservice teachers also spent one day a week in a field experience placement. The field placement was a Kindergarten through Grade Two (K-2) building located within 20 miles of the university in a rural community. Eighty-three Caucasian children attended this school, and each child was on the free lunch program. The thirty preservice teachers were divided among ten classrooms in this new K-2 building: four kindergarten classrooms in which eight preservice teachers served, five first grades in which twenty preservice teachers served, one second grade where two preservice teachers were placed, and one remedial reading room where one preservice teacher spent one half of her time.

Preservice teachers spent a total of ten days in their field placements during the semester.

I knew in advance that the adopted program was Saxon Math, a complete pre-packaged, pre-scripted, highly rigid learning program where teachers read verbatim the script to their students while they fill in the front of a black and white worksheet daily. The back is completed at home for homework and brought back to school to be corrected the next day. The kindergarten program is scripted but entails less paper work than the later grades.

Administering Consent Forms

After obtaining permission from the Institutional Review Board (IRB) to conduct my research, (a copy is located in Appendix E), another professor came into my class and presented information about my study to the preservice teachers without my being present. Preservice teachers were given time to ask questions and asked to sign the consent forms regarding whether or not they wished to participate in the study. The professor collected the forms, put them in an envelope, and kept them in one of his files. After I posted grades for my students, the professor gave me the envelope of student consent forms. All preservice teachers consented to be in this study.

Data Collection Methods

I chose to use reflective writing as the method for my data collection. According to Mewborn (1999), Dewey began using reflective thinking early in the twentieth century, believing teacher education's primary responsibility was to enable preservice teachers to ponder their practice with curious minds, not just proficient skills. As a teacher, my prior experiences using reflective writing

allowed me to see the benefits firsthand of this instructional strategy as a method to clarify my own pedagogy while processing the classroom environment and situations that arose. Commonly used at the university, reflection is an expected component of preservice teacher education. Therefore, I have implemented reflective writing in each class I have taught. Reflective writing functioned both as instructional and assessment techniques and enabled me to gain insights into the preservice teachers. As Hart (2002) reports, reflection enables preservice teachers to create "a deeper assimilation of knowledge" (p.4). This coincides with my experiences, thus prompting me to use reflective writing as a data source for this study.

Two reflections were assigned each week in my mathematics methods course. One was given in class as either a response to a reading assignment or as a processing tool to reflect on what was done that particular day in the methods class. The second reflection was an out-of-class assignment relating to past experiences, prior knowledge, personal narratives, or current field experiences in which preservice teachers were involved. A total of twenty-five reflections were assigned during the spring semester. After collecting these reflections, I photocopied them and stored the photocopies until after grades were posted. Points were awarded for writing reflections, and full points were given for completing the out-of-class reflections as specified. In-class reflections were generally given full points except when preservice teachers had not read the required material. Nonetheless, data were not analyzed until after grades were posted, so the interests of preservice teachers were not compromised.

Reading individual preservice teachers' written reflections allowed me to understand their thought processes in a deeper context. These thought processes were not as readily apparent in the classroom because of the size of our class and time constraints. However, I was able to personally address specific preservice teachers' experiences and thoughts with feedback in their reflections. At times preservice teachers brought comments and questions from their reflective writing into the teacher education class, and other times preservice teachers would ask me questions privately. Therefore, reflective writing was used as weekly assignments to document preservice teachers' growth and as a method for me to individualize instruction and feedback for each preservice teacher. Preservice teachers were encouraged to honestly reflect and use critical thinking while writing their reflections; evaluative points were not reduced when preservice teachers disagreed or reacted negatively to a class session. Each out-of-class reflection asked an initial question followed by more probing questions in order to search for preservice teachers to explain their thoughts and reasons for their beliefs. The typical length of these reflections was between one and two pages. In-class reflections were more spontaneous, often centering around what we did that day in math lab, newly acquired skills from class, opinions of short videos, and responses to pedagogical quotations from preservice teachers' readings.

Reflective Writing Topics

For the initial reflection I wanted to access questions preservice teachers were bringing into teacher education, both in mathematics education specifically and education in general. Preservice teachers were to write 10 questions each: one-half of the questions concerned what they wanted to learn about math; the

other five questions were open-ended topics they wanted to learn about during the semester. As a final reflection, preservice teachers responded to their own initial questions. Additional topics for reflection were determined weekly as I reflected on areas of knowledge brought up in math lab, dissonance in areas of discussion, and issues under the general category of teacher education and constructivism that needed more exploration. Personal narratives, field experiences, text readings, and standards comprised the other reflection topics. Table One represents the reflection topics and frequency with which each was written about.

Table One: Reflection Topics and Frequency of Writings

Topic Written About	Number of Times	Percentage
Text Readings	6	24%
Personal Narratives	2	8%
Initial/Final Questions	2	8%
Standards	3	12%
Teacher Education & Constructivism	7	28%
Field Experiences	4	16%
Open-ended	1	4%
Total	25	100%

Analysis of Preservice Teachers' Reflections

Initially, I planned to analyze the data by reading one entire semester's worth of reflections by one preservice teacher, then go on to read another complete set of data written by a different preservice teacher. I separated the

reflections from their original stacks into 30 stacks of approximately 25 reflections each. This turned out to be a time-consuming process, but at first I believed reading each preservice teachers' reflections from the beginning of the semester to the end of the semester would give me a better picture of each preservice teachers' learning and growth. When I read through one preservice teacher's entire reflections, I felt that I had lost the context which reading several preservice teachers' viewpoints at one time on the same subject had previously revealed.

I reread the journal I had written during the semester of my own reflections of the course, to see if it would help me clarify a method to organize my data. Because I had read the reflections of the entire class about one topic at a time during the semester and seemed to obtain voluminous information about preservice teachers, I realized I was better prepared to make comparisons and meaningful constructs when I regrouped the reflections into their original order, categorized by date and subject written rather than classifying types in terms of one complete preservice teacher's individual reflections. As I reviewed the topics assigned for reflective writing, I began to group the reflections into broad categories as a way to organize my data. These categories initially were: Personal Narratives, Field Experiences, and Teacher Education with Constructivism in which the next three chapters are designated.

Reading each of the preservice teachers' comments and reactions to one topic at a time gave me a clearer picture of what preservice teachers were thinking and how they were processing their learning. Additionally, a range of development among preservice teachers was more easily recognized when

reading their reflections as parts of a whole class writing about one topic, which provided me with a context to analyze the data. For example, if one preservice teacher mentioned a certain way of viewing a subject we were discussing while another preservice teacher expressed the same thought, yet a third preservice teacher believed something totally different, it gave me a better view of how the entire class was learning. It allowed me to discover what one preservice teacher was seeing individually, and then compare it contextually to the views of the rest of the class. Similarities were expressed differently, yet the message could be picked out and corroborated by other preservice teachers in their writing.

I organized the topics in clusters that I believed would enable me to categorize and capture the essence of preservice teachers writing (as seen in Table One). Reading through the five separate reflections of field experience data, I highlighted and took notes of major ideas preservice teachers were disclosing in their writing at different times during the semester. I continued to do this with each category from Table One. Although I was finding many thoughts and identifying learning processes from preservice teachers, I needed a better way to organize the data in terms of writing my chapters. Initially, I decided to combine the theories of teacher-education constructivism with preservice teachers' field experiences in chronological order because the two occurred simultaneously during the semester. However, this proved to be unwieldy both in terms of readability and organization. Personal Narratives clearly became a chapter unto itself. Combining teacher education and field experiences was confusing and disorganized. Therefore, I decided to place Field Experiences with Preservice Teachers in Chapter Five and follow with Constructivism in Teacher Education in

Chapter Six. Although the order in which the reflections were written alternates between Constructivism in Teacher Education and Field Experiences with Preservice Teachers, for the sake of organization and clarity, they are divided for the reader into two separate chapters. I decided Field Experiences should follow Personal Narratives and precede Teacher Education and Constructivism to give the reader more context to situate both areas. Had I followed Personal Narratives with Teacher Education and Constructivism, and finished with Field Experiences with Preservice Teachers, the reader would not have seen the dichotomy between the field experiences and teacher education as clearly.

Therefore, Chapter Four describes preservice teachers' personal narratives, Chapter Five is devoted to preservice teachers' field experiences, Chapter Six discusses teacher education and constructivism, and Chapter Seven offers conclusions to the study.

Rethinking the Importance of Reflection Categories

Initially, I had some preconceived notions about which reflections would provide useful data, but upon rereading the reflections, different thoughts surfaced. Some reflections that I believed would be important and provide clarity ultimately did not. For example, I had chosen six reflection topics that were short direct quotes from the text. These were informative to me and also served as an assessment about the content preservice teachers read and comprehended. However, these topics did not yield data useful to this study. Similarly, three reflections about standards revealed some useful information, but not as much as I had hoped. However, reflections written about field experiences, teacher education and constructivism, personal narratives, and initial and final questions

proved to be very insightful and filled with much self-knowledge about preservice teachers' own learning. They clearly articulated events in their field experiences, posing deep questions and elaborate descriptions about what they were seeing in the classroom. Preservice teachers connected their learning in the math lab to prior experiences and distinctly articulated their thought processes about how they had been taught previously as compared to what they had learned in teacher education.

Trustworthiness of Data and Constructivist Research

One aspect of a researcher's trustworthiness is lack of research bias (Merriam, 2001). As described in Chapter One, I am a constructivist both in my learning and my mode of teaching whether I am working with children or adults. Therefore, as I filtered preservice teachers' reflections through my background and experiences, I realized some ethical problems are incurred. I am aware that my tolerance for traditional educational instructional strategies, including skills-based didactics, is extremely limited. This was true even though traditional strategies had dominated much of my education until I was able to choose courses according to my own interests. Constructivism represents my enduring learning experiences, my favored method of learning, and both the instructional and theoretical framework I rely on while teaching. My constructivist beliefs and background are compatible with the type of interpretive research this study represents.

The goal of research is to produce genuine and reliable knowledge in an honest manner for professionals to use in their fields as they interact with people (Merriam, 2001). My intention is to present and interpret preservice teachers'

construct of reality and understanding in their learning and teaching within teacher education. This qualitative research methodology occurred when I watched preservice teachers build on their past experiences while they constructed new meanings. Additional experiences provided in constructivist teacher education were fostered, and I watched as the "light bulb turned on" for preservice teachers. Preservice teachers' reactions and constructions were communicated by the surprise they showed in class, excitement in their actions, and verbal and written comments as they understood math conceptually, often for the first time.

As preservice teachers wrote their reflections in class weekly, the intention was to capture their immediate reactions to and spontaneous comprehension of educational philosophy. Reflections written outside of class were designed in order that preservice teachers could ponder ideas rising to the surface and have some time to synthesize these thoughts before they wrote about them. My data are based on weekly reflections written by preservice teachers over the course of the semester. One purpose of these reflections was to enable me to keep a pulse on changes in their understanding and beliefs about education. Merriam (2001) calls this "long-term observation...gathering data over a period of time in order to increase the validity of the findings" (p. 204). This also contributes to what Merriam (2001) terms an audit trail, documenting the collection of data and allowing others to follow our process. My observation continued an entire semester, thus satisfying the long-term aspect of data collection. Because of the sheer volume of data collected from my study, 30 preservice teachers writing twenty-five reflections yielded over 750 pieces of data to comprise my audit trail.

Interpreting and Illuminating Preservice Teachers' Discourse

Although exact replication is not possible for qualitative research, Merriam (2001) suggests this in no way undermines what was discovered because many interpretations exist within the same data. My study existed during one semester, with many sets of human beings; preservice teachers, field experience teachers, and classrooms of children. Many circumstances and situations arose during the semester within several contexts, methods cohort classrooms, and field experience classrooms. Different observations and reflections are elicited from preservice teachers in several contexts. These contexts represent knowledge and reality within each person's construction of learning, which can be used to gain useful interpretations of preservice teachers' journey to become teachers.

Additionally, Merriam (2001) posits the premise of research is to produce genuine and reliable knowledge in an honest manner that rings true for professionals to use in their fields as they interact with people. The scope of my study offers insight into the lives of preservice teachers during their methods coursework.

Chapter Four

Preservice Teachers' Personal Narratives and Prior Knowledge

Prior knowledge and experiences play an important role in learning (Carter & Doyle, 1996). Therefore, knowing where preservice teachers' current learning comes from is important to teacher educators who want to gauge the assessment of prior knowledge as related to teacher education. This is essential in educating our preservice teachers to work with children in their future classrooms.

This chapter details the personal narratives and prior knowledge preservice teachers bring into their methods course. Four main sections make up this chapter: preservice teachers' personal narratives and remembrances of elementary school, pedagogy preservice teachers believe based on their personal narratives, questions preservice teachers bring into education, and a summary of personal narratives and prior knowledge. Each section is based on preservice teachers' reflections during their methods' cohort of their junior year. Chapter Five delves into the specific instructional practices preservice teachers experienced during their field experiences. Chapter Six explores the constructivist classroom in teacher education. Chapter Seven represents the conclusions reached from this research.

Personal Narratives and Remembrances of Elementary School

Personal narratives play an important role in preservice teachers' lives as they enter the profession of teaching. Accessing these narratives is a way to begin to understand preservice teachers' construction of pedagogy (Cole, 1990). Accordingly, as one of the beginning activities for the semester's methods course,

I asked preservice teachers to write about their elementary school experiences. I provided the probes: memories, specific subjects, particular incidents, impressions of school, and any related experiences that they brought to teacher education from their elementary years. The title of the reflection activity was collectively titled *"The Good, the Bad, and the Ugly"* so that I might have multiple stories recounted. As Lortie (1975) reminds teacher educators, preservice teachers bring many narratives into their college coursework. Abundantly descriptive reflections written by preservice teachers retell interesting experiences with real-life learning in curriculum as well as in social encounters with peers. Joyful encounters as well as unpleasant memories surfaced, happy occasions and embarrassing moments were recalled. Most preservice teachers experienced both positive and negative situations in elementary school and feel they have valuable experience from their days as students. As Carrie relates, "There are some memories that I can picture vividly in my mind, but those usually are because they were traumatic or associated with a strong feeling."

Remembrances preservice teachers write about fall into following broad categories: interesting curriculum, uncomfortable memories, misconstruction of elementary experiences, interpersonal relationships, acknowledging others' experiences, and individual emotional experiences. What follows is a description of each category.

Interesting Curriculum

Many preservice teachers do not remember particular subjects they experienced in school. Rather, they described the creative, engaging projects in which they were involved. The highlights revealed by preservice teachers include:

dissecting bees, participating in a play, making props, designing sets for plays, observing fire-bellied newts, publishing class books, creating family trees, participating in a banking system, having a Williamsburg day, watching tadpoles turn into frogs, pet fish, collecting leaves, new objects on the nature table, counting real money, working with clocks and real food, planting seeds, painting a dinosaur mural, listening to teachers read chapter books aloud, planning three meals, going to a grocery store, making the meals and eating them, art class and student exhibits, music class and winter concerts, Civil War projects, class stores with checkbooks, building castles, log cabins, volcanoes, creating and designing their own assignments including learning centers, writing stories, visiting historical cites while living in Washington, D. C., field trips to museums in Chicago, having a teacher from England that taught them how to knit, to making and presenting formal tea. Elsie summed it up, "Mrs. D made every lesson meaningful, and each subject was connected to something real...the class was so engaged and into our activities, that we were almost always on task." Linda recalled:

> Every elementary teacher had their own unique methods for making the classroom come alive through instruction and atmosphere. I wish I could go back and talk to each one of them individually, especially my lower primary teachers. And sometimes I wish my memory just served me better. My early years were filled with a broad sense of compassion and curiosity.

As preservice teachers described the rich learning experiences they had, they mostly cited memories of particular events described as activities in which

they had participated. Hands-on, interactive learning methods made preservice teachers' learning interesting, relevant, and memorable through a wide variety of different experiences.

Uncomfortable Memories with Curriculum

Preservice teachers vividly recall unpleasant memories from their past school experiences. Preservice teachers remember disliking boring worksheets and timed tests with addition, subtraction, and multiplication. If timed tests were not passed, students could not go on to the next level. This resulted in adverse feelings concerning their mathematical abilities and affected preservice teachers' school attitudes. While feeling incompetent in timed races where the fastest student won a prize and the importance placed on timed tests, preservice teachers felt discouraged about their mathematical abilities because they felt speed indicated mastery. This competition and focus on rote memorization further belittled preservice teachers. Ability grouping filled preservice teachers' lives with feelings of incompetence as students when they were placed in "low groups." Betsy related her memories of grouping:

> My first vivid memory is from fourth grade. Fourth grade was the first year that they divided us up into higher and lower groups for math and reading. They did not call these groups higher or lower, but instead gold and blue. Everyone knew what was going on though, which group had the 'smarter' children and which had the 'lower.' I was put into the low reading group although I did very well on the reading test...Looking back, I am not sure what shaped my decision about my intelligence, but after fourth grade, I had very little confidence in my ability to perform well in school. I was

never challenged in grade school because I was in the lower group, so they did not think it was necessary.

When one preservice teacher moved to another state, she went from a curriculum that she was doing well in, to a tracked curriculum where she faired less well. Because she had not yet learned the skill that would have landed her in a high placement within this tracking system, she was placed in the lowest group. She commented, "This devastated me. I could not believe that I had been on top of everything we were learning in Ohio to one of the lowest students in the class." Feelings of embarrassment: about being dumb, slow, or inadequate were expressed by six preservice teachers when ability groups were used during instruction in their elementary years. Preservice teachers placed in lower ability groups felt diminished in their achievement as students for two reasons. First, their self- confidence suffered from the labeling. Second, teachers' lower expectations eroded the preservice teachers' own perceived ability in mathematics.

Other preservice teachers began to feel uncomfortable with curricula as they realized they had a problem within a specific area, such as math, writing, reading, spelling, or science. Shelly reported, "Writing reports or any other type of paper has always been a struggle for me. To this day, because of what I went through, I agonize over writing papers." Claudia related:

> Looking back on my experience, I was behind developmentally from the rest of my peers. I was forced to leave the classroom and get help with my reading and math skills. I remember the struggles and fears I had in first grade. I remember having a hard time learning how to count money and

telling time. I also remember not having the patience to sit still and comprehend the story I was trying to read...I do remember always feeling like the teacher had no hope for me. She was always telling my mom something negative about me.

Coincidentally, when a preservice teacher outpaced other students by reading ahead a few pages without the reading group, her boredom resulted in behavior that ended with a reprimand. These memories illustrated the keen perceptions elementary school preservice teachers still possess and should serve as reminders that early school experiences have long-lasting effects on students.

Mis-construction of Elementary School Experiences

A few preservice teachers had experiences that colored their beliefs about teaching methods although they were mislabeled and misconstrued. Four different examples follow. Debbie shared that her reading ability came quite easily to her:

I was always the child who read thoroughly and did not struggle on words. I also can recall a time in which my teacher allowed me to be in charge of the 'low' reading group. I got to hold the teacher's book and I had the students read out loud to me.

Although Debbie remembered this experience, she did not qualify it through a preservice teachers' perspective as peer tutoring, but rather remembered her ability to hold the teacher's book, "be in charge," and help the "low reading group," a very archaic and traditional view of teaching.

Another preservice teacher moved and discovered she was in the lowest math group, which meant she had a different teacher for this subject and moved

to a different classroom for this instruction, which she interpreted as team teaching. Cheryl dislikes team-teaching today because of her placement in the lower group. This does not really reflect the pedagogy of team-teaching, rather it is ability-grouped instruction which she disliked. Understandably, she wishes to keep all of her students in a self-contained elementary classroom when she teaches because of her prior experiences.

Ability groups were favorable for Kris because of her high placement in them. She related:

> In our school, whether a student was to be placed in the high, average, or low reading and math groups was determined in first grade. I remember I was always in the high math and reading classes; I was very proud of this. I remember looking down upon the 'slower' learners but I'm not sure why. However, I don't believe that those groupings were a bad thing. Many of the students learned the skills they needed to learn and eventually made their way up to a higher-level class the following year. It's not about who is smarter or quicker to learn. It's about what stage of learning they were at, whether for reading or math. If we were ready to start learning multiplication at the end of first grade but the other groups were not, why should we be penalized and continue to foster our growth in those areas?

Kris looked at this situation with the eyes of a "high" group student, stressing her entitlement while diminishing the impact to "low" group students. She remembered children climbing to higher groups, something that is often impossible because of lack of preparation and the slower coverage of curriculum in these "lower" groups. However, if children were indeed allowed to fluidly work

in flexible grouping, it casts a more equitable view on this through the current eyes of a preservice teacher with regard to how she would facilitate learning in her own classroom.

Although many preservice teachers discussed their dislike of timed math fact tests previously, they did not equate the memorization of facts as challenging as Anne described her second grade experience:

> I, of course, wanted so badly to get a perfect score so I practiced with flash cards at home. Finally, I was able to complete the whole sheet in time. An incident like this was good for a student who was usually not challenged, because it demonstrated to me that I would have to work at some things. Looking back on this experience, I realize the value of challenging all students, whatever level they may be on.

Anne's opinion of challenging students is valid; however, she equated her ability to memorize facts through practice as educational. She failed to recognize that her own less demanding school experiences did not correlate or compare with rote memorization, a didactic practice. Enrichment activities require problem solving and critical thinking. Therefore, if she believes memorizing facts enriches a student's curriculum without prior construction of conceptual development, her thinking is misguided because learners must construct real meaning and conceptual understanding before memorizing key facts. Similarly, these four examples offer a misconstruction of pedagogy from preservice teachers' past experiences that reverted back to didactic pedagogical practices as Carter & Doyle (1996) claim often happens with preservice teachers.

Interpersonal Relationships

Preservice teachers' narratives about their elementary education indicated that they valued the environment and relationships their teachers created for them in school regardless of the particular subjects covered. Teachers who made personal connections with preservice teachers helped them feel comfortable and expressed interest in their lives, building relationships preservice teachers remembered. Teachers encouraged, challenged, and willingly helped those struggling students. Other teachers infused excitement into learning, had faith in their students, allowed exploration and experiments, which built fond memories for preservice teachers. Other qualities such as friendliness, being treated fairly, positive personalities, acknowledging students' accomplishments, keeping students engaged in hands-on activities, writing about personal problems in journals, treating each child with respect, and forming a classroom community were regarded highly. Janet related:

> For the most part, I really enjoyed school. I never struggled with it and always loved my teachers except for the year I was in fourth grade. I think the main experiences I can bring from my elementary years into teaching are the patience and kindness I experienced from my teachers. These qualities in my teachers helped to make my educational experiences overall very positive. I hope that I can do the same for the children that I teach.

Preservice teachers recognize that strong interpersonal relationships with

students build a foundation for learning and plan to implement numerous ways to develop relationships within their own classrooms so children feel valued and respected.

Acknowledging Others' Experiences

Thriving on the interesting learning experiences written about earlier, many preservice teachers did well throughout their school years. Additionally, they survived more traditional didactic methods and ability tracking, many were proud of their learning groups and skill levels, but they also showed compassion for those who struggled. Ellen commented, "I can remember taking spelling tests, which I also found fun. I know now, however, that all children do not learn this way." Preservice teachers realize they need additional instructional strategies to use with children to insure their success. Watching a child being denied use of the bathroom and the unfortunate consequences, as well as seeing the denial a fellow student's request to go to the nurse because of feeling sick (again with a disastrous outcome) fueled elementary school memories and feelings of empathy for fellow students. Preservice teachers vowed not to allow events such as these happen in their own classrooms because of the empathy felt for other students.

Individual Emotional Experiences

Specific emotional events triggered memories from preservice teachers such as being reprimanded in a loud voice in front of the class for an error in writing or being duct taped to a chair because the student was out of her seat were recalled with humiliation. Receiving a paper back with red Xs all over it and calling out grades from assignments in front of the rest of the class were other insulting experiences. Feelings of shame for counting with fingers and the

inconsistent discipline of taking recess away for some transgression served to fuel unpleasant encounters. Being intimidated and scared when a teacher whacked the desk with a ruler to get the next answer and yanked a pencil out of a student's hand were remembered as mortifying. Embarrassment over a silly name that stuck with a student all year and faking illness to avoid an unkind teacher were additional occurrences that preservice teachers faced.

As a student in a lower income school, one preservice teacher remembered the desire she had to teach at a similar school, in part because of the belittling and powerful attitude one teacher displayed toward them as students. Interestingly, as preservice teachers wrote about negative memories and feelings concerning school experiences, these descriptions tended to be lengthy and passionate while revealing intricate settings, events, and emotions. Lindsay remembered:

> One memory that I will never forget is when we separated into reading groups and were talking about our book. I was talking to my neighbor and my teacher yelled at me to go back to my seat and put my head down. I was so upset and though she is still my favorite teacher, I hated the way she did that to me and I will never forget it.

What stood out were the lasting memories these unfortunate incidents formed in preservice teachers, overshadowing their learning. Hillary described:

> My kindergarten teacher was Mrs. M. I think she must have been 80 years old back then. She was one of those teachers that should have retired before I ever got to school. She was just an older teacher who taught in very traditional ways and punished children in very traditional ways.

Fifteen years ago it was okay to put a child's nose in the corner or tie him/her to his/her chair if they kept getting up...I do not really remember what I learned or how I learned it, but will never forget Mrs. M.

Early memories of school, especially those regarded as unfair practices, carried over into preservice teachers' recollections many years later and impacted ideas about their own teaching. Because of these experiences preservice teachers are able to view school and its incumbent practices through the eyes of a child. Table Two summarizes preservice teachers' elementary experiences in school.

Table Two- Preservice Teachers' Elementary Experiences in School

Positive Elementary Experiences	N= 6	21.5%
Mostly Positive Experiences with a Few Negative Experiences	N= 4	14%
Positive Overall Experiences with Negative Math Experiences	N= 5	18%
Positive Early Elementary Experiences with Negative Experiences Later	N= 5	18%
Negative Elementary Experiences	N= 6	21.5%
No Memories of Elementary School	N=2	7%
Total	N= 30	100%

Pedagogy Based on Personal Narratives

Past experiences in the classroom are remembered and brought into teacher education as a starting point for preservice teachers to construct their pedagogy (Holt-Reynolds, 1992). Janet expanded on this:

> My own personal experiences with good and bad teachers make me realize how long the impression that I make is going to last. I mean I am twenty-one years old, and the things that happened to me when I was eight and nine still affect me a great deal. I want to be one of those teachers that students look back on and have great stories to tell.

Remembering a classmate's humiliation and how a teacher treated a classmate left a lasting impression. Preservice teachers know the value of kindness and compassion when it comes to working with children. Using personal narratives that brought unpleasant memories to the surface, preservice teachers recognized the type of teacher they do not wish to emulate. They intend to be caring, respectful, and sympathetic to their students' needs.

Many elementary teachers are responsible for teaching all subjects in self-contained classrooms, and this impacted preservice teachers in different ways. Preservice teachers reported some teachers emphasized independent reading, bringing enjoyment and opening doors to some readers, a practice which preservice teachers wanted to replicate in their own classrooms. Other teachers underscored creative writing that allowed preservice teachers to express their feelings and expand their imaginations, again an aspect of curriculum preservice teachers wanted to reproduce in their own classrooms. However, when a teacher favored one subject and spent more time on that subject, while neglecting another subject, it had adverse effects on the students. Because some teachers placed a lesser value on mathematics, some preservice teachers struggled and felt anxious throughout their school careers whenever math was introduced.

Additionally, preservice teachers that had been in low reading groups disdained the practice and vowed to be open to new ideas and change when they became teachers such as flexible grouping, a concept constructivism emphasizes. These experiences preservice teachers encountered underlie the value of treating all subject areas as equally important while making them interesting for students, another characteristic of constructivist learning. As learners, preservice teachers acknowledged how differently they learned in some subject areas, needing divergent approaches to comprehend material. Peer tutoring, alternative instructional strategies, use of multiple learning styles, and real-world experiential learning are some constructivist practices that would have helped preservice teachers stay curious, involved, and less reluctant to learn. Cathy explained:

> As an elementary teacher I hope that I can bring above all a sense of balance to my classroom. I never want a child to not understand a concept because I am only teaching it one way. I often think if a teacher would have found a way to link math to meaningful stories and adventures I could have been better in it. I hope that I will always be willing to look for what inspires the children in my class.

Other preservice teachers fared well in school yet recognized that others did not and noted the implications this has for their own practice. Ellen related:

> I think I bring positive experiences from my elementary years to my teacher education. However, I think that because I didn't have a traumatic or particularly hard time with school and the way the subjects were taught then, that I will have to try harder to make an attempt to teach in different

ways than what fits my personal learning style. For others, who may have had teachers teaching the way I was taught, and did not like it, it will be easier for them to recognize the importance of varied teaching strategies as they relate to children who do not learn that way. Through my classes I am definitely seeing the wide variety of learners that are out there, and will undoubtedly take this information with me as I start teaching children with different styles, backgrounds, and preferences.

Ellen's comments indicate that preservice teachers are aware that their pedagogy and instructional styles must be varied to accommodate diverse learners which they may or may not have experienced in their own schooling as children.

Prior Knowledge about Constructivism

Preservice teachers bring extensive prior knowledge into teacher education and as teacher educators, it is critical to provide opportunities for preservice teachers to share their views, according to Knowles and Holt-Reynolds (1991). For this reason, I began the semester with a quote about didactical teaching practices to determine preservice teachers' responses before introducing constructivism. *Young Mathematicians at Work* (Fosnot & Dolk 2001a), the preservice teachers' text supplied the following quote:

> Teaching was what teachers did. They were supposed to know their subject matter and be able to explain it well. Students were supposed to do the learning. They were expected to work hard, practice, and listen to understand. If they didn't learn, it was their fault; they had a learning

disability, they needed remediation, they were preoccupied, they were lazy. (p.1)

Preservice teachers responded in writing during class refuting these statements and sharing many solid ideas of constructivist thinking. Believing teachers' roles have changed since they were in school, preservice teachers expect teachers to build relationships with their students by knowing them, connecting with them, encouraging them, and building confidence in them. Teachers' roles now are seen as partnerships where they, as teachers, are learning as much as they are teaching. Linda related:

> I think teachers and students are two entities that meld together into safe and integrated communities of practice. In no way do I see them as separate. We must work hard, listen and understand as partners in this process called education.

Preservice teachers think the teacher's job is to keep things interesting in the classroom by continuing to look into new practices and finding additional ways to present material to students. Creating a child-centered environment where learning is engaging is one aspect. Utilizing many instructional methods, preservice teachers believed adapting lessons for children to learn in a variety of ways is necessary for learning. Individualizing learning is important to preservice teachers in aiding children. Learning is an active process for children. Preservice teachers believed there should be a variety of learning experiences for children that encompass all learning styles. Cooperative groups, peer tutoring, and additional learning materials were all methods mentioned that could help children learn. Having in-depth knowledge of subject matter, while making sure

their practices are current are key to teaching. Taking the child's perspective reminded some preservice teachers of how learning occurs. Cheryl shared, "There have been many times when I did not understand a concept in the beginning, but after working with it and manipulating it, the concept became easy." Monica explained:

> However, there is so much more that goes into teaching. Many times, as a child, I needed guidance instead of instruction. Teachers need to know how to explain their material in a way that each individual child can understand. This is just as important as knowing the subject matter.

Preservice teachers come into teacher education with a broad understanding of learning that emphasizes relationships with students, environments where students will thrive, and the use of many instructional strategies which are components of constructivist learning.

Learning is Developmental

As a follow-up to the rigid text selection about learning from the prior week (discussed in the section above) the discussion on constructivism, also taken from the text, *Young Mathematicians at Work* (Fosnot & Dolk, 2001a) reads:

> When one recognizes this developmental nature of learning, one sees the fallacy in the belief that one activity or series of activities can bring all children to the same point at the same time. (p. 37)

Responses from preservice teachers took into account the teacher's responsibility as well as the children's needs and espoused their beliefs and their questions about how they would handle their own classrooms. Debbie shared:

I definitely agree with this belief. I do not think that one activity/series can produce an equal level of comprehension among all students. I think this will be one of the most challenging situations I will face as a teacher. One child may have a complete understanding of the material I present while another child may be clueless. What do I do in this situation? How can I make sure that all my students have benefited or grown intellectually from the activities I have them engage in?

Other preservice teachers expressed the universally held early childhood belief that all children are different; they come from a variety of backgrounds, are exposed to assorted experiences, learn in numerous ways, and possess dissimilar weaknesses and strengths. Jean suggested, "Learning should start where the child is already at and go from there. The teacher needs to adjust the difficulty to meet the personalized needs of each student."

Many suggestions for classroom practice were reflected by preservice teachers including; flexibility so students could proceed at individual paces, observation by the teacher to carefully articulate what children need, and planning on the part of the teacher to adjust the curriculum to meet these students' needs. Individualizing activities for students while recognizing student interests and providing an all-inclusive environment incorporating many strategies were primary concerns of preservice teachers. They recognized this will be difficult to accomplish as new teachers. Heather discussed her views:

I think that there are many different ways of learning the same concepts. A teacher should have a wide variety of strategies to teach the concepts and then take time to evaluate the learning that took place. By doing this, the

teacher can realize which students have not achieved the knowledge goals from the activities. Having to teach lessons in numerous ways does not equate to poor teaching. I think it actually shows that you value the uniqueness of each student and their particular learning style. This will make the learning that takes place more meaningful to all the students in the classroom.

Preservice teachers understood the individuality of children and the obligation of teachers to make learning possible by providing multiple learning opportunities for students and viewed these as professional strengths rather than weaknesses in teachers. Within these strong pedagogical beliefs, also apparent are many questions that preservice teachers bring with them into teacher education. The next section deals with these inquiries.

Questions Preservice Teachers Bring into Education

Preservice teachers are full of questions as they enter their methods coursework. I decided I needed to know more specifically what these particular preservice teachers' interests were at the beginning of the semester. Their assignment was to write ten questions each about what they wanted to learn this semester; one half of the questions had to deal with mathematics and the other half were open-ended questions pertaining to any educational questions preservice teachers had. Over 300 questions were submitted. Because of the sheer volume, most of this section is a synthesis of preservice teachers' questions grouped among the following five themes: their own performance in the classroom, questions about helping children, critical instructional concerns,

parental involvement, and job-related questions. This section will address each of these in more detail and describe preservice teachers' concerns.

Performance in the Classroom

"How does a teacher construct good open-ended problems that are meaningful to children and yet teach appropriate lessons?" Cheryl asked. Preservice teachers remembered their own experiences and wanted to insure that the children they are teaching do not suffer because of their own inadequacies. A common question asked by preservice teachers was how to teach a subject that they struggled with as children. Naturally, preservice teachers did not want to repeat their own bad experiences from school. They wanted to make sure their own understanding of a concept is solid before trying to teach it in the classroom and wanted to brush up on skills in which they still feel lacking. Some preservice teachers felt unprepared to teach a certain subject altogether. As a result, preservice teachers wanted to guarantee their comfort with material and areas of study so they can teach and construct meaningful curriculum.

Other commonly asked questions revolved around the best way to teach, finding what Heather termed her "personal learning style," incorporating and integrating curriculum, and dealing with the difference in subject matter since preservice teachers' own elementary school days. Not surprisingly, given some of the preservice teachers' memories, one person asked how to handle herself when things weren't going well. Monica stated, "I would like to learn how to stay positive even when I am having a bad day. Going through elementary [school] I always found it very noticeable when my teachers became frustrated and were having a bad day." Preservice teachers were highly aware of the mood,

atmosphere, and pace they set for learning in their classrooms and wanted to insure that they have the tools to help children develop to their full potential.

Questions About Helping Children

Preservice teachers considered children's feelings about learning an integral part of teaching, rightfully so. Hillary asked, " If a child answers wrong, do I correct him/her? How do I do this without making them feel bad about themselves or keep them from sharing their answers again?" Of particular concern was preventing students from feeling too much frustration, knowing when to jump in and help, yet not going overboard and offering too much help for emerging learners. When students struggle, preservice teachers wanted to know what steps they should implement to scaffold learning. Cheryl asked, "When a child is significantly behind the class in conceptualizing a task, how can you catch him/her up?"

Coupled with this, another goal of preservice teachers was attracting and capturing children's interest so students enjoy content matter. Additionally, determining what children already know and infusing confidence in learners was also important. Preservice teachers wanted their own students to avoid some of the discouragement they themselves felt as students. Recognizing a group of children compose a wide variety of learning levels in each classroom, preservice teachers craved strategies and information about accommodating all learners and adapting for special needs children. Accordingly, with the emphasis on meeting each child's needs, preservice teachers wanted to know how to work with accelerated learners. Questions were raised about whether to give these students

harder work in the same subject or design another project for children who already knew the material being taught.

Instructional Strategy Queries

By far the most data provided concerned instructional strategies and pedagogical questions. Preservice teachers asked about timing of subject matter, when or if there was ever a time it was too early to introduce a topic for children to learn. Specifically, while wondering about effective ways to reach different age groups, one preservice teacher questioned whether primary age children really understand graphs. Some preservice teachers felt teaching the early grades' content would be easier than teaching that of later grades. For example, preservice teachers believed the concepts of addition and subtraction seemed easier to teach than multiplication and division because their understanding of addition and subtraction is more stable. Additionally, most preservice teachers were eager for information about integrating different subject matter such as math and science in creative ways for students. In conjunction children should see the relationships among subjects and connect these to real-life situations. In order to make learning fun, interesting, and meaningful for children, preservice teachers yearned for the means to accomplish this within their own pedagogy.

In tandem with developmental practice as a central challenge, preservice teachers pondered what is taught at specific grade levels and at what ages children develop certain skills. In addition, preservice teachers questioned how to teach these skills and integrate learning centers in the classroom that can develop the appropriate learning opportunities for children. Teaching content to all learners in a variety of methods was important to preservice teachers. Questions

about individual versus group learning and whole group instruction puzzled preservice teachers. Methods of incorporating subjects into everyday learning activities are fundamental concerns preservice teachers seek to learn so their students will be challenged appropriately.

Preservice teachers wondered how to manage their instructional time effectively with questions such as how to decide on how much time to devote to certain subjects. In conjunction with this preservice teachers speculated about the best time to teach a particular subject during the school day. For example, preservice teachers asked what a typical day's schedule looks like, whether literacy activities needed to be scheduled for mornings with math, science, and social studies relegated to afternoon activities. Preservice teachers also asked if short lessons were effective and how to use them. Long range planning for the school year intrigued preservice teachers as well; they asked when, where, and how to introduce big ideas and concepts for optimum student learning. Regarding pacing of curriculum and how to plan, Hillary asked:

> How do I know when it is too much or when to stop helping? How do I know when they are not getting it or what do I do if there are a few kids who need extra help? Do I stop and help them only or do I wait for another time?

Not surprisingly, underlying all of these topics is the issue of classroom management. Preservice teachers acknowledge the importance of a good discipline system, including setting rules, but they also wanted children to explore their learning environment. To support this, preservice teachers are interested in accumulating as many resources as possible, including lesson plans

with meaningful games and activities. Constructive visual aids to help children learn, as well as outside activities such as field trip ideas were high priorities for preservice teachers. While noting the key role manipulatives play in classroom learning, some preservice teachers asked how they would be able to differentiate between a child's learning or child's distraction while using manipulatives.

Other instructional questions concerned the issues of ability grouping and whether or not it is ever effective to use didactic traditional teaching methods such as worksheets. Preservice teachers wondered how to fit in extra skill practice without use of worksheets and what, if any the role memorization occupied in learning. Preservice teachers sought methods of implementing state standards while folding these into creative lesson plans. In tandem assessment and evaluation strategies are important to preservice teachers. They endorsed different assessment methods, rather than worksheets with standard paper and pencil tests; preservice teachers questioned how they can understand where children are in their knowledge without this type of standard, rigid testing associated with didactic teaching methods. Preservice teachers asked to learn about the wide variety of instructional strategies during their methods courses.

Parent Involvement

A few preservice teachers acknowledge the importance of parental involvement in their children's learning. For the most part the questions asked were more traditionally based educational questions. For example, preservice teachers wanted to know how to promote flash card use at home for children to learn their number facts (these were part of the first ten questions asked). They also wondered what would happen if children did not come home with a daily

graded worksheet (again one of the initial ten questions asked at the semester's beginning). One preservice teacher did express concern about parental involvement in the deeper issue of curriculum. Cheryl asked, "When principals and parents are focusing more on reading and writing, how can you include math so the children get the best of all three worlds?" Although some preservice teachers asked more cursory questions regarding parental involvement, Cheryl did realize parents were more immersed in their children's education.

Future Career Related Issues

Understandably, preservice teachers are looking to the future and asking questions about teaching as a career. While wondering about "burnout," preservice teachers question how to keep fresh and rested to insure they are effective teachers. Queries about teaching in an urban environment were posed by preservice teachers. Additionally, preservice teachers asked whether memorizing standards was necessary during a job interview, and how difficult it actually was to find a job. Suzanne asked, "Is it hard to get a first grade or kindergarten position? How do I insure a future employer that I have the skills that it takes to teach children how to read?" Serious about learning their craft, preservice teachers want to be prepared.

As their methods' coursework ends, preservice teachers also desire creative ideas for student teaching next semester. When their methods' block began preservice teachers pondered a wide gamut of issues including their classroom skills as teachers, instructional strategies, and job security. Knowles and Holt-Reynolds (1991) sum it up this way:

They have taught us how to teach them. Preservice teachers talk -

about their prior experiences and their practices as beginning teachers - profoundly affects what we do when we meet them and attempt to influence their future direction. We meet them as they stand at the crossroads of course work and field work. (p. 101)

Summary of Personal Narratives and Prior Knowledge

Preservice teachers have strong recollections of their past school experiences; while all encounters were distinct, some common characteristics were shared. Absorbing and using curriculum with interesting projects and performances stood out in preservice teachers' minds. Relationships with teachers, especially extra kindnesses, are remembered fondly from elementary school. Also vivid is the experience of riding the bus with friends.

While recalling disconcerting events connected with particular subjects, preservice teachers remembered areas in which they did not do well. Preservice teachers expressed empathy toward their elementary classmates who experienced difficulties in school even if they had done well themselves. Dysphoric episodes where teachers publicly humiliated students were also intensely remembered even if the preservice teacher was not directly involved. Because these reflections ranged from one end of the continuum to the other, the title *The Good, the Bad, and the Ugly* appropriately sums up the various elementary school experiences shared by preservice teachers. Preservice teachers are cognizant of their many experiences and recognized positive learning experiences they hope to create as well as acknowledge experiences they wish to avoid with their students. Teachers that skimmed some subjects while emphasizing different subject areas and used

certain instructional strategies to the exclusion of others strategies alerted preservice teachers to this bias.

As these memories surfaced, preservice teachers brought many questions to teacher education. They were inherently worried about their performance in classrooms. In particular they were concerned about their own abilities, especially centered about how much assistance to offer students. Preservice teachers were anxious to encourage children but did not want to frustrate them. This led preservice teachers to ask questions about different instructional strategies such as when to use which particular methods at critical moments. Furthermore, preservice teachers sought ways in which to cultivate parental participation in their classrooms. Lastly, there were many other professionally related issues preservice teachers were eager to discuss such as what is involved in searching for teaching positions. It is clear that an important component of teacher education is the ability of teacher educators to elicit and answer questions preservice teachers bring into their coursework. Chapter Five describes the field experiences preservice teachers encountered during their methods coursework.

Chapter Five

Preservice Teachers' Field Experiences During Their Methods Cohort

Field experiences play a crucial role in preservice teacher education as discussed in Dangel and Guyton's (2003) meta-analysis of constructivist learning in Chapter Two. During their methods cohort, preservice teachers spent one day a week for ten weeks at a new Kindergarten through Grade Two (K-2) building in a rural community. The entire school population received free lunch. All students were reported to be Caucasian, although at least one African-American student was enrolled. As acknowledged earlier, I knew the mathematics program the school used was Saxon math, a scripted curriculum where each teacher said and did the same lesson on the same day in the same way, the polar opposite of what I was teaching in my teacher education course. I wanted to capture preservice teachers' reactions and impressions during the semester of their field experiences.

Four reflections were written during the semester concerning preservice teachers' field experiences and comprise the sections of this chapter. The first reflection dealt with preservice teachers' expectations and about preservice teachers' first day in the field. The second reflection was written after the preservice teachers had been at their field experience two or three times. The third reflection was written that same week and involved the comparison of text readings with what preservice teachers were seeing in their field experience. The final field experience reflection asked preservice teachers to describe what they had learned during their ten days in the classroom.

Field Experience Expectations and the First Day in the Field

Thirty preservice teachers spent one day a week at the field site; because of the volume of preservice teachers one half of the group spent one day at the school, while the other half spent another day at the school and two preservice teachers were in the classrooms at the same times. Therefore, when reflective assignments were given, depending when the preservice teacher wrote their reflection, and what day they were in the field, some variation of topics was inevitable. The first topic I asked preservice teachers to write about was: What do you expect your field experience to look like? What do you think the teacher will be doing? What role will the children have? What activities do you envision taking place? What will the classroom environment look like? I purposely asked several questions so preservice teachers had a variety of response modes. For example, if one saw something taking place in the classroom that she found interesting, I wanted her to write about it. Conversely, if someone else noticed something else, I wanted her to follow her own interests and elaborate on it in her reflection. As it turned out because of the schedules, some preservice teachers went to their field experience shortly after our class, so their reflections looked back on their first day at the school.

Child-Centered Classrooms Expected

Four preservice teachers wrote their reflections about what they expected to see in their field experience classrooms. These preservice teachers hoped to see a child-centered curriculum with developmentally appropriate practices. Rebecca anticipated:

> A loving, caring, respectful, safe classroom...in which each child learns at his/her own pace... learns from their experiences with each other... the environment feels like a classroom community...I hope the children work in small groups around the classroom, rather than sitting at individual desks.

Jean expected:

> The classroom to have a variety of manipulatives, books, and science activities. Children get to participate in hands-on activities that promote problem-solving...The classroom will have a focus on investigations and real-life experiences. There will be very few worksheets and an abundance of projects that are 'open' to new ways of doing things... discoveries and explorations.

Preservice teachers have been in early child-care field environments for two previous semesters, and many have also worked in these during summers and while in college. Thus, they expected to find a K-2 building that matched what they knew to be good pedagogy for young children. For this reason I wanted preservice teachers to write down what they expected before walking into this field experience. I wanted them to articulate what they expected to find so they could make direct comparisons with these expectations during the rest of the semester. Additionally, I wanted to know what preservice teachers expected of their field experiences.

Enjoyable First Day

A majority of preservice teachers thoroughly enjoyed their first days in their field experiences; seventeen expressed excitement about what they saw

happening in "real classrooms," even if there were some misgivings after seeing the math program. Some stations were observed in kindergarten rooms with cozy reading corners, dramatic play areas, and colorful walls. Warm relationships with students, updated technology, and spacious rooms with new equipment led preservice teachers to believe this would be a good learning experience for them, even though many noted an abundance of worksheets (which was philosophically different from what they expected to see). More importantly, at least initially, to preservice teachers was how the children acted in the classrooms, rather than if they were engaged in true learning. Janice described:

> I think I had the impression that in most classes there are usually one or two children that are the so-called "trouble-makers," but there didn't seem to be any in this group...The children were allowed to help each other while they were working on assignments...get up and go to the restroom or get a drink when necessary.

Indeed preservice teachers were noting the preponderance of worksheets, but these did not overcome their excitement to return and be part of the classrooms. Cheryl related:

> I could not believe that after all we have learned in class that timed worksheets were still being used in a classroom, yet they were right in front of me. A little boy Nate immediately groaned when the worksheet was passed out. I went to him and asked if something was wrong. He replied, 'I hate these things. I can never do them all and it makes me not have fun.' After his complaint, the teacher said to start and the children had two minutes to complete thirty single-digit addition problems. There

were some children that whizzed through the worksheet. Others were making tally marks on their papers to help compute the problem and still others were using fingers. Nate was working as fast as he could come up with the answers. He completed the first fifteen problems correctly when the teacher said that time was up. He threw his pencil and stated, 'I hate this! Everyone else is done and I never get to finish.' The teacher told him how proud she was of him because he correctly answered all of the problems he completed. This did not satisfy Nate, so I told him he could take the worksheet home and practice on the rest, but he said he did not like math and did not want to take it home. After this whole scenario took place, I knew that I would never include timed worksheets in my classroom. I could just see the discouragement and hatred Nate had developed for math, and I know there were better ways to help children learn addition...Overall, the day went quickly and productively. I learned some techniques that I would and would not use in my classroom. Most importantly, I began to make a connection with the children and am excited to return next week.

Although preservice teachers realized what they were seeing in their field experiences was not promoted in their pedagogical learning, this did not override their enthusiasm about returning the following week to work with the students. Kind, empathetic teachers initially made the lack of child-centeredness in the learning environment seem less destructive.

Ambivalence on the First Day

Three preservice teachers reacted with ambivalent feelings to their first day in field experience. Although kindnesses were noted, these kindnesses did not overcome the sense that this was not as good of a learning environment for the children. Students copying sentences from the board, working independently on worksheets for most of the day, and begging for a worksheet to count as a test grade did not sit well for these early childhood preservice teachers. Along with observing classroom practices, preservice teachers did interact with students. Kris recounted:

> During the self-selected reading a girl asked me if she could read to me. I felt a little uncomfortable not knowing exactly how to scaffold her learning or 'what to do next' to help her. Did she feel uncomfortable? Was she nervous reading to me? What did she think of me? How does she evaluate her own reading skills?

Preservice teachers were not sure how they fit in at this point; they wanted to help and assist students but still questioned their abilities and methods. Additionally, Kris caught something going on in back of the classroom of which she did not think the teacher was aware. Evidently, there was a "Student of the Week" and the teacher had asked the girl what she wanted to be someday. Meanwhile, Kris listened in on another conversation, which could have had a far-reaching impact if caught by the teacher and discussed openly:

> Matt, a little black boy still sitting at his desk, was talking with his white friend John. Matt said, 'When I grow up I'm gonna be President!' And John looked at him with a confused look on his face, 'You can't be

President!' 'Why not?' asked Matt. 'Because...well, because...no, I can't say it. It would be too mean.' Matt encouraged him to say what he was thinking anyway and John replied, 'Well, because you're brown and there are no brown presidents.' Matt sat and thought about this. 'Oh,' he said, and then they turned around to continue to listening to the 'Student of the Week' talking.

This conversation brings up some important points. First, the statistics the school has posted list the population of the school as 100% Caucasian. Second, the scope of this conversation far outweighs the other conversation that was taking place in this classroom. Unfortunately, the teacher couldn't hear this conversation and use it as a springboard to really discuss an important issue with which these children were already grappling. Whether she would have done so or not is unknown. Also unfortunate was that this was the preservice teacher's first time in this classroom. Perhaps if she had known the teacher better, she could have relayed the conversation between Matt and John and the teacher would have known of its existence. A paradox presents itself. Here is a teacher implementing worksheets and conducting 'Student of the Week,' a fairly traditional, didactic curriculum. However, she could have seized this opportunity and guided these students in a truly meaningful dialogue that they were already having amongst themselves about race and equality.

Disappointing First Day

Six preservice teachers expressed disappointment with their field experiences after the first day on location. Several circumstances played into this. First, there was a two-hour delay due to snow at the school and the children's

routines were changed. Second, it was the 100th day of school, so the children were very excited about the celebration, which further contributed to the general chaos of the day. Lastly, preservice teachers were pressed into service immediately upon entering the classrooms and asked to copy papers and do other chores, which contributed to the pressure they already felt upon entering a new environment. Combined with the heavy emphasis on worksheets, preservice teachers left feeling dissatisfied about their field experience. Anne explained:

> Probably the most frustrating aspect was Saxon math. My teacher introduced it as 'dry, but something I have to do.' If she thinks it's dry, no doubt the children do as well. Saxon provides a script for the teacher and two worksheets per day. When the fact sheet was passed out the children had a limited amount of time to complete it. When one student 'messed up' his sheet and didn't have time to correct it, he began to cry. I can see the early stages of hating math form in this classroom.

Fiona described her introduction to the class:

> The children came in and wrote about their weekend and corrected papers from the week before. I personally did not see the reason to start off the day going over problems missed the week before. Kendall and I both had to find the children that missed problems and help them find the right answers. We really had no idea how to go about this, because the teacher didn't give us any ideas. The children didn't know us and had no idea what was going on.

Although all of the preservice teachers did not start their first days with a

delayed schedule and the 100th day of school, all did participate in Saxon math. When some preservice teachers were placed in charge of meeting individual children on Monday morning to review mistakes on math papers from the week before, they found it difficult. Six and seven-year-olds have a hard time remembering what they did an hour ago, let alone what they did in school the week before. These preservice teachers were disheartened by the practices they saw occurring in their field experiences.

Table Three represents the data described above involving the first day of field experiences preservice teachers disclosed.

Table Three: First Day Experiences

Description of First Day Experience	Number of Preservice Teachers	Percentage of Preservice Teachers
Enjoyable	N= 17	65.5%
Ambivalent	N=3	11.5%
Disappointing	N=6	23%
Total	N=26*	100%

*N was not 30 due to snow day schedules.

Subsequent Impressions

After participating at the field sites for a couple of weeks, I wanted to know more about what preservice teachers were experiencing. I gave them the following writing prompt: What do you notice about your field experience that you had not thought of before? What did you think would be different? What do you wonder about now that you have been there a couple of times? Reactions differed according to the classroom environment to which preservice teachers were exposed, and basically some were experiencing positive learning while other

preservice teachers were not. This section describes the dichotomy in preservice teachers' perceptions of their field experiences.

Positive Perceptions

Interestingly, one of the preservice teachers who felt negative after her first field experience visit, changed her mind about the teacher with whom she was working. At first this preservice teacher assumed that her teacher was going to be old-fashioned because of her age and appearance. Debbie explained:

> However, by the second time I was at the field experience, I noticed that she was an incredible teacher. The children respect her so much and listen to her. She never yells at them and she is always equally respectful back to them. She allows them to do a lot more hands-on activities rather than worksheets. I have yet to see the children sit down and do a math worksheet. Instead, the children play with manipulatives, adding them and identifying patterns. She has circle-time at least four times during the day, so the children are not stuffed in their desks all day. My teacher is such an amazing educator, and I am sorry I ever doubted that in the beginning.

Kara and Lindsay appreciated the methods their field experience teachers employed to avoid frustrating the children. Even though the teachers did use worksheets, they also sought to "make learning a more enjoyable experience for their students." Recognizing that the scripted curriculum and worksheet-driven materials were not effective learning techniques, these preservice teachers nonetheless applauded their field experience teachers for the effort they put into

their teaching to make it less dry for their students. Sadly, only a few preservice teachers found this to be the case in their field experiences.

Malcontents After a Few Weeks

The overwhelming majority of preservice teachers were not content with the learning atmosphere in their field experience classrooms. Many reasons were cited: extensive use of worksheets as the primary focus of instruction including use of direct instruction model for learning, lack of open-ended work, and strict planning of lessons from month-to-month without any room for spontaneity. Fiona shared:

> The lessons that are taught also really bother me. I think it would be fine if it were not a bunch of pointless worksheets. I have never seen so many worksheets. If a child gets a worksheet wrong, we go back and help the child just the same way it was taught in class. I find this pointless. I feel that if a child did not get it the first time, then there should be another way to teach the material. Instead the material is all lecture/worksheet based. The teacher spends most of the time standing in front of the room going over the worksheet together and having them write the correct answer on the worksheet. The children become bored. It is a horrible thing to watch.

One aspect that confused preservice teachers was the appearance of the new K-2 building and the assumption that because it was a K-2 building, early childhood practices representing the most up-to-date pedagogy would be present. Kris remarked:

> I really thought the school would be different than this. You walk into this beautiful new building and see one thing, messages about life skills and

using multiple intelligences on the walls and bulletin boards, but in the classroom they are doing another.

Seeing the posting the following life skills: respect, caring, patience, curiosity, sense of humor, responsibility, resourcefulness, initiative, effort, organization, integrity, flexibility, pride, problem solving, friendship, and courage on the walls of the school while witnessing something entirely different take place in classrooms caused concern. Jean stated:

> The teacher is also inconsistent with discipline. For example, if she really likes a child and the child is usually good, she will not discipline the child for breaking minor rules. If a child is the type that disrupts more often, she is more direct and severe with that child, even if they do something minor. The lack of fairness in the classroom is what surprised me the most.

Additionally, lack of child-centered curriculum, lack of creative input from teachers because of scripted curriculum, strict adherence and implementation of standards, lack of science and social studies, and free reading time granted only if worksheets are completed and corrected, both surprised and alarmed preservice teachers. Monica shared her thoughts:

> As I walked into the second grade classroom filled with 19 little faces, I thought I knew exactly what to expect. However, after being in the classroom for only four days, I discovered many new ideas, perspectives, and difficulties that I did not expect. The biggest difficulty that I never paid much attention to before was the list of standards that must be completed throughout the year. I knew that standards existed, but I did not realize how strictly a teacher has to follow them. When asking my

teacher what she was planning for her science curriculum, she turned to her standards book and then picked up a book full of worksheets and lesson plans. She explained to me that she does not have much free time to teach the children what she wants to teach them. All of her time is taken up by the stress of meeting these standards. After learning how unsuccessful worksheets are throughout our clusters, I was surprised to find that this was the basis of the curriculum in the classroom.

Another preservice teacher, Heather expressed her view of standards and their implementation in the classroom which was closely mirrored with what was being taught in the teacher education classes:

> I feel that the standards should be used more as a double check tool for teachers so that they are confident in the content of their teaching. The curriculum should be structured in such a way as to get all of these standards met throughout the year, but the teacher should have the flexibility to design lessons that are appropriate in the classroom at that time. There is a wide variety of levels of learning going on in the classroom at one time, and I feel that there is not a place for an activity that only allows a select few students to actually learn from it. The class, as a whole, should be given activities that are challenging on a variety of levels so that all children in the classroom are learning concepts that are not to easy and not too frustrating.

The next two comments add to what has been discussed; lack of individualization for differentiated learning among students and lack of creativity and freedom for the teachers, bring up additional issues. Hillary stated:

The thing that really gets me is that each child is given the same worksheet for math, science, etc. Annie, a girl that has a learning disability and an IEP (Individualized Education Plan), who can barely write her name out, gets the same worksheet as Jason, who can count and write to 100 and can add and subtract double-digit numbers. Is this fair? Not to Annie who is left at her desk scribbling on the backside of the worksheet, because she has already gone through the front and has the number zero for each answer. Unfortunately, I do not see any individualized teaching in my room.

Shannon added:

It seems that there cannot be that much freedom and it makes me think why do I want to be a teacher if we cannot have any control or freedom in how our classroom is run.

Preservice teachers were astute at picking out areas in their field experience that did not match with what they had previously learned to expect in early childhood classrooms. Worksheets dominated instruction, rote learning was expected, and teachers as well as students were frustrated. This was illustrated by discipline issues that surfaced during instruction. Table Four shows how preservice teachers reacted to their field experiences during this time.

Table Four: Preservice Teachers' Reactions to Field Experiences After a Few Weeks

Reactions	Number	Percentage
Positive	N=3	13%
Dissatisfied	N=20	87%
Total	N=23*	100%

*Note N depended on how many preservice teachers turned in reflection assignments for each category of data, thus N varies from reflection to reflection.

Text Readings Compared to Field Experiences

Because of the discussions in our teacher education classes about field experiences and my obvious desire to help preservice teachers process these experiences, I decided to prompt a reflection during class which stated: Compare and contrast what you read in your text with what you have seen in your field experiences. Again there was a dichotomy among what preservice teachers were seeing in their classes. Some felt their experiences paralleled the text readings, while the vast majority saw significant discrepancies.

Parallel Experiences to Text Readings

Two preservice teachers saw similarities in their field experience classrooms and the *Young Mathematicians at Work* (Fosnot & Dolk, 2001a) reading. One preservice teacher admitted that she had not seen too many lessons in math but had seen manipulatives used so children could sort and classify. The other preservice teacher, Janet, totally misinterpreted what *Young Mathematicians at Work* was trying to convey. In fact this was a pattern that persisted the entire semester with Janet, which was the misunderstanding

between teaching for conceptual understanding versus figuring out rote solutions to individual math problems. Janet related:

> In my field experience I have had the opportunity to work with one little boy one-on-one quite a few times. We spend most of the time redoing his mathematics worksheets from the day before. He is not unlike the girl with the trouble over the seed packets (in reading). He seems to have some grasp of the concepts, but not entirely. When he gets confused or a little lost, he just resorts to what he does know and does his best to finish his worksheet. Reading all the examples in our text made me realize that what he does is not uncommon or unusual and that he will get it completely sooner or later.

Janet made several faulty assumptions comparing the text reading to her field experience. First, she likened the problem-solving she read about in the text to correcting worksheets with a student. The text problem asked children to plan how they would purchase hybrid seeds that came in packages of five. The worksheet Janet helped the student correct had isolated number problems on it, devoid of any contextual meaning, yet she related them both to problem-solving. Second, what Janet terms "concepts" in relation to the boy correcting the worksheet is simply addition and subtraction in the rote form. Conceptual understanding in the reading revolved around children understanding that they could change the groupings of the seed packets to figure out what they needed for their garden, a substantial leap in mathematical understanding. When Janet discussed her student being "lost" she referred to his method of coping to fill in the worksheet, meaning he did whatever it took to get through the thirty or so

algorithms on his paper. Janet also assumed that going over a worksheet the next day was similar to the long-range problem of planning a garden and ordering seed packets, which the children did in the text reading over several days. She did not comprehend that when children are doing their own drawing, writing, or figuring with a situational dilemma presented to them, like planning a garden, it is substantially different from a worksheet full of simple addition and subtraction algorithms, although they are both called "problems."

Lastly, Janet seemed to think her student would "get it sooner or later," working with rote algorithms, associating these with what the text explained, that students who constructed their own knowledge when presented with real-life engaging problems would make meaning from their work. When, in fact, making meaning and constructing knowledge are far different methods for children than filling in a worksheet devoid of any context.

Discrepant Experiences to Text Readings

Sixteen preservice teachers found discrepancies relating to what was explained in the text readings, *Young Mathematicians at Work* (Fosnot & Dolk, 2001), (referred to as *YMAW*) as compared to Saxon math in their field experiences. Elsie explained:

> At my field experience, where worksheets are used excessively, a certain procedure is used to find a certain answer. In YMAW, children are given the opportunity to work through problems with their own methods. If an incorrect answer comes up, the teacher can see how the answer was reached. If an incorrect answer shows up on a worksheet, there's no way of telling how far off the child's thinking was, or if it was a simple error.

Fiona captured the philosophical difference between constructivist math, used in teacher education and Saxon math, used in field experience, "It is all about the process, something YMAW develops, not the product which is Saxon worksheets." Janice explained her own difficulties while trying to assess a Saxon worksheet:

> The math worksheets the children are given with the Saxon math are hard to assess. I graded some of them and it was impossible to tell whether some of the children didn't understand the lesson or just made mistakes. YMAW gives ways to assess the children so that you can see whether or not they understand a concept. Also, giving them the opportunity to draw pictures to show how they understand a concept lets them have a broader range of ways to show they know it.

A key difference preservice teachers found between YMAW and Saxon math lay in how the children responded to problems. YMAW furthered preservice teachers' knowledge and understanding of individual children and the scaffolding needed in order to make concepts clearer. When children draw to interpret real-life problems, a teacher can see the process the child went through while figuring out how to solve the problem. With Saxon math, the teacher only sees numbers written on the paper, not an accurate way to assess a child's knowledge of math much less the students' thought processes and conceptual understanding.

Final Thoughts on Field Experience

At the end of the ten-week field experience, I wanted to more fully understand what preservice teachers had learned. Their writing prompt was: What did you learn from your field experience now that it is over? Much learning

had taken place with a wide variety of encounters during field experiences. Probably the most expressed sentiments from preservice teachers involved the joy of developing relationships with children and their own teaching experiences. Preservice teachers shared practices they would replicate in their own classrooms as they become teachers as well as those they would not. This section discusses each of these as well as some lingering questions preservice teachers still had after their field experience ended.

Practices Preservice Teachers Would Replicate

One preservice teacher commented on her field site teacher's "amazing classroom management skills." The field experience provided preservice teachers with many different ideas and strategies about how they might handle their own classrooms in the future. Suzanne explained:

> Not only did I start to feel more comfortable in that classroom, I started to rethink prior judgments I had made about the teacher. The classroom is in immaculate order and the teacher has the children in such a routine that if you don't do things like her, they go nuts. Totally inflexible. But then I began to appreciate the way they had procedures down by the back of their hand, and they would carry on their busy morning work while she continued to get the classroom ready for the day. They always knew what was expected of them and there seems to be less trouble that way. The teacher also had a much different voice than I do. The teacher is very quiet and the children can pick out her voice from anywhere. That was hard to understand at first, because I tend to use a lot of inflection in my voice and vary my voice level a lot according to what I am doing with children. It was

so obvious that the teacher cared about all of the children and that they knew that, not as a collective group but each individual child felt the care that the teacher has for them. That seems to help with behavior also, because they are really seeking her approval, not as a meaningless reward, but from her heart.

When preservice teachers saw a strong relationship between students and teachers, they realized that discipline issues and procedures in the classroom ran more smoothly compared to classrooms in which this was less evident. Initial greetings, both by students, preservice teachers, and teachers as children first entered the classroom, allowed some time to share new events and happenings in students' lives. Another way of learning about students was fostered during journal writing because children wrote about themselves, their families, and what was important to them.

Reading aloud to children was an activity preservice teachers planned to pursue in their own classrooms, for two reasons. First, they did not see reading aloud as frequently as they thought they should in their field experiences and realized what a powerful instructional model it is for children. Second, preservice teachers genuinely enjoyed reading to children and noted that it had a calming effect on the children's demeanor. It was an effective way to "take a break" which allowed both children and teacher to escape into the story and create another learning opportunity, one that is often under-used.

Hands-on methods of learning with manipulatives proved powerful for both preservice teachers and children. Preservice teachers noted the interest and engagement of students when teaching their own science experiments, an

enthusiasm that was missing during much of the day during the children's regular learning with worksheets. Additionally, some teachers used a kinesthetic approach to learning words with "airplane" writing, using their fingers in the air writing imaginary letters, and clapping to the letters to words. Again, student involvement was high and preservice teachers appreciated this more active form of instruction.

One preservice teacher was so impressed with her field experience teacher that she requested to be placed in her room next year during her student teaching. Because this teacher was "looping" her class, she would teach the same students again next year in second grade. Jill's excitement stemmed from the fact that she already knew the children and teacher; thus her comfort level was high. She would be able to work with the teacher over the summer and help her plan for the upcoming year rather than going into a classroom where a teacher has already arranged the schedule, room, plans, and some activities. She was pleased she could be an active participant in this process.

Many preservice teachers expressed worthwhile experiences at their field site that they would emulate in their own classrooms, such as building relationships with students, offering hands-on instruction, and instilling the joy of reading and reading aloud to their students.

Areas Preservice Teachers Would Not Duplicate

Lack of flexibility in curriculum and use of direct instruction bothered preservice teachers. They felt they were not seeing the types of instructional strategies and use of materials that had been modeled at the university and other field settings. Rebecca shared her frustration that students were allotted only ten

minutes per center and then required to rotate to another center. This barely allowed her to get adjusted to what the children were supposed to do at each center and certainly did not let allow children to get settled and begin learning. Discovery and inquiry were missing.

Saxon math proved a challenge for preservice teachers. They could not understand following a word-for-word script to teach children mathematics while doing page after page of non-contextualized problems and then sending more of the same home as homework for these young children. Preservice teachers saw multiple opportunities daily to use math in a real world in a meaningful manner, but they were overlooked. This frustrated preservice teachers, especially as they were learning alternate methods in teacher education with which they wished they had been allowed to experiment while in a classroom with students. Following this, preservice teachers were disenchanted with the amount of grading these worksheets required and the lack of any real learning from errors because of the format of instruction. The repetition bored the preservice teachers and soured the students on mathematics altogether because they could not see the usefulness or purpose of it. Cathy stated:

> In addition to the planning problems within the Early Childhood system, the rigid structure of the field site also created a variety of tensions. The school implemented a very structured and rather bland method of teaching (such as Saxon math) which seemed to discourage me from attempting to implement any of the alternative methods of education that we have learned about this semester. Although this did not directly affect my lesson plans due to the amount of freedom my teacher allowed, I did

feel that it had a very negative impact on the way that I personally interacted with the children. I was required to implement classroom management techniques, which were not in line with my own philosophy of teaching, and this often resulted in a personal struggle between my own beliefs and those of the field site.

One method of assessment within the Saxon math program involved the teachers asking each child to count once a week to see if that student had mastered counting. What frustrated preservice teachers was the lack of practice the children had counting outside this weekly assessment time. Incidentally, preservice teachers found many opportunities during the day when counting could have been utilized as a practical activity, yet this did not occur. In effect, the assessments preservice teachers were asked to give checked to see if the children had mastered the stated objective, rather than as a means to guide instruction for children's learning. Especially confusing to preservice teachers was the number of people in the classroom helping. There was a minimum of four adults daily, therefore even individual or small group counting activities were possibilities that were not explored. Additionally, one preservice teacher found her field site teacher was so uncomfortable with mathematics that she devoted the minimum amount of time to the scripted lessons and used the majority of her instructional time with literacy, which she felt much more comfortable teaching.

Lingering Comments and Questions

Upon reflection, twenty-eight preservice teachers felt they had learned from their field experiences, while two decided the experiences were counterproductive because of the unfavorable classroom environments in which

they were placed. Three preservice teachers changed their minds about what they believed they would like to teach as a result of their field placements. One decided that she would rather teach preschool, another believed she would do better with older students. Marge shared:

> I learned a lot from this experience. It was great to get an idea of how much planning and preparation goes into a school day on the teacher's behalf, however, I feel like the work was often created just because I would be there. I also learned that I no longer would like to be a kindergarten teacher, at least not at this school. Some days I didn't mind it, but overall the day was too crammed and the priorities of the subjects being taught I felt were out of place. For instance, each time there was a birthday almost the entire class period was spent on the birthday party. I feel like this type of celebration is blowing things out of proportion. The best part of my entire experience was being in the reading room. I met with five or six second graders every thirty minutes all afternoon. This is when I learned the most about teaching.

Other preservice teachers remarked that while teaching on their own, they began to see their own weaknesses in their teaching styles which was helpful because they then knew what areas needed more attention. Because of these experiences, preservice teachers learned that many things can go differently than planned and decided they needed to practice some lessons before embarking on them in the classrooms. Furthermore, preservice teachers were reminded frequently by their experiences at the field site that teaching is a much harder job than they had anticipated it to be. Finally, preservice teachers wondered why

learning could not be more enjoyable for the children during this field experience because preservice teachers did know techniques and instructional strategies that would have positively impacted the children's engagement and excitement in the learning process. Why couldn't children's curiosity be nourished and learning coexist within the framework of the strong natural interests of children bring to school?

Summary of Field Experiences

Differences in field experiences are to be expected and depend upon the personalities of teachers and preservice teachers as well as classroom dynamics. The teachers at this particular field site, because of its location near a large university, had two different preservice teachers with them each day, four days a week, twice a semester. To say the school was inundated with preservice teachers is an understatement, which means the university chooses sites for availability, but not necessarily for quality. However, preservice teachers believed that they were being placed in an early childhood setting that followed the parameters early childhood methods espouse due to the fact that the university had selected this site for Early Childhood majors to spend their field experience. They expected to witness developmentally appropriate practice, not the use of the highly rigid, scripted Saxon math program. Relying on worksheets for most instruction, preservice teachers circulated among the desks helping students as the teacher provided direct instruction on the overhead for the students to copy. Both of these factors contributed to a less-than-perfect, though memorable, learning experience.

Several preservice teachers had positive field experiences, and one is returning to student teach with the same teacher in the fall. Interacting with children and working with them were the highlights of this experience. Preservice teachers also learned to look at their own practices and decided they have much to still learn. Some preservice teachers indicated that they saw parallel experiences in their field experience classrooms compared to the text we were reading in teacher education. Most preservice teachers, however, realized that pedagogical discrepancies existed between the concepts they were reading about in teacher education and what was taught in their field experience. Additionally, preservice teachers were both surprised and impressed with the daily work that goes into being a teacher. New respect for the teaching profession was developed by preservice teachers.

Chapter Six examines the teacher education aspect of the mathematics methods course, describing both what transpired in the teacher education classroom and the responses of preservice teachers to these constructivist experiences.

Chapter Six

Constructivism in the Teacher Education Classroom

Considering the vast amount of experiences preservice teachers bring into their education classes, it is imperative that groundwork establishes them as a cohesive, working group of learners. Nowhere is this more evident than in mathematics due to the numerous backgrounds found in preservice teachers' personal narratives. This chapter recounts the teacher education classroom experiences during preservice teachers' early childhood mathematics coursework. The following major sections are discussed, initial coursework experiences, building arrays as a learning strategy, new ways to attach meaning to mathematics, and the use of a case study.

Initial Coursework Experiences

In keeping with the constructivist philosophy, experiences in the math lab during teacher education classes involved extensive use of manipulatives. This allowed preservice teachers the opportunity to use hands-on materials to gain insight into various mathematical concepts. Centers were set up in which preservice teachers could become familiar with many manipulatives such as geoboards, pattern blocks, unifix cubes, fraction bars, base 10 blocks, scales, counters, tangrams, dice, spinners, and three dimensional wooden cubes. Initially, preservice teachers explored and "played" with the manipulatives without any directions as to specific outcomes. As they worked in small groups discovering various characteristics of the manipulatives, they began to decide ways in which the materials could be used to construct meaning around several mathematical concepts, a key purpose of the constructivist activity. After working

in centers, the whole group came together and brainstormed the many mathematical activities that each manipulative could be used for to construct understanding for children in the classroom. This allowed preservice teachers to create their own activities from manipulatives and understand the importance of meaning-making in the process of student learning. To cement conceptual learning for preservice teachers, each teacher education class involved the use of manipulatives for given tasks beginning with counting, sorting, graphing, addition, subtraction, and classifying.

Similarly, the alternating of small group and whole group activities was present during each teacher education class. Small groups worked on open-ended tasks during which they engaged in critical thinking and problem-solving. In addition, whole group discussions followed these small groups to allow the small groups to share their findings with the entire class. Several of the following sections elaborate on these experiences. Although each week in the math lab the class participated in hands-on conceptual mathematical activities, initial data collected from preservice teachers focused on *Young Mathematicians at Work* readings, personal narratives, and field experiences rather than what we did in class. This, was due, in part to the fact that I wanted their personal narratives stated (as reported in Chapter 4) before they were able to dig too deeply into learning math in a constructivist fashion. Additionally, I wanted their initial reactions to their field experience (as reported in Chapter 5) which took place during the first couple of weeks during the semester. Lastly, I could discover the nature of preservice teachers' impressions while they learned how to add and subtract with manipulatives. They seemed to accept this method as a natural and

commonsensical approach to mathematics. Thus the data presented here were acquired further along in the semester (about half way through the course).

Classroom Artifacts

As the semester progressed, preservice teachers became more and more disenchanted with their field experience (see Chapter 5). As the facilitator for this group, I felt we needed some retooling. Consequently, as I prepared to teach the last class before spring break, I knew that I needed a new tactic to engage the preservice teachers. They had expressed repeatedly the hunger they had for "real-world experiences" in teaching. Accordingly, I believed our class time could best be spent by bringing in classroom artifacts that I had collected throughout my fourteen years of teaching. I transported four crates and innumerable rolls of butcher paper writings to class. I felt it was important that preservice teachers to see the vast assortment of "real world" teaching materials and the simplicity with which they were created.

Every artifact was laid out on tables as the preservice teachers walked in. These included student-made class books, first graders' journal writings, kindergarten theme notebooks of lesson plans, journals I had kept of my own conundrums, parent-teacher reading notebooks, large laminated sayings from popular children's trade books I had made, notes first grade children had written to each other as emerging writers, photographs, and innovative samples of children's work. Butcher paper charts with Venn diagrams, lists my classes had brainstormed for practically every topic of study, chapter diagrams students had made cooperatively as collages, and graphic organizers of every description covered the tables of the lab. The tired, after-lunch look was replaced

immediately by the sheer look of surprise and glee on preservice teachers' faces as they started looking through these artifacts. I gave a brief summary of what each table held and then circulated throughout the room while preservice teachers examined, handled, and inspected each of the materials. Many questions arose and discussions both between preservice teachers and me followed. The reflection topic posed at the end of class was: What helped you today? Gina articulated:

> They should have a weekend conference where people like you tell us stories...After feeling so discouraged, I was debating even doing my student teaching...I am jazzed about being a teacher again. It's odd how a couple of hours of your life can be so inspiring.

Connecting Practice to Real World Experiences

Sharing materials, data, and stories collected from my own experiences seemed to link preservice teachers closer to their own practices. Comments that my "ideas, struggles, and successes" (Anne) seemed to make teaching more real were expressed repeatedly. Preservice teachers confirmed where they were in their process of learning and what they needed to know at this point in time, while seeing actual pieces of students' work gave preservice teachers a more concrete understanding of what type of projects children are capable of doing. Realizing a wide variety of learning activities are possible to accomplish in the classroom with butcher paper and markers, preservice teachers understood how continually revisiting these drawings, charts, and graphic organizers can deepen learning for children. Additionally, while examining materials preservice teachers

began to understand that there were many different types of materials they could make or collect for their own classrooms quite inexpensively.

New Ideas Coalesce

Accordingly, unanticipated methods to implement and organize teaching materials helped preservice teachers form new ideas about their practice. The use of binders to keep thematic units, divided into sections according to content areas of study, and a monthly agenda encouraged and relieved preservice teachers because they were able to see what was reasonably accomplished in day-to-day planning for students. In conjunction with these organizational strategies, discussing individual artifacts and how they were used in the classroom enabled preservice teachers to see a wide variety of strategies for accomplishing different goals. For example, each child had a small spiral notebook that went home daily with a classroom library book for the parents and me to communicate. This allowed the parent to question and comment to me about what was happening with their child's reading. Additionally, I shared specific reading strategies based on individual children's needs that they could implement with their child, rather than the well-known "sound it out" strategy.

Finally, after seeing the artifacts I had saved, preservice teachers commented on how much data was available for them to collect in the classroom. They also realized they, as new teachers, needed to preserve their own artifacts in order to document what they would accomplish. Class books are an example in which children retold and illustrated learning experiences from a field trip. Natural skill development is enhanced, for example, when a trip to a farm results in a class book incorporating both writing and illustration by each student. Each

page began with a letter of the alphabet, and thus the book contained the entire alphabet modeling the use alphabetic order in literacy.

Sharing artifacts was powerful for both preservice teachers and me; it allowed them to feel better prepared to teach because they saw many instructional strategies that they could easily emulate. Simultaneously my strong constructivist model of instruction was validated. Preservice teachers asked for copies of parent handbooks I had made so they could have a model for their own practice as well as for lists I had made with certain materials and useful activities. Additionally, preservice teachers drew and wrote in their notes about various artifacts. Preservice teachers clearly enjoyed the session. Hillary commented on class the day before spring break, "Oh-mi-gosh! I am so glad I came to class today!"

Building Arrays as a Learning Strategy

As the class moved into more complex mathematical concepts that began with multiplication, preservice teachers began experiencing new and different ways of thinking about mathematics. They were discovering more divergent methods than they had seen with addition and subtraction. I introduced multiplication in the visual pattern of arrays. Specifically, 3 x 4 could be considered as rug dimensions and drawn on graph paper as three squares horizontally and four squares vertically. Next preservice teachers were given Base 10 blocks, which had individual centimeter cubes they could build as 3 x 4, also in an array. This led to brainstorming other ways people used arrays in daily life; for example preservice teachers described grocery store arrangements of fruit in boxed arrays including apples, strawberries, blueberries, and pears. As preservice

teachers explored arrays and their multiple methods of use, I asked them to write about the process of multiplication and building arrays by comparing the combination of the concrete and the abstract to their own learning of multiplication. Their reflections described their experiences of four different learning scenarios: those in which they had not previously understood multiplication conceptually, those in which they had previously learned multiplication conceptually, those in which they were comfortable with the rote method they had learned, and those that were comfortable with the rote method but understood the value of building arrays to enhance understanding for students. Each will be described in this section.

Lack of Conceptual Understanding

Many preservice teachers felt they had never really understood multiplication other than how to go through the rote steps to obtain a number for an answer. Cathy commented:

> Honestly, I do not think that I ever learned to multiply. I learned that you memorized facts (multiplication tables) and took times tests. The bad thing for me was that my short-term memory was great. I could memorize anything to pass a test, but I never understood what it meant. Today was the first time I ever understood what multiplication actually was...Today was wonderful for me in that I had a really big math click. I hope that by teaching in two ways I will allow children to experience the same excitement of learning and understanding.

Other preservice teachers were not as good at memorization and did not fare as well. Some preservice teachers had parents who helped them with their

homework only to be told by their teachers that the method they used was incorrect. The simplicity of using Base 10 blocks to build the multiplication problem in a visual way led preservice teachers to wish they had been shown this method as early learners. As these preservice teachers discovered multiplication as a concept that could be built with manipulatives to make meaning of what they were doing, their surprise grew into a lively classroom experience in the math lab. They felt that they could have learned multiplication much more readily had they been given the opportunity to work with manipulatives.

Prior Experience with Manipulatives

Other preservice teachers remembered using manipulatives to enhance their understanding of multiplication and generally enjoyed mathematics, although some unpleasant experiences occurred. For example, after initially using objects to sort into groupings to see part of the multiplication concept, many preservice teachers were then ushered into rote memorization and time tested as children. These proved difficult because although they knew the material, the excitement and frenzy of a stopwatch caused many to freeze and not remember their facts. Preservice teachers also shared strategies they had learned to make multiplication easier for them to master; for example, looking at a problem as a repeated addition of the numbers being multiplied turned out to be useful. Kara explained, "I've always been able to pick up on strategies in solving math problems very easily." Preservice teachers who used Base 10 blocks and other manipulatives realized their value as a visual tool, because they could make sense of the multiplication problem and "actually physically see where the numbers are coming from" (Mary). While recognizing some strategies they were

familiar with, other strategies were new, and the preservice teachers commented on how they could use these to differentiate instruction in their classrooms. Despite the variations in these preservice teachers' backgrounds, all remember using hands-on methods to enhance their understanding of multiplication and planned to use it in their own classrooms as part of constructivism.

Rote Learners of Multiplication

Separately, some preservice teachers learned multiplication as a rote process and did not seem to mind this way of learning; because now it was such an ingrained response, they did not even think about what they were doing. Shelly responded, "I see how children learn by different methods and not every way works for every person, but for me the way I learned still seems the easiest way." Worrying that too much time was taken by drawing arrays or using Base 10 blocks, preservice teachers felt that the traditional way of multiplying was more time-efficient and that sooner or later children would need to "just do it" anyway. This group felt that by taking time to work with manipulatives, children would be confused when they had to move away from them and learn traditional multiplication techniques.

Conventional Learners who Favor Manipulatives

Other preservice teachers learned multiplication the more traditional way and were comfortable with it but could see the value of teaching children how to build arrays to insure understanding. Cheryl looked back on her experiences and explained, "I'm sure many children did not understand the conventional way of multiplying and the visual way of multiplying would have been a tremendous help." While these preservice teachers were successful with traditional methods

of learning multiplication by rote, they valued the opportunity to see how the use of arrays allowed a conceptual understanding of the multiplication process and planned to use it with their own students to promote meaning-making.

Table Five shows the categories of preservice teachers and their beliefs while learning arrays. This table is shown so the reader might better synthesize differing ways preservice teachers view their own learning. Although percents are used, I recognize this as an organizing tool not to be used for statistical purposes. Each table has a different number of participants because at times fewer than thirty preservice teachers attended class.

Table 5- Preservice Teachers' Perceptions of Learning Multiplication

Prior Lack of Conceptual Understanding	N= 10	38%
Prior Experience with Manipulatives	N= 8	31%
Rote Learners	N=5	19%
Conventional Learners who Favor Manipulatives	N=3	12%
Total	N=26	100%

Preservice teachers experienced multiplication differently as students, but over three-quarters of them decided the use of manipulatives either was beneficial or would have been beneficial to them as learners and planned to use arrays and Base 10 blocks in their own classrooms to foster a conceptual understanding of mathematics.

New Ways to Attach Meaning to Mathematics

During another class, the conceptual understanding of multiplication was extended through the use of different strategies. Additionally, sorting and

graphing activities were utilized to provide new frameworks for discovering mathematics using everyday objects. This section details what preservice teachers thought about extended multiplication strategies, sorting, and graphing activities that were used in the math lab. I posed the following questions for reflection: Write about what we did today concerning multiplication, sorting, and graphing. What stood out to you? What did you learn? What helped your thinking about teaching children?

Multiplication and Large Numbers

While learning themselves, preservice teachers also expressed the value gained from differing strategies to approach multiplication. Individually they had their own favorite strategies they relied upon while multiplying, something they had been doing for years, yet they had never considered it to be useful for mastering multiplication. Betsy wrote:

> Talking about the multiplication strategies helped me realize the many different ways children can go about learning multiplication. I understand that I must pay close attention to how a child is learning and what process they are using to fully understand where they are developmentally, even if I do not understand fully the strategies they used.

Other preservice teachers echoed this, stating they had not previously thought about how many different strategies and methods there are to arrive at a solution. Many preservice teachers had only learned one or two different strategies beforehand. Strongly believing they needed to know, learn, or recognize many approaches to problem-solving, preservice teachers pursued new methods so they might recognize and understand ways students might process

multiplication in their future classrooms. Preservice teachers fundamentally believed they needed to comprehend students' thought processes and work to enable learning to occur for all children in the classroom. Interestingly, preservice teachers mentioned a technique that they learned in algebra with the acronym of FOIL, representing first, outer, inner, and last, the order they were to multiply numbers in quadratic equations. They had never thought about using it with young children as a multiplication strategy to aid conceptual development.

Sorting and Classifying

Including the use of everyday objects into a constructivist classroom was part of weekly ongoing learning activities. Shells and shoes were the sorting and classification items used in one particular session. Baskets of shells were passed around to each table. Preservice teachers were asked to sort and classify the shells into groups according to properties they agreed upon. Later, the class used the shoes they were wearing to do a whole group shoe sort based on the different characteristics of the shoes. Mary explained how she would incorporate these activities into her curriculum:

> I loved the sorting activity we did with the shells and our shoes! I think children would love these activities because there are so many ways to sort them. Plus, you can use almost anything to sort.

Along with the simple, primary principle of sorting and classifying common objects, preservice teachers began to consider many everyday items they might use in their own classrooms for children to construct initial meaning. Furthermore, preservice teachers began to realize they could create meaningful mathematical activities for their students with simple materials that were found

many places in the classroom without formalized lengthy lesson plans. Last minute engaging activities could be utilized at transition times, for example, during the ten minutes before lunch when children tend to be restless. Children could do them independently, in small groups, or as a whole class. Preservice teachers found the sorting and classifying to be restful and relaxing, which they believed students would find also, thereby ensuring a smoother flow for learning in their classrooms.

Graphing

Closely associated with sorting and classifying are graphing activities during which children lay real objects on a large table or floor graph. Preservice teachers graphed their favorite place to swim (such as a lake, ocean, or a pool) by placing a shell in the appropriate column. The graph was set up near the entrance to the math lab, so when preservice teachers entered, they saw the graph and placed their shell in the appropriate category. Mary stated:

> I learned how to incorporate everyday items (shoes, gloves, even children) into math activities by sorting and graphing data. Talking about all the ways to sort the objects helped me think about the different ways you could teach children the same concept. Learning and math is fun!

Additionally, the graphing contributed a strong visual component to learning, which preservice teachers appreciated because the concepts were illustrated with life-size real objects that children could manipulate. As preservice teachers also discovered, a graph lends itself quite naturally to interaction between peers, which promotes communication about mathematical principles, a desirable outcome in the classroom. Preservice teachers experienced first-hand

the reason for explaining what they had done. Interpreting their learning orally deepened the way in which they perceived a concept and thus strengthened their own knowledge, which is crucial to constructivist learning.

Candy Bars and Crawling Animals

As I continued mathematical exploration into more advanced activities for preservice teachers, I was conscious of striking a balance by presenting open-ended problems that were mildly frustrating as well as activities that were still open-ended and more creative yet would be challenging to young children. *Young Mathematicians at Work*, the series of texts the class was reading, and TERC's (not an acronym) *Investigations into Data and Space*, another series of texts were used during each teacher education class. The session described in this section is divided into two parts, one describing learning fractions, and the other, a TERC activity for data collection.

Chocolate and Fractions

For many preservice teachers fractions were confusing and something over which they felt little mastery of during their own school experiences. For that reason, I wanted to "normalize" fractions into everyday real-life problems. This meant that preservice teachers could begin to conceptually build their own understanding instead of relying on old rules, such as "invert and multiply" which had no real meaning for them.

I posed the scenario of having six children but only 5 "Hershey" bars (the flat, segmented candy bar). Small groups formed and preservice teachers were asked to figure out ways to divide the candy bar so each child had the same amount of chocolate. When finished, each group presented their method on the

board in front of the room and explained the process they had used to obtain their answer. Fiona explained:

> I thought it was interesting how each group came up with different ways to divide the candy bars. I like seeing all the examples of how the problems can be figured out, because it takes a look into what a child might see when he or she sees a problem. I think the best part is that if we would have just looked at the problem a little bit closer, we could have just said it was 5/6 because you have 5 candy bars and 6 people. The problem was much easier than we made it out to be. I realized then how children can feel when they look at a problem.

Repeatedly preservice teachers expressed amazement at the different ways their peers decided to solve the problem. They saw the importance of allowing children to draw, share, and explain their answers because of the many methods available to solve this problem. Rebecca commented, "Drawing pictures and diagrams increases one's understanding and comprehension of a concept incredibly." Working with a tangible problem seemed more beneficial to preservice teachers, and they, in turn, could see how important it is for children to be given an authentic task rather than a worksheet with meaningless numbers and no real-life context. After listening to different methods used for problem-solving, preservice teachers also believed children would learn from their peers' explanations and develop new ways of problem solving.

In conjunction with this new belief, preservice teachers understood the importance of discovery, exploration, and investigation of mathematical problems as an initial learning tool. Cathy explained:

> This has greatly influenced my own concept of teaching math. I had always liked the idea of children learning through a hands-on approach, however, I honestly always thought that they would use the hands-on approach to practice certain skills after I taught them the formulas. Looking at problems such as the candy bar problem, it is easy to see how the children can learn through their own methods first. The formulas come much later.

Evidently preservice teachers had believed in hands-on learning, but in this case, it was just to practice what the teacher had already taught the students. This was clearly not constructivist. After constructing their own meaning first, preservice teachers understood the value of later introducing the formula after learning had been internalized. This inductive approach represents a huge shift in this thinking of preservice teachers.

Ways Animals Move and Data Collection

Posing the dilemma, "Does It Walk, Crawl, or Swim?" this TERC activity was geared for second or third graders to enable them to collect, sort, and classify data through a constructivist activity. Preservice teachers were asked to brainstorm a list of animals that were indigenous to their neighborhoods and sort them into groups according to how these animals travel, thus answering the question, "Does It Walk, Crawl, or Swim?" Cheryl recorded her thoughts:

> I liked how we were able to explore the activity first to understand it better. It is easier for me to get it when we do the activity instead of reading through the information...It was a good activity and I can see how other areas of the curriculum can be incorporated into it, such as social studies. It is definitely a lesson I would use in my own classroom.

This was the consensus of the twenty-six preservice teachers that participated in this activity. Additionally, preservice teachers remarked that they had heard about integrating math and science but had no idea it could be a simple as an activity like "Does It Walk, Swim, or Crawl?" Many preservice teachers connected extensions to this lesson quite easily after having a base to build on such as this. While preservice teachers found this activity engaging, interesting, and fun (they forgot they were "doing math") they discovered they were also learning especially about new ways to think about mathematics. Accordingly, as they participated in groups with other preservice teachers, they were able to look at the activity through a child's eyes because they were also processing sorting and classifying animals, just as children would be doing. Preservice teachers saw the importance of thinking through the problem rather than having it narrowly defined, which is the case in non-constructivist classrooms. They valued this learning activity while understanding how important small group learning can be as a forum for students to discuss concepts. Furthermore, preservice teachers decided there were numerous ways to represent this data, spanning the many different learning styles that they would surely encounter in their own classrooms. Learning mathematics with peers while captivated with an interesting open-ended problem in a collaborative hands-on environment further enabled preservice teachers to see the value of this type of activity.

Social Construction of Meaning

As the semester progressed and mathematical concepts continued to become more difficult, preservice teachers saw the wisdom in discussing their

text readings together to better connect what they were reading to their learning. Three *Young Mathematicians at Work* (YMAW) texts emphasized open-ended situations for children to solve using their own methods, whether they involved manipulatives, diagrams, drawings, or both. In the textbook, children were presented with a problem and then asked to work in small groups to make meaning of it before explaining to the class how they approached the problem. Each phase of this was described in the text. Consequently, YMAW presented many children's drawings combined with descriptions of classrooms and the types of problems posed. This proved confusing to preservice teachers, especially since they had witnessed only scripted math in their field experience. Therefore, in teacher education classes I assigned small groups of preservice teachers certain sections of YMAW to discuss and then teach. At the close of class, I asked preservice teachers: Write about what you learned today concerning YMAW and our conversations about it. Ellen offered her insight:

> Well, I'd have to say discussing it definitely helped in understanding it. Hearing other people talk about these concepts made it much more clear than just reading it. I think math is much more of a social learning activity than it has been treated. We can learn so much from each other and the different ways we each "word" things.

Allowing preservice teachers themselves to experience the power of learning together enabled them to comprehend the importance of small group discussion for use with their future students. As a result, preservice teachers witnessed their own struggles and could identify with similar situations their students may also encounter. Thus, by actually working through the process

constructively, preservice teachers apprehend its value and will be more likely to use it in the classroom because they saw first-hand its impact. Preservice teachers believed that working on a problem in a contextual way would enhance students' learning because it was more meaningful. Also, preservice teachers concluded that students would be better prepared for real-life experiences because they had been exposed to them continually and encouraged to think more deeply about problems. This was certain to serve students well throughout life.

Additionally, preservice teachers felt by utilizing discussion and small groups as instructional strategies that they, themselves as teachers would have a better understanding of their students and be better prepared to scaffold students' learning. Informal assessment, a particularly useful outcome of small group discussions and whole group sharing was recognized by preservice teachers as a useful tool in their quest for understanding students' conceptual thought processes and for helping them move these thought processes forward.

Role-Playing as a Learning Venue

Because real life challenges and events that could occur in classrooms were of interest to preservice teachers, role-playing was a natural insertion into this constructivist curriculum. Preservice teachers generated situations in which they felt they needed to see modeled in this mock setting. Various topics were covered including how to resolve conflict within classrooms between students, classroom management, parent-teacher conferences, discussions with administrators, how to insert personal philosophy into their collaboration with other teachers without alienating others, and interviewing for teaching positions. Cathy described the process in this way:

> Last week was the first time I had ever witnessed role-playing as a teaching tool, and I loved it. It was a great way to look at how teachers and parents interact. I would like to do more of these activities, because I felt the combination of selecting our own problems for discussion and then working through them very actively was a great learning tool for me...Obviously it is not possible to cram everything that a teacher needs to know to be successful in the next few weeks, but I do feel that these small topics will provide me with some extra ammunition that I need to face the world of teaching with my head up.

Interestingly, preservice teachers had not considered the value of role-playing in assisting their own learning nor as a powerful learning tool to use in their own classrooms. Given the opportunity to play a variety of roles, preservice teachers were able to explore the dynamics of different situations and both practice and observe multiple ways to handle them. Recognizing varying approaches to circumstances enlarged preservice teachers' perceptions and allowed them to "try out" new methods within the scaffolding of a teacher education classroom. As a result, twenty-five of the twenty-six teachers felt that role-playing was extremely beneficial. These twenty-five preservice teachers had never attended a parent teacher conference. One preservice teacher who did not find the role-playing helpful believed it seemed contrived because she had experienced actual parent-teacher conferences.

Case Study From a Teacher Educator's Perspective

At our final class I shared a case study, an authentic document representing my experiences with a boy I taught in both first and fourth grades

(in Appendix B). My rationale was twofold: I wanted preservice teachers to understand clearly my thought processes and the various strategies I implemented with this struggling student, and I wanted preservice teachers to comprehend how I had blended my constructivist theory into practice. Both are described in this section. As a final reflection, I asked preservice teachers to respond to the case study and ensuing class discussion. Suzanne shared:

> It's helpful to look at what your thought process was in regard to Zach. It also exemplifies the conviction to do the right thing for your students, which is often overhauled by the pressures that come with teaching. It's one thing for professors to tell pre-professional teachers to do what's right for the students, but this paper shows us what it looks like which is so important.

Looking Deeply at a Child

Preservice teachers were amazed at the depth of knowledge, which accrues as a teacher begins to truly "know" a child. The teacher comes to understand his strengths, interests, and vulnerabilities. Additionally, preservice teachers did not expect a child to show such dramatic differences in learning subject matter. Jean stated, " This case study helped me understand that a child can be very skilled in a lot of areas, but struggle in others." Reminding preservice teachers that many students learn through varied methods, this case study offered multiple and sometimes unique instructional differentiation illustrating how to capture and maintain student interest while building intrinsic motivation. Showcasing student strengths and struggles encouraged preservice teachers to focus on individual children's specific needs while reinforcing their strengths while

helping them learn.

An In-depth Look at Practice

Preservice teachers noticed this case study provided a summary of differentiated instruction, which they had learned this semester and contextualized the true aspects of a child's learning. Commenting about this understanding of one child, Jill added:

> There were very good depictions of the child. I liked the details. It seems that this would have taken a lot of work to think about one child. How difficult is it to think about 25 children at one time?

Preservice teachers realized that working with an entire classroom of children would provide challenges, and they regarded this as a journey through their own pedagogy. Surprised at the attention one child needed, preservice teachers appreciated the many strategies they had been learning throughout the semester. For example, concentrating on student strengths as a foundation for learning enabled preservice teachers to view students in another way, besides the the traditional "deficit model" focusing on what children cannot do and fixing it with continuous repetitious practice. Additionally, my listing of resources and explaining specific thought processes with various techniques enabled preservice teachers to have a working document to which they could refer as they began their own practice. New perspectives and transparency about real-life practice helped preservice teachers grapple with their own thoughts. Cathy explained:

> It was really interesting to read that you never had this one magical breakthrough that fixed everything. I often feel that television and various books give the impression that the good teachers always have those

breakthroughs. Teaching is not always about working miracles. It is about doing the best that you can all the time and knowing in your heart you did what you could.

Summary of Constructivist Teacher Education

Preservice teachers experienced multiple constructivist activities during the semester in teacher education. They worked with a variety of manipulatives and discovered applications that helped many children to learn mathematical concepts in the classroom. Additionally, preservice teachers' own understanding was enhanced; working with small groups of other preservice teachers provided them with their own learning experiences. This, in turn, enabled preservice teachers to see how this instructional technique validated their learning and could be utilized effectively in the classroom with students. While explaining thought processes to others in a whole group setting, preservice teachers found their meaning-making and learning deepening with respect to what they were explaining. Accordingly, discussions among learners strengthened conceptual development and allowed preservice teachers to realize the value and role of classroom discussions in their own practice.

Preservice teachers requested real-life classroom experiences so they could contextualize their meaning within their own learning frameworks. In turn, these experiences propelled preservice teachers into considering learning in new ways. Classroom artifacts that I had collected allowed preservice teachers to glimpse some materials, learning activities, and organizational methods that could be replicated in their own classrooms. Building more complicated mathematical concepts with manipulatives in different ways allowed preservice teachers to

construct their own meaning, and this in turn enabled them to see the important role this plays in the classroom. Sorting, graphing, and classifying with items from nature or everyday objects gave preservice teachers opportunities to participate in simple but critical mathematical development. Role-playing between preservice teachers and me allowed the class to work out various scenarios they will encounter as teachers, again providing real-life experiences.

Last, analyzing a case study rounded out our constructivist teacher education experience. Believing in "walking the talk," I shared my own real-life experiences with a student in order for preservice teachers to understand the processes I went through as a classroom teacher. In Chapter 7, I share the conclusions I have obtained from my study.

Chapter Seven

Conclusion: Integrating Personal Narratives And Constructivism into Teacher Education

I chose to pair two conceptual frameworks in order to study preservice teachers' and their pedagogical development. First, I used the personal narrative framework Carter and Doyle (1996) developed to identify and examine experiences preservice teachers bring with them into teacher education. Second, I applied the meta-analysis Dangel and Guyton (2003) provided on constructivism as a vehicle to describe how preservice teachers were being taught in teacher education. Infused with my strong preference for inductive thinking and constructivism, the summary of these frameworks and my findings are shared in the following sections.

Summary of Findings

If we are the sum of our experiences, personal narratives play an important role in our epistemology as developing teachers (Carter & Doyle, 1996). Martinez (1998) believes personal narratives serve as organizational tools to make sense of our world, and are often overlooked as a valuable teaching agent. Brownlee et. al. (2001) found that when preservice teachers revisit their own learning through personal narratives, oftentimes, important influences are revealed in their educations that they had forgotten or misperceived. Smith and Latosi-Sawin (2000) allow that these personal narratives and revelations form the core of preservice teachers' authentic voices. Brownlee et. al. posit that these are intricately linked to their professional identities. Cole (1994) notes that if these personal narratives are interpreted out of context, they can become a source

of misinformation rather than a strong pedagogical base to inform their teaching. Accordingly, Carter and Doyle found that preservice teachers' misinterpretations of past experiences further their propensity for didactical teaching. Therefore, it is of paramount importance to examine preservice teachers' personal narratives Knowles and Holt-Reynolds (1991) believe and provide a forum to discuss them within the teacher education classroom.

My study found similar results. That is, preservice teachers come into teacher education with a wide variety of prior school experiences. These need to be examined and discussed because these personal narratives are filters that preservice teachers continue to look through as they continue their teacher education. Furthermore, if left unexamined, preservice teachers continue to rely on their previous beliefs, which distort their current learning. My study showed how one preservice teacher, Janet, repeatedly misconstrued how children learned and continued to believe in repetitious worksheets for students.

When we remember what it was like for us as children and as new learners through our personal narratives (which Janet was unable to do, but the other 29 preservice teachers were), it allows us to become better teachers. We can connect and relate more fully to the world of children. Thus, my findings that personal narratives allow preservice teachers to link their experiences to their own learning as they construct their pedagogy closely mirrors other researchers' results (Carter & Doyle, 1996; Cole, 1994; Holt-Reynolds, 1992; Knowles & Holt-Reynolds, 1991; Richardson, 1996).

Constructivist Pioneers

Constructivism has been credited to some of the most influential thinkers of the twentieth century, beginning with Dewey and following with Piaget and Vygotsky (Brooks & Brooks, 1993; Gales & Yan, 2001; Gillespie, 2002b; Kirova & Ambika, 2002; Livingston, 2003). Many studies exist that emphasize the value of constructivism for preservice teachers because of the robust learning, which occurs as meaning is constructed (Aldrich & Thomas, 2002; Cole, et. al., 2003; Hart, 2002; Holt-Reynolds, 1991; Martinez, 1998; McClure, et. al., 2003; Zazkis, 1999). Dangel and Guyton (2003) conducted a meta-analysis of constructivist studies and research literature that entails eight characteristics for constructivism in teacher education. My findings within these distinguishing factors are described in this section: constructing a learner-centered environment, the safety of cohort groups, the power of reflection for preservice teacher learning, the unexpected results from extensive field experiences, the efficacy of collaborative learning, the strength of relevant problem-solving, the potency of authentic assessment, and convincing action research.

Constructing a Learner-Centered Environment

When learners take ownership of their learning, connections deepen and allow expanded understanding during this learning as Dangel and Guyton (2003) reported. I found similar results: when preservice teachers were provided with an environment that invited exploration, inquiry, and questions, they became engaged and active in their own learning. Asking preservice teachers to write ten questions they were interested in learning during the semester allowed me the opportunity to tailor the learning environment specifically to address these

questions. Additionally, the extensive use of manipulatives for hands-on experiences during centers proved vital for concept development. Small group activities and discussions enabled preservice teachers to "try out" new practices and share their results with each other before whole group discussions took place. Each of these contributed to creating a learner-centered environment for preservice teachers, which I believe is essential for constructivist learning to take place.

Safety of Cohort Groups

Learning in small cohort groups that stay together over a period of time allows preservice teachers to build their own learning communities and scaffold each others' learning (Dangel & Guyton, 2003). I found that the preservice teachers I worked with had been together the previous semester in their classes and continued learning together in the same cohort of classes. During their field experiences preservice teachers were also paired together in classrooms at the same time. This cohort grouping contributed to the emotionally safe atmosphere in my class where preservice teachers carried on lively discussions debating pedagogy with each other. Additionally, I found that building a learner-centered environment within cohort grouping promoted strong scaffolding for contructivist learning which built the foundation for collaborative learning and problem-solving.

Power of Reflection for Preservice Teacher Learning

Both as a way to build on prior knowledge and share thoughts with teacher educators, reflection allows preservice teachers to get in touch with their own learning (Dangel & Guyton, 2003). I could not have done this study without the

reflections from these preservice teachers in this cohort, nor do I believe I could have been an effective instructor. In a class of thirty preservice teachers practicing constructivism, it is not possible to be part of each small group discussion or know everything that is happening during a two and one half hour class. Naturally some participants are more vocal than others. Therefore, preservice teachers' reflections truly enabled me to "get inside their heads" and have a better understanding of what preservice teachers included in their own learning and how they processed this learning. Additionally, reflections covered many topics: personal narratives about past learning experiences, text readings, field experiences, and happenings in class. Reflections gave me a more rounded and well-balanced picture of what was occurring in preservice teachers' learning and the ability to hear all voices.

Unexpected Results from Extensive Field Experiences

In concert with teacher education, field experiences are critical to the scaffolding preservice teachers need as they develop their pedagogy (Dangel & Guyton, 2003). It seems logical that as teacher educators, we would want our preservice teachers to participate in and witness "best practice" classrooms. Dangel and Guyton allow that each field experience provides preservice teachers with another glimpse into classroom life. I agree that the more experiences preservice teachers join in the classroom, the better prepared they will be for their own classrooms. However, prior to this study, I would have selected constructivist classrooms to support the learning of preservice teachers. At the established field experience site which used Saxon math during the 2003-2004 school year, this group of preservice teachers witnessed scripted workbook

instruction. Furthermore, the Saxon math curriculum used in the school is the exact opposite of constructivist learning which I was teaching in the teacher education classroom. This led to many interesting discussions and reflections, which I will discuss further in the contributions to teacher education findings section.

Efficacy of Collaborative Learning

Collaborative learning improves preservice teachers' efficacy and sense of learning during constructivism (Dangel & Guyton). Working in small groups allowed preservice teachers to experience the power of collaboration thus illustrating the importance of learning together socially. Many had never worked in small groups with mathematics and were surprised how readily constructivism allowed this to be a natural learning opportunity. Specifically working in centers with different manipulatives at each center allowed preservice teachers to collaborate and construct their own learning. Having experienced the advantages of collaborative learning first-hand, preservice teachers are more inclined to use it in their own classrooms as an instructional strategy.

Strength in Relevant Problem-Solving

Problem-solving builds on collaborative learning because it is often best done in small groups where preservice teachers learn in new ways (Hart, 2002; Dangel & Guyton, 2003). Dangel and Guyton state that creating open-ended, real-life problems is essential to constructivist learning and induces preservice teachers to wrestle with new ideas. The data from my study support this; preservice teachers began to look at mathematics in new ways after working together to problem-solve. TERC activities showed preservice teachers out-of-

the-box thinking, ways of looking at mathematics they had not considered before. Many preservice teachers were surprised that mathematics focused so heavily on thinking and the process reached to obtain a solution. They discovered that explaining their reasoning processes to each other was an important tool for conceptual understanding. Consequently, preservice teachers were amazed at how many different ways there were to solve problems that they had not considered before. This stretched their thinking and allowed multiple methods to learn mathematics, which is the goal of constructivist learning.

Potency of Authentic Assessment

Dangel and Guyton (2003) found that because of the different learning paradigm with constructivism, conventional assessment is no longer a reliable measure of learning. Further, they state that examining the process of growth during the semester becomes the focus of assessment. My study concurs with these findings. I used preservice teachers' reflections and the ten questions they asked as assessment tools. At the end of the semester, I asked the preserivce teachers to revisit their original ten questions and write answers to them and hand them in to me. The purpose of this was to remind preservice teachers of what they did and did not know at the beginning of the semester and show them what they had learned during the semester. The data retrieved from this was useful to me because almost all of the three hundred questions had been covered during the semester. Appendices C and D are two of the most complete preservice teachers' assessments, which revisit their original ten questions with their end-of-semester responses which clearly show the value of authentic assessment.

Convincing Action Research

Utilizing their own data preservice teachers grew and began their own professional development (Dangel & Guyton, 2003). I believe the reflections these preservice teachers wrote over the semester concerning a wide variety of experiences serve as a sort of action research for them to chronicle their experiences, as well as for me because I was continually using these reflections to plan my next class session with preservice teachers. Accordingly, the ten questions asked and answered by preservice teachers also provide a form of action research whereby they can see for themselves what they have learned during the semester. As a way for preservice teachers to see my action research, I provided them with a case study I had written about one of my former students (as seen in Appendix B). After having reviewed over 700 pieces of data that these preservice teachers provided during the semester, I believe they participated in action research and that it was crucial to their development as teachers.

Contributions to the Field of Teacher Education

I have found six contributions to the field of teacher education in this research study. Each is described in this section with its role in education. First, the role of personal narratives is well documented in teacher education, as is the role of constructivism. Accordingly, I believe that personal narratives must be the foundation with which constructivist learning is built for preservice teachers. Thus, they are inextricably linked, and one is not useful without the other. Before teacher educators can initiate constructivist learning, I believe that preservice teachers' personal narratives must be activated much as children's prior knowledge is sought before embarking on a new area of curriculum. It is

imperative that teacher educators know what content knowledge and contextual knowledge preservice teachers bring into teacher education. Personal narratives written by preservice teachers at the beginning of the semester allow teacher educators a unique insight into preservice teachers' past experiences, and hence, beliefs about education. Once this is known, teacher educators can begin to build a constructivist learning environment based on preservice teachers' personal narratives and prior knowledge. This study shows the importance of utilizing personal narratives as the base with which to build constructivist learning. I have constructed a model of what this would look like as shown in Figure One: A Model of Constructivism in Teacher Education (see page 158). The eight components of constructivism rotate around the core which is composed of the preservice teacher and his/her personal narratives.

Second, preservice teachers need to think about what they want to learn and express this in the form of written questions for teacher educators. This allows preservice teachers to be active in their own learning and provide some of their own inquiry into teacher education. By requesting ten questions from each preservice teacher, the teacher educator is able to see a wide range of interests preservice teachers are bringing into the field. Naturally there is some overlap of the first few questions that are fairly standard that many preservice teachers ask, but then the questions diverge into many aspects of teacher education. Teacher educators therefore need to use these questions as a springboard for some of the content in constructivist learning so that preservice teachers can see the relevance of student participation in designing curriculum. Collecting these questions also serves as a foundation to obtain preservice teachers' prior

knowledge about education and past experiences. For example, preservice teachers asking how to teach mathematics without worksheets, allows teacher educators to acknowledge that preservice teachers do not know how to teach without worksheets because they have learned mathematics through worksheets themselves. Crafting constructivist practices for preservice teachers to participate in and explaining how these activities are designed and organized afterwards are critical to preservice teachers' learning. Furthermore, these initial questions can be used as an assessment tool at the end of the semester by giving these original questions back to preservice teachers. Asking preservice teachers to respond to their own questions from the beginning of the semester enables preservice teachers to look back and revisit what did not know and were interested in learning earlier. These written questions by preservice teachers remind them "where they were" at the semester's beginning. Again, this gives preservice teachers some practice at reflecting and self-assessing what they have learned throughout the semester, because they often forget or misconstrue what they did not know prior to the course.

Third, the role of extensive field experiences is accepted as common practice in constructivist practices. What is unexpected, however is the outcome that arose between the field experience and teacher education classes. Utilizing Saxon Math in their field experiences, a pre-packaged, scripted, rote mathematics curriculum allowed preservice teachers to witness first-hand the effects of non-contextualized paper and pencil worksheets. Twenty-nine of the thirty preservice teachers were firmly against Saxon Math after teaching and experiencing this program in their field experience. Whereas, in the teacher education classroom,

these same twenty-nine preservice teachers declared that they would facilitate constructivist practices in their own classrooms. I feel fairly certain that my talking about scripted math and its negative effects would not have had the same intense and powerful impact on preservice teachers as their own real-world experiences did. They were able to speak with informed and knowledgeable expertise after witnessing and working with Saxon Math first-hand and the frustrations it imposed on both children and teachers. It is an experience preservice teachers will remember. It certainly molded their pedagogy concerning learning mathematics. This could also be considered action research conducted by the preservice teachers because they compared and contrasted what transpired in the field experience to the teacher education classroom.

Fourth, I found the use of my previous artifacts from my teaching experiences with children helped take children's work and teacher resources into the teacher education classroom. When morale begins to flag, as it often does about mid-semester, taking real classroom tools, resources, projects, and artifacts for preservice teachers to examine and discuss ignites new learning and passion about their chosen profession. Preservice teachers could see the value of some instructional practices more meaningfully by seeing specific concrete examples of children's ideas and work. For example, I repeatedly used and discussed the importance of butcher paper charts made with students in the classroom to access their prior knowledge. Although we made butcher paper charts in the teacher education classroom and used them, it was not until they saw children's actual thoughts represented on these butcher paper chart artifacts that preservice teachers made the connection. Hanging butcher paper charts that a group has

made can activate and reactivate prior knowledge and communicate to children much-needed associations. Thus, I believe teacher educators enhance preservice teachers' learning by sharing some of their own artifacts and collections from their own teaching experiences. Different ways of seeing items and resources spark new learning, which brings a new dimension into education classes for preservice teachers.

Fifth, introducing role-playing into teacher education allows preservice teachers and teacher educators to take on different roles, positions, and situations that are real parts of teaching. Preservice teachers role-play with each other, and teacher educators role-play for preservice teachers. Role-playing permitted me the ability to "model in context" various circumstances teachers confront. I am labeling and coining the phrase "contextualized modeling" to describe a situation- specific form of role-playing in which preservice teachers could watch me "in action" playing the role of a teacher while they pretended to be parents, administrators, and children in various situations. Additionally, I found that when preservice teachers role-played, it allowed them to "try on" different viewpoints, roles, and situations that they will undoubtedly encounter. Role-playing enabled preservice teachers to practice and rehearse dilemmas within the safety of their teacher education classroom. The feedback I received from preservice teachers convinces me that both role-playing and contextualized modeling are important components of teacher education and should be practiced often.

Finally, I believe it is important to provide preservice teachers with my own research and learning. This was illustrated by using a real-life case study I

had written about one of my elementary school students. Preservice teachers' feedback indicated that they were grateful to read about a "real" student in "real" situations with a "real" teacher who did not have some magical solution but rather committed herself to this student by keeping his best interests at heart to enable him to grow and learn. Thus, I feel it is crucial for teacher educators' believability and credibility that they be able to share honest experiences with preservice teachers, as illustrated by using actual case studies.

Limitations of this Study

Several limitations exist in this study, not the least of which is my pronounced belief and bias in constructivism for all learners. Furthermore, this study was conducted near a large, tier-one university in the Midwest with thirty preservice teachers. The lack of diversity could hamper the effectiveness of this research because all of the preservice teachers were female Caucasians. Additionally, the setting was rural and involved almost all Caucasian children with the exception of one African American child. I am not suggesting that the content of this research would be any different if it were used in an urban setting with a wide diversity of children. To the contrary, all of my experience and review of literature underline the importance of constructivist learning for ALL children. I am simply mentioning that the study would have been richer with preservice teachers and children from many different backgrounds and cultures. Especially different, I believe, would have been the preservice teachers' personal narratives because none of the preservice teachers in my study had been in urban or multicultural settings as children.

Implications for the Field of Teacher Education

The implications for the field of teacher education closely follow the contributions to teacher education. Personal narratives should be the initial component of constuctivist teacher education coupled with preservice teachers' questions because of the important background information and prior knowledge they provide. Personal narratives allow teacher educators to better plan for the constructivist learning experiences preservice teachers need to build their pedagogy. This is illustrated in Figure One: A Model of Constructivism in Teacher Education (see page 158).

Field experience sites with ineffective pre-packaged curriculum should not be discounted as potential learning experiences for preservice teachers. Although not the optimum environment, preservice teachers emerge with stronger constructivist beliefs because of their first-hand experiences with a scripted curriculum. However, this must be coupled with a strong constructivist teacher education program to allow discourse and help preservice teachers process their thoughts and experiences.

Finally, three elements augment preservice teachers' understanding while they are learning their craft. Artifacts from classrooms, role-playing in teacher education, and presenting real case studies teacher educators have written represent three techniques teacher educators can bring into their classrooms to make learning more concrete for preservice teachers. These strategies and techniques can enhance constructivist learning for both preservice teachers and teacher educators by delving more deeply into real issues that confront teachers

daily. Techniques and strategies that surface from these three elements allow for more connected real-life learning in teacher education classrooms.

Implications for Future Teacher Education Research

I believe that there are several implications for future research teacher education. First, personal narratives should be a part of constructivist pedagogy and as such, they should be studied in conjunction with constructivism. I would like to see a meta-analysis conducted of personal narratives. Second, I would suggest as a result of this research a possible link to constructivism; instead of eight components of constructivism as Dangel and Guyton (2003) found, perhaps a ninth one exists, that of personal narratives. Personal narratives seem to fit well within the constructivist framework, and I believe they need to be identified as an initial construct to be considered when teaching preservice teachers constructivism.

Second, replicating this study with preservice teachers of diverse backgrounds could contribute insight. The personal narratives they bring into teacher education should be examined as well as their experiences with constructivism in teacher education. Because of their different backgrounds, it would be interesting to see the similarities and contrasts based on their diversity and experiences in school. The exploration of different cultures, races, socio-economic statuses, religions, and genders in personal narratives would offer much needed variety to teacher education.

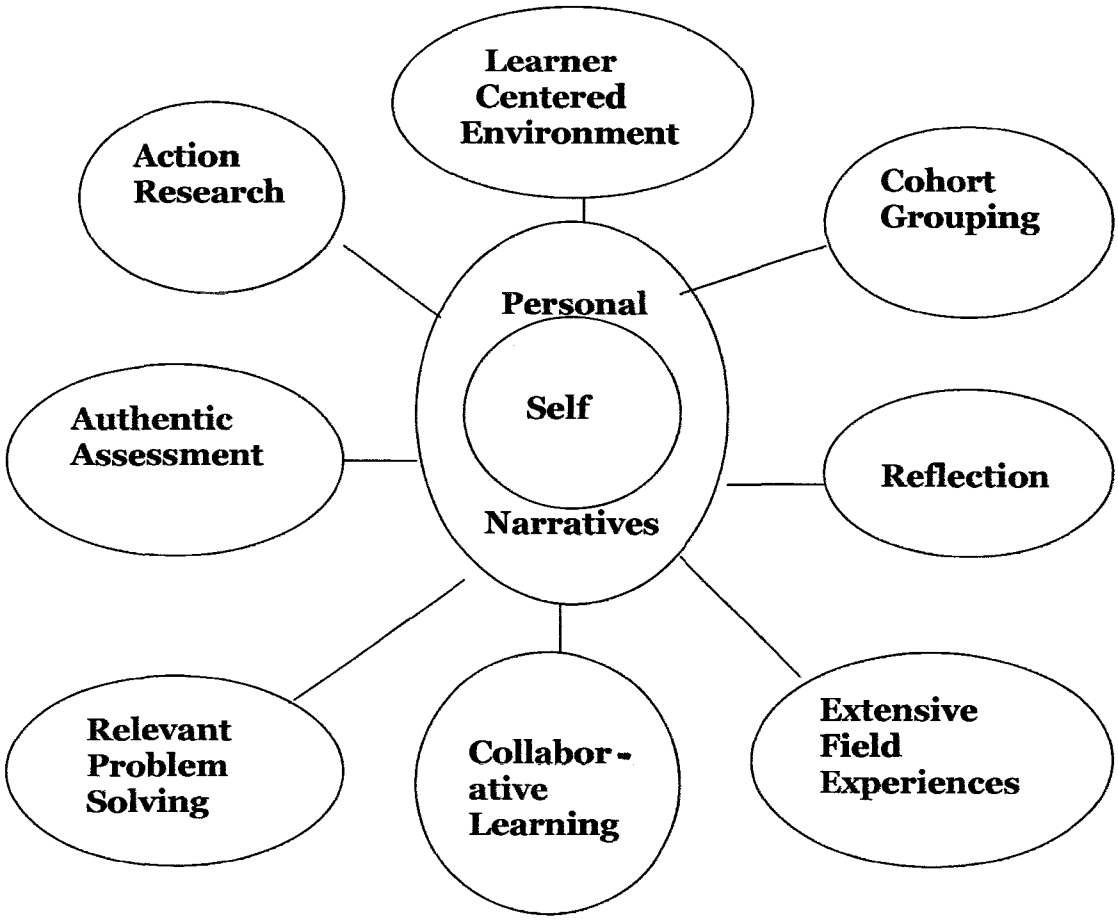
These beliefs from diverse preservice teachers' personal narratives, coupled with a rigid scripted curriculum in their field experiences, would yield interesting data. Another research study could be conducted in an urban rather

than rural setting. Children of diverse backgrounds could be observed. It was difficult for me to teach preservice teachers who had not experienced diversity in their own classrooms as they grew up. Because I had taught outside a megalopolis, I had worked with diverse children. Explaining these nuances to preservice teachers was difficult because they had no prior knowledge or experience with children different from themselves.

Additionally, if scripted pre-packaged curriculum and constructivist curriculum were both researched in field experiences, the reflections preservice teachers describe could be studied. A similar comparison study would be useful at the same site. I believe this would be especially powerful, given the school districts' use of scripted curricula in urban settings as a panacea for children's supposed success. This would be a way for preservice teachers to begin their own action research, become more informed, and provide a voice to what they had seen first-hand, rather than believing the claims of text book manufacturers.

My final suggestion for future research would be a longitudinal follow-up study of preservice teachers through their first five years of teaching. Descriptive research of issues confronting new teachers about curriculum and instruction would benefit the field of teacher education in general. I am sure that there are other nuances that could be explored in the future studies I have described. I leave it to the initiative of other researchers to add to this work.

Figure One: A Model of Constructivism in Teacher Education



This model represents what it would look like to have the preservice teacher in the center as self, surrounded by that preservice teacher's personal narratives serving as a base for constructivism. Surrounding are the eight components of constructivism as found in Dangel and Guyton's (2003) meta-analysis and also confirmed within my research.

References

Abbott, M. L., & Fouts, J. T. (2003). *Constructivist teaching and student achievement: the results of a school-level classroom observation and study in Washington technical report.* (ERIC Document Reproduction Service No. ED481694).

Aldrich, J. E., & Thomas, K. R. (2002). *Evaluating the diverse constructivist beliefs of early childhood, elementary, and middle school education majors.* Paper presented at the Annual Meeting of the Mid-Western Educational Research Association, Columbus, OH (ERIC Document Reproduction Service No. ED472815).

Barth, R. S. (2001). *Learning by heart.* San Francisco, CA: Jossey-Bass.

Bjorklund, D. F. (2000). *Children's thinking: developmental function and individual differences.* United States: Wadsworth Thomson Learning.

Bielenberg, J. E. (1993). *How a teacher's beliefs and knowledge inform practice.* Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Atlanta, Georgia. (ERIC Document Reproduction Service No. ED362396).

Bos, J., Terwel, J., Verloop, N., & Wardekker, W. (2002). Observation in teaching: towards a practice of objectivity [Electronic version]. *Teachers College Record, 104,* 1069-1100.

Brantlinger, E. A., (1999). Inward gaze and activism as moral next steps in inquiry. *Athropology & Education Quarterly, 30,* 413-429.

Bright, G. W., & Vacc, N. N. (1994). *Changes in undergraduate preservice teachers' beliefs during an elementary teacher-certification*

program. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA (ERIC Document Reproduction Service No. ED375087).

Brown, D. (1999). Promoting reflective thinking: preservice teachers' literacy autobiographies as a common text [Electronic version]. *Journal of Adolescent & Adult Literacy, 42,* 402-411.

Brownlee, J., & Dart, B. (1998). The integration of preservice teachers' naïve and informed beliefs about learning and teaching [Electronic version]. *Asia-Pacific Journal of Teacher Education, 26,* 107-121.

Brownlee, J., Purdie, N., & Boulton-Lewis, G. (2001). Changing epistemological beliefs in pre-service teacher education students [Electronic version]. *Teaching in Higher Education, 6,* 242-269.

Brosnan, P. A. (1994). *Practices during the implementation of mathematics standards.* Columbus, Ohio. (ERIC Document Reproduction Service No. ED 372949).

Bullough, Jr. R. V., & Stokes, D. K. (1994). Analyzing personal teaching metaphors in preservice teacher education as a means for encouraging professional development. *American Educational Research Journal, 31,* 197-224.

Bureau, W. E. (1993). *Seeing supervising differently: the processes of facilitating change in a veteran teacher's beliefs.* Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, Georgia. (ERIC Document Reproduction Service No. ED 358508).

Campoy, R. (2000). Teacher Development: fostering reflection in a potstructural era [Electronic version] *Contemporary Education, 71*, 33-42.

Carter, K., & Doyle, W. (1996). Personal narrative and life history in learning to teach. *In Handbook of research on teacher education* (pp. 120-142). Skula, J. (Ed.). New York: Macmillan.

Chatterji, M. (2002). Models and methods for examining standards-based reform and accountability initiatives: have the tools of inquiry answered pressing questions on improving schools? *Review of Educational Research, 72*, 345-386.

Cohen, M. D., & Nath, J. L. (2000, April). *The challenge of impacting preservice teachers' beliefs: a comparison of traditional and field based programs.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Cole, A. L. (1990). Personal theories of teaching: development in the formative years. *Alberta Journal of Educational Research, 26*, 203-222.

Cole, A. L., & Knowles, J. G. (1993). Teacher development partnership research: a focus on methods and issues. *American Education Research Journal, 30,* 473-495.

Cole, D. J., Ryan, C. W., & Tomlin, J. A. (2003). *Inquiry based science: a constructivist approach in teacher education.* (ERIC Document Reproduction Service No. ED473042).

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher, 19* (5) 2-14.

Dangel, J. & Gutyon, E. (2003). *Expanding our view of teaching and learning:*

applying constructivist theory(s) to teacher education. Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, New Orleans, LA (ERIC Document Reproduction Service No. ED472816).

Delpit, L. (2004). Struggle and hope. In C. Glickman (Ed.), *Letters to the next President: what we can do about the real crisis in public education* (pp. 70-76). New York: Teachers College Press.

Denzin, N. K., & Lincoln, Y. S. (Eds.) (1998). The landscape of qualitative research: theories and issues. Thousand Oaks, CA: Sage Publications.

Dewey, J. (1933). *How we think.* Boston: D. C. Heath.

Dewey, J. (1938). *Experience and education.* New York: Simon & Schuster.

Dewey. J. (1990). *The school and society: the child and the curriculum.* Chicago: University of Chicago Press.

Doyle, M. (1997). Beyond life history as a student: preservice teachers' beliefs about teaching and learning. [Electronic Journal] *College Student Journal. 31, 519-532.*

Erdal, S. O., & Ongel, K. (2003). *Promoting learner-centered instruction through the use of cooperative and inquiry learning strategies.* (ERIC Document Reproduction Service No. ED479308).

Feikes, D. (1995). *One teacher's learning: a case study of an elementary teacher's beliefs and practices.* Paper presented at the Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, Columbus, Ohio (ERIC Document Reproduction Service No. ED 389605).

Fickel, L. H. (1999). *Democracy is messy: exploring the beliefs and personal theories of a high school social studies teacher.* Paper presented at the American Educational Research Association, Montreal. (ERIC Document Reproduction Service No. ED 433282).

Fosnot, C. T., & Dolk, M. (2001a). *Young mathematicians at work: constructing number sense, addition, and subtraction.* Portsmouth, NH: Heinneman.

Fosnot, C. T., & Dolk, M. (2001b). *Young mathematicians at work: constructing multiplication and division.* Portsmouth, NH: Heinneman.

Fosnot, C. T., & Dolk, M. (2001c). *Young mathematicians at work: constructing fractions, decimals, and percents.* Portsmouth, NH: Heinneman.

Gates, M., & Yan, W. (2001). *Relationship between constructivist teacher beliefs and instructional practices to students' mathematical achievement: evidence from TIMMS.* Paper presented at the Annual Meeting of the American Educational Research Association, Seattle, WA (ERIC Document Reproduction Service No. ED456133).

Gaudelli, B. (1999). *Teacher as self: understanding pedagogy in global education.* Paper presented at the Annual Meeting of the College and University Faculty Association National Council for the Social Studies, Orlando, FL. (ERIC Document Reproduction Service No. ED 437393).

Gillespie, M. K. (2002a). *EFF research principle: an approach to teaching and learning that builds expertise.* National Institute for Literacy. Washington, D. C. (ERIC Document Reproduction Service No. ED472429).

Gillespie, M. K. (2002b). *EFF research principle: a purposeful and transparent approach to teaching and learning.* National Institute for Literacy, Washington, D. C. (ERIC Document Reproduction Service No. ED472428).

Gillespie, M. K. (2002c). *EFF research principle: a contextualized approach to curriculum and instruction.* National Institute for Literacy, Washington, D. C. (ERIC Document Reproduction Service No. ED472430).

Goodfellow, J., & Sumsion, J. (2000). Transformative pathways: field-based teacher educators' perceptions [Electronic version]. *Journal of Education for Teaching, 26,* 245- 258.

Goodlad, J. I. (2004). Why we need public education. In C. Glickman (Ed.), *Letters to the next president: what we can do about the real crisis in public education* (pp. 54-60). New York: Teachers College Press.

Hackenberg, A. J., & Lawler, B. R. (2002). *An ethics of liberation emerging from a radical constructivist foundation.* Paper presented at the Biennial International Conference on Mathematics Education and Society, Helsingor, Denmark, (ERIC Document Reproduction Service No. ED468200).

Hankins, K. H. (2004). My students, my school. In C. Glickman (Ed.), *Letters to the next president: what we can do about the real crisis in public education* (pp. 113-119). New York: Teachers College Press.

Hart, L. C. (2002). Preservice teachers' beliefs and practice after participating in an integrated content/methods course [Electronic version]. *School Science & Mathematics, 102,* 4-15.

Hillard III, A. G. (2004). If we had the will to see it happen. In C. Glickman (Ed.), *Letters to the next president: what we can do about the real crisis in public education* (pp. 27-34). New York: Teachers College Press.

Holt-Reynolds, D. (1992). Personal history-based beliefs as relevant prior knowledge in course work. *American Education Research Journal, 29,* 325-349.

Hung, D.W. (2002). Metaphorical ideas as mediating artifacts for the social construction of knowledge: implications from the writings of Dewey and Vygotsky [Electronic version]. *International Journal of Instructional Media, 29,* 197-214.

Imel, S. (2003). *Adult civic education. practice application belief.* Office of Educational Research and Improvement, Washington, D. C. (ERIC Document Reproduction Service No. ED480439).

Janesick, V. J. (1998). The dance of qualitative research design: metaphor, methodolatry, and meaning. In N. K. Denzin & Y. S. Lincoln (Ed.), *Strategies of Qualitative Inquiry* (pp. 35-55). Thousand Oaks, CA: Sage Publications.

Jarrett, O. S. (1998). Playfulness: a motivator in elementary school science teacher preparation. *School Science & Mathematics.* 98, 4, 181-188.

Joram, E., & Gabriele, A. J. (1997). *Preservice teachers' prior beliefs: transforming obstacles into opportunities.* Paper presented at the Annual Meeting of the American Educational Research Association. Chicago, IL (ERIC Document Reproduction Service No. ED408269).

Kerka, S. (2003). *Appreciative inquiry. trends and issues alert.* Office of

Educational Research and Development, Washington, D. C. (ERIC Document Reproduction Service No. ED473671).

Kirova, A., & Bhargava, A. (2002). Learning to guide preschool children's mathematical understanding: a teacher's professional growth. *Early Childhood Research & Practice, 4, 2-19.* (ERIC Document Service Reproduction Service No. ED464764).

Knowles, J. G., & Holt-Reynolds, D. (1991). Shaping pedagogies through personal histories in preservice teacher education [Electronic version]. *Teachers College Record, 93,* 87-113.

Kovalik, S., & Olsen, K. (1997). *ITI: the model integrated thematic instruction.* Kent, WA: Kovalik & Associates.

Kritzenberger, H., Winkler, T., & Herczeg, M. (2002). *Mixed reality environments as collaborative and constructive learning spaces for elementary school children.* ED-MEDIA 2002 World Conference on Educational Multimedia, Hypermedia and Telecommunications, Denver, Co. (ERIC Document Reproduction Service No. ED477046).

Lauer, P. A. (1999). *Guidelines for applying the learner-centered psychological principles to preservice teacher education.* Office of Educational Research and Improvement. Washington, D.C. (ERIC Document Reproduction Service No. ED440928).

Lin, H. L., Taylor, J., Gorrell, J., Hazareesingh, N., Carlson, H. L., & Asche, M. (1999, April). *Early childhood and elementary preservice teachers' beliefs.* Paper presented at the meeting of the American Educational Association. Montreal. (ERIC Document Reproduction

Service No. ED430677).

Livingston, D. R. (2003). *Reclaiming early childhood teacher education: a critical Constructivist approach.* Paper presented at the Annual Meeting of the Southeastern Regional Association of Teacher Educators. Savannah: GA. (ERIC Document Reproduction Service No. ED481713).

Lowery, N. V., (2002). Construction of teacher knowledge in context: preparing elementary teachers to teach mathematics and science [Electronic version]. *School Science & Mathematics, 102*, 68-84.

Martinez, K. (1998). Preservice teachers adrift on a sea of knowledges [Electronic version]. *Asia-Pacific Journal of Teacher Education. 26,* 97-107.

McClure, R., Johnson, B., & Jackson, D. (2003). *Assessing the effectiveness of a student-centered classroom.* (ERIC Document Service Reproduction No. ED477743).

McGhie-Richmond, D. R., Jordan, A., & Underwood, K. (2002). *Discovering the general in the particular: a case study of an exemplary teacher's beliefs.* Paper presented at the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 465728).

McLachlan-Smith, C. (1993). *Developing literacy at kindergarten: an examination of teacher's beliefs and practices.* Paper presented at the Annual Meeting of the Australia and New Zealand Conference on the first years of school, Perth, Western Australia, Australia. (ERIC Document Reproduction Service No. ED 376930).

Merriam, S. B. (2001). *Qualitative research and case study applications in education.* San Francisco, CA: Jossey-Bass Publishers.

Mewborn, D. S. (1999). Reflective thinking among preservice elementary mathematics teachers [Electronic version]. *Journal for Research in Education, 30,* 316- 342.

Minor, L. C., Onwuegbuzie, A. J., Witcher, A. E., & James, T. L. (2002). Preservice teachers' educational beliefs and their perceptions of characteristics of effective teachers. *The Journal of Educational Research, 96* ,116-127.

Muchmore, J. A. (1999). *Toward an understanding of life history research.* Paper presented at the American Educational Research Association, Montreal. (ERIC Document Reproduction Service No. ED 429956).

Muchmore, J. A. (2001). *The story of "Anna": a life history study of the literacy beliefs and teaching practices of an urban high school English teacher.* Paper presented at the American Educational Research Association, Seattle, WA. (ERIC Document Reproduction Service No. ED 454159).

Munsinger, H. (1971). *Fundamentals of child development.* San Diego: Holt, Rinehart & Winston.

Nathan, M. J., & Petrosino, A. (2003). Blind spot among preservice teachers. *American Educational Research Journal.* 40, 905-928.

Nieto, S. (2004, March). *What keeps us going?* Paper presented at IUPUI School of Education meeting, Indianapolis, IN.

Nottis, K., Fererstein, A., Murray, J., & Adams, D., (2000). The teacher belief inventory: measuring the theoretical and practical orientations of

preservice teachers [Electronic version]. *Education, 121,* 90-102.

Palmer, P. J. (1998). *The courage to teach.* San Francisco: Jossey-Bass.

Pedersen, B. & Brash, S. (2000). *Climate: soaring to excellence.* Presented at Brainworks TLC, Indiana Summer Institute, Indianapolis, IN.

Quinn, R. J. (1998). The influence of mathematics methods courses on preservice teachers' pedagogical beliefs concerning manipulatives. [Electronic version]. *Clearing House. 71,* 236-239.

Reiff, R. (2002, January). *If inquiry is so great, why isn't everyone doing it?* Paper presented at Proceedings of the Annual International Conference of the Association for the Education of Teachers in Science. Charlotte, NC.

Reissner, S. C. (2002). *Narrative, organizational change, development and learning.* Paper presented at the Annual Eureopean Society on the Education of Adults Life-History and Biographical Research Network Conference, Geneva, Switzerland. (ERIC Document Reproduction Service No. ED465062).

Richardson, V. (1996). The Roles of attitudes and beliefs in learning to teach. In *Handbook of Research on Teacher Education,* (pp. 102-119). Sikula, J. (Ed.). New York: Macmillan.

Rodgers, C. (2002). Defining reflection: another look at John Dewey and reflective thinking [Electronic version]. *Teachers College Record, 104,* 842-866.

Rosberg, M. A. (2003). *Work and play: are they really opposites?* (ERIC Document Service Reproduction No. ED473151).

Russell, S. J., Corwin, R. B., & Economopoulos, (1998). *Investigations in*

number, data, and space: sorting and classifying data. Dale Seymour Publications: TERC.

Sarason, S. B. (2004). *And what do you mean by learning?* Portsmouth, NH: Heinemann.

Senge, P. (2000). *Schools that learn: a fifth discipline fieldbook for educators, parents, and everyone who cares about education.* New York: Doubleday.

Senge, P. (2002). Personal communication December 11, 2002.

Schoonmaker, F. (1998). Promise and possibly: learning to teach [Electronic Version]. *Teachers College Record, 99,* 559- 592.

Smith, M. S., & Latosi-Sawin, E. (2000). Moving backwards to move forwards: helping beginning teachers through autobiography [Electronic version]. *Contemporary Education, 71* (3) 13-17.

Spillane, J. P., Reiser, B. J., & Reimer, T. (2002). Policy Implementation and cognition: reframing and refocusing implementation research. *Review of Educational Research, 72*, 387-482.

Spinner, H., & Fraser, B. J. (2002). *Evaluation of an innovative mathematics program in terms of classroom environment, student attitudes, and conceptual development.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA (ERIC Document Reproduction Service No. ED464829).

Vacc, N. N., & Bright, G. W. (1999). Elementary preservice teachers' changing beliefs and instructional use of children's mathematical thinking [Electronic version]. *Journal for Research in Mathematics Education, 30,*

89-111.

Van de Walle, J. A. (2004). *Elementary and middle school mathematics.* New York: Pearson Education.

White, B. C. (2000, November). *Preservice teachers' beliefs: nonrational to irrational to rational.* Paper presented at the Annual Meeting of the Mid-South Educational Research Association: Bowling Green, KY.

Woods, P. (1987). Life histories and teacher knowledge. In J. Smyth (Ed.) *Educating teachers: changing the nature of pedagogical knowledge* (pp. 121- 135). New York: Falmer Press.

Zazkis, R. (1999). Challenging basic assumptions: mathematical experiences for pre-service teachers. *International Journal of Mathematical Education in Science & Technology, 30,* 631-651.

Zemelman, S., Daniels, H., & Hyde, A. (1998). *Best practice: new standards for teaching and learning in America's schools.* Portsmouth, NH: Heinneman.

Zidon, M. & Greves, S. (2002). *Does this fit? INTASC-based portfolios in a constructivist program.* Paper presented at the Annual Meeting of the Northern Rocky Mountain Education Research Association, Estes Park, CO (ERIC Document Service Reproduction Service No. ED475826).

Appendix A

Reflection Assignment Questions and Probes

The reflections listed are in order as they appear in my research study.

Chapter Four: Preservice Teachers' Personal Narratives and Prior Knowledge

1. Write about what you remember from elementary school. Provide any specific memories, subjects, incidents, or impressions of school.

2. YMAW (2001a, p. 1) "Teaching was what teachers did. They were supposed to know their subject matter and be able to explain it well. Students were supposed to do the learning. They were expected to work hard, practice, and listen to understand. If they didn't learn, it was their fault; they had a learning disability, they needed remediation, they were preoccupied, they were lazy."

3. YMAW (2001a, p. 37) "When one recognizes this developmental nature of learning, one sees the fallacy in the belief that one activity or series of activities can bring all children to the same point at one time."

4. What do you want to learn this semester in this course? What do you wonder about? Write ten questions, five questions specifically concerning mathematics methods you are curious about; the other five can be questions you have about education in general.

Chapter Five: Preservice Teachers' Field Experiences During Their Methods Cohort

1. What do you expect your field experience to look like? What do you think the teacher will be doing? What role will the children have? What activities do you envision taking place? What will the classroom environment look like?

2. What do you notice about your field experience that you had not thought of before? What did you think would be different? What do you wonder about now that you have been there a couple of times?

3. Compare and contrast what you read in your text (YMAW) and what you have seen in your field experiences.

4. What did you learn from your field experience now that it is over?

Chapter Six: Constructivism in the Teacher Education Classroom

1. What helped you today with the artifacts I brought in from my own teaching experiences in the elementary classroom?

2. Write about the process of multiplication and building arrays. Compare this to your own experience of learning multiplication.

3. Write about what we did today concerning multiplication, sorting, And graphing. What stood out to you? What did you learn? What Helped your thinking about teaching children?

5. What stood out today concerning YMAW and our conversations about it?

6. What did you learn from reading the case study I wrote about a student That I had been in my classroom in both first and fourth grades?

7. Revisit the original 10 questions you wrote for me at the beginning of the semester. Write your own answers to each question now that the semester is over. What have you learned? What are your thoughts now?

Appendix B

Zach's Story: Reflecting and Pondering a Former Student

This paper recounts a student I taught both in first grade and then later in fourth grade in a large public grade school located outside a major city. The purpose of this study is to analyze this student's experiences in public education, specifically the needs this child brought into the classroom, the choices I made, and the ways I adapted my curriculum to fit his learning style. Additionally, this paper will address how these experiences can impact teacher education.

Zach's Characteristics

Zach entered my first grade room as I was transitioning from teaching kindergarten back into first grade. Developmentally this was a good fit for me, because first grade teachers tend to remember the end of the year when students seem so able, often forgetting how young they seem as beginning first graders, both in skill level and attention span. Coming from kindergarten myself, my expectations were more in line with beginning first graders.

Zach was a small, wiry boy with a curious mind and an energetic personality. Zach was enthusiastic about our classroom, he enjoyed the ever-changing science table, the Lego table, and all of the many mathematical activities we did. His knowledge of math and science were particularly strong and he was able to construct intricate designs with Legos and other manipulatives. His ability to describe how an object worked or how something was put together was nothing short of amazing.

He participated in the activities we did on the rug such as calendar, verbal activities, mental math, including many skill-building activities with shared reading and big books. He was an active participant sharing his thoughts, comments and well-articulated answers, proving that his verbal skills were strong. Likewise, he enjoyed my reading aloud daily after lunch, listening but also liking to move around. I know he listened because where ever he was in the room, he would call out predictions about the story being read, indicating excellent auditory skills.

Unfortunately, this fondness for school did not extend to reading independently or writing. We drew and wrote daily in journals, the developmental spectrum was highly individualized. While some children drew pictures and tried to write one word labels, some began to write sentences using developmental spelling. Zach spent exorbitant amounts of time readying his workspace finding just the right materials he needed to draw and write. This was unusual, because students were free to sit at any table that had an available spot. Most of his classmates raced to sit by friends, but Zach did not particularly care who he sat with and dawdled finding a seat. Children knew they had to keep one seat open at each table so I could rotate around during journal time helping, listening and participating as a writer. Zach was a master at looking busy and involved with tablemates during journal writing. He was generally very interested in what everyone else was drawing and writing, engaging other students to tell him about their work, but seldom on task with his own writing and drawing.

When I would come to his table to sit and work with the others, Zach would go sharpen his pencil, get a drink, or use the restroom always managing to

take the circuitous route back to his spot, conversing with others on the way. Journal time was a relaxed time, with soft music playing at the end of the day and children were also learning in a social manner, helping each other with sounds, suggestions, and encouragement. I would linger at Zach's table for him to make the long journey back to his seat and assist him sound out the initial consonant sound for some object he had hurriedly drawn, usually only using one color. He did not enjoy creating drawings on paper or writing. He struggled with many of his sounds as some others in the classroom did also, each child at a different place on the developmental spectrum.

Academic Concerns for Zach

I was in a quandary how to proceed, Zach was sharp as a tack in all other areas, except phonemic awareness and his distaste of drawing. I had taught one of his cousins years before, she was now an upper classman in high school. She had initially struggled with reading, and later was diagnosed with attention deficit and a learning disability. More recently, I had had this female cousin's younger brother in kindergarten that he was not ready for. He would sit under a table and suck his thumb rather than participating in any of the available activities, so it was decided he should have an extra year in preschool. This child was a couple of years older than Zach, and he had also been with labeled attention deficit disorder also. Was Zach also developmentally not quite ready for school or were there some learning disabilities? Unlike his cousins, Zach was very verbal and engaged in school, ready and willing to try many things except independent reading and writing.

Quick to bring his parents on board, I let them know what was happening in class. They agreed to have his eyes checked and to try and read more with him at home. Our classroom had an extensive library, funded by a grant I had written, so students could choose from many books at all reading levels. The books available ranged from photographic essays with no words, but interesting pictures of animals to nonfiction books with trucks, insects, reptiles to fiction books, and lastly to humorous simple chapter books, like Junie B. Jones by Barbara Parks. We had an at home reading program where each child could self-select their book choice each afternoon, read with their families at night, and bring their book back the next day. This was the only homework my first graders were expected to do. The next day children would read to each other, voluntarily sign up to read to the class if they desired, read to parent volunteers, or me.

Zach would slip out the classroom door readying himself to go home, oftentimes without a book. The other children would take great care selecting what they wanted to read that night with their families. However, Zach, an only child with both parents at home in the evening with him, would do his best to make his departure out without a book. Figuring out Zach's tricky maneuvers, I would engage him to pick his book to take home. This only backfired on me, because once the book found its way home, Zach would conveniently forget to bring it back to school, which meant he could not take out another book until the first one was returned. I was out-witted by a six year old who lived across the street from the school!

Zach was an intelligent boy with a lot of common sense and life knowledge who was setting himself up for failure in second grade and beyond. The questions

I kept asking myself were this: Was he a little boy who liked learning by actively working with his hands rather than more sedentary activities like reading? Was he avoiding the very activities he felt he did not do well in? Was he going to bloom later in the year as I had seen others do in the past? Or was he learning disabled? If indeed, he was learning disabled the conundrum facing me was the school district's pull-out program for labeled students.

Reasons for Zach's Non-referral

The methods employed by the learning disability teacher seemed to focus on children's weaknesses, by doing worksheet after worksheet of drill-like activities, not my choice of instructional methods. This was more of a band-aid approach rather than teaching children new strategies that built on their strengths. Also, Zach was very astute and going to a special room alone would not sit well with him. Other children carrying the learning disability label were not terribly socially aware, this was not the case with Zach. Additionally, if he were to be labeled he could no longer participate in going to reading center which about one quarter of all first graders attended, thereby minimizing the stigma. I did not agree with the primary reading specialist's intensive phonics instruction, but she did offer some other learning opportunities that I thought would help Zach.

Based on my past experiences with learning disabled children, the system the school employed, and Zach's personality, I decided Zach would do better remaining in my classroom. I did not want to squash his enthusiasm for school and knew that the multiple instructional strategies I offered my students would enhance Zach's learning.

Differentiated Instruction for Zach

As a constructivist and child-centered teacher I felt comfortable with the options I could provide for Zach, but was concerned about his masterful avoidance of reading and writing. I knew I wanted to work with his strengths because he was so self aware, while scaffolding other areas of his learning. Therefore I challenged and stimulated his verbal abilities whenever I could by asking him to explain to the class his knowledge about different areas. He would explain how he came up with an estimate that was fairly accurate during weekly estimating activities, describe how he figured out a mental math problem, and elaborate for the class how he constructed something. I wanted to keep his interest high in school so he would continue to actively participate.

Zach was enriched mathematically, whenever I saw he could do something with ease, I accelerated the activity. For instance if the class was working on facts to ten by rolling two dice and getting the sum, I gave Zach three dice to add so the sums would be around twenty furthering his knowledge. Additionally, when Zach came into the classroom in the morning he would do a quick once-over of the room looking for new objects and changes in any of our science experiments. I admired his curiosity and constantly added new items to our classroom to engage Zach and the rest of the class in stimulating interest.

Scaffolding Zach, I made a concerted effort to sit with him every journal time for a few minutes and try to draw him out with his writing. This was not always effective as one of his classmates had severe emotional problems that had not been diagnosed and frequently would be screaming or banging his head against the wall at this time. Still, I made sure to check in with Zach and talk

about his writing. As we read the word wall everyday, Zach was often the pointer, the person who commanded the class in recognizing our sight words. He enjoyed being in front of the class leading.

During silent reading, the children liked to go to different areas of the classroom and read in pairs, a favorite place was under the computer. I wanted to encourage this community of readers, so supplied the room with small pillows, flashlights for each child, and a wide variety of books as described above. Zach was a hider and would go to remote areas of the room to read. As a method to enhance his reading, I would pair him up with a strong reader so they could share a book together. There was a high demand for the Junie B. Jones books because they were funny and beginning chapter books that thrilled the first graders, offering a powerful motivation to build reading skills.

I continued to wrestle all year with my concerns for Zach, he was not the only child who did not know all of his sounds, but he was more developed than the other children in many ways. I kept watching for signs that his reading and writing skills were emerging, while carrying on this internal dialogue in my head about the inappropriateness of our special education pull-out program's methods and the devastating effect it would have on Zach.

Meanwhile, Zach excelled in other classroom activities including all strands of mathematical thinking, spatial relationships, scientific principles, and verbal abilities. Quick to interpret any reading others did aloud in the class, I knew his comprehension was sharp. This data contributed to my belief that Zach was closing in on putting the reading puzzle together. I had seen students virtually over night finally grasp the pieces of reading and watched them fall in

place. Others in the class were on similar footing with Zach in reading ability, the difference now that I reflect on this was that Zach was much quicker in other areas, more articulate, and completely in tune with happenings in his environment and surroundings, whereas these other students were not.

Reflections on Zach's First Grade Experience

Zach completed first grade without reading fluently, his parents and I spoke often of his progress. He made gains in the sounds he knew, his word recognition, contextual clues, meaning making, and other reading activities. Steady gains were made at the reading center, although he would continue his visits there for the beginning of second grade, as would many others. In some instances I felt I had failed Zach, his potential was so great, yet in other areas I felt I had given Zach a solid year of exploring his interests in school and building on his strengths.

I was concerned about Zach's future in second grade because each of the second grade teachers was extremely traditional, whereas my classroom had been child-centered. Zach was not a child who would do well having to sit at a desk all day filling in worksheets. He was curious, needed for movement, and active choice making to promote his learning, none of which would be available in second grade. I finished the school year with a feeling of incompleteness regarding Zach's first grade experience, I was unsure why he avoided reading and had not made more progress with it. His parents were well aware of what was ahead for second grade, because Zach's male cousin, whom I mentioned previously was just one school year ahead of Zach and the families were close.

Fourth Grade with Zach

Two years later, I was asked to teach fourth grade and able to hand pick much of my class. I requested Zach because I genuinely liked him and wanted the opportunity to work with him again. I also wanted to see how he had fared academically, because his third grade teacher had been much like his second grade teacher. I also felt a responsibility toward Zach and his family, I wanted to help him as much as I could with his learning.

It was good to have Zach back in my classroom, we basically picked up our relationship where we had left off when he was seven. Now nine, Zach was one of the smallest people in our class, the girls were beginning to outpace the boys in height. He was still extremely curious, liked to move around while he learned, caught onto new routines quickly, and liked to help figure out how things worked in the classroom. During the first week of school, one of the other students asked about something that was going on in class. I didn't hear the question, students were working in groups, but I did hear Zach say, "No, she's not like that. This is okay." He knew what I expected in my class and that entailed students becoming autonomous and making their own decisions regarding some of their learning.

Zach was just as perceptive and inquisitive as I had known him to be earlier. There was a new edge in his personality though, and he was easily angered by other students. I learned through some of my other former first graders in our class, Zach had been the scapegoat of his third grade classroom. His teacher had overturned his desk on the floor in front of the class because it was messy, humiliating him as it would anyone in that position. Zach had been belittled so often during his last two years at school that he was quick to become

defensive in his peer relationships. I saw this firsthand through our class meetings, watching Zach's temper flare whenever he felt backed into a corner by his peers. Through continued class meetings, conflict resolution activities and frequent seat changes for all, this calmed some.

Zach's Academic Progress

Zach continued to excel in mathematics, science, and social studies activities, especially those that involved inquiry learning. I read aloud daily to the class after lunch, while Zach enjoyed this he was never in his seat, preferring to walk around the classroom quietly and organize our materials. Others were content to sit, listen, and draw, but Zach needed this movement. I asked the class to predict what was going to happen at a crucial point in the chapter, without missing a step Zach piped up from across the room and explained what he thought was coming in the story with great animation.

Early in the school year, the class wanted to explore the classroom's materials, so late in the afternoon having endured most of late August's heat in a classroom with twenty-four nine year olds, two windows, and no air conditioning, I agreed. We all needed a little space to do some independent learning. After having set up a few ground rules for appropriate behavior, the exploration began. The manipulatives I had collected over several years while teaching kindergarten and first grade were quickly dispersed and being used in novel ways.

Cabinets were being opened to see what had been left in them from the prior teacher and kits of electrical equipment were discovered. Zach honed in on the electrical kits and soon a group had formed around him. They were handing each other wires, bulbs, and batteries and discussing how to assemble the pieces

to make a circuit. Electricity was an essential science unit for fourth grade and according to the other teachers, not supposed to be undertaken until well into the year. I made an on-the-spot decision to allow Zach and his classmates to follow their interests and continue to build. I knew from prior experiences in my classroom that even though children might use and explore materials, coming back to them later in the year does not dampen their interest, but can rather fuel it because of the increased knowledge the children develop. The excitement in the room was palpable. Circuits were being built and students were asking each other how they worked and how to elaborate on them. Sprawling over most of the surfaces in the classroom, these circuits became more and more complex with advanced wiring and additional light bulbs being added. Zach was in his glory, as was the entire class. Children were collaborating, cooperating, discussing, and negotiating as they explored and learned with various materials.

However, when silent reading or writing was involved, Zach's interest quickly dropped. He increasingly despised it and found more and more excuses to avoid it altogether. By this time, Zach had tested out of reading center, but fourth grade had a new reading specialist and I wanted her to screen him. His testing showed he was reading and barely qualified for reading center. The reading specialist said he could join his other classmates that received help, about one quarter of the class. He went a few times, but what the others needed from the reading center, Zach did not. The reading specialist tried an independent computer program that could be used during Zach's learning center time. He went along with this for several sessions, the lure of using the computer proved initially to be a strong motivator. But that novelty wore off too and Zach stopped.

Meanwhile in class the students could choose between a couple novels to read independently. Time was set aside in class for reading and reading was assigned for homework most days. Zach continued to read in obscure places in the classroom and I would often catch him moving around not doing much reading. These fourth graders were used to doing traditional book reports from third grade when finishing books, and I believed strongly in a concluding project, but found book reports to be repelling and not a motivator to finish a book. The more books read, the more book reports were expected from the children. I wanted to motivate my less interested readers and book reports were not going to accomplish this.

Adaptations of Reading Curriculum

Believing in choice and multiple methods of expression, a professional development resource of mine suggested that children make a game about the book they read. Comprehension could be assessed, individuals could create with multiple mediums from paint to clay to building a complex game with maze-like activities. As children finished their books, materials were available for them to build their games in class while others were still finishing their novels. This became a strong motivational tool, because as games were built the students explained them and got to play them with each other.

Zach had not finished reading his novel as others began to create their games, but he was quite interested in how they were constructing them and offered suggestions. I reminded him that he was welcome to begin as soon as he was finished reading. The novels the class was reading were selected as fourth grade reading material, but some were shorter than others. Zach always asked me

how many pages were in each novel before making his selection. About a week later, Zach finished his novel and built a very interesting game depicting what the book was about.

I felt I had a "hook" to engage my class in reading. Additionally, the school was involved in an accelerated reader program whereby points were awarded to each student and each class for the total number of books read and comprehension tests passed on the computer, an instructional practice I was not fond of. I knew some of my students were voracious readers and some were slowly making their way through the books, so I questioned the teacher in charge of point-keeping who posted a public display of each classes' progress on a bulletin board along a well-traveled route in the hallway. This teacher informed me that whenever I read a book aloud to the class and did a comprehension activity, she would post points for our class. When I brought this back to my class, they embraced the idea because I read aloud daily and this was a way to even the playing field for my slower readers.

I read many books aloud, the class decided on many different projects to assess these novels and most importantly, Zach felt he was part of this process. I wanted to tap into his enthusiasm for reading, even if it was as a listener. Zach's social awareness remained high, always in the know about what others around him were doing and he made it his mission to check each classes' status for our reading points. As a class, we were ahead of the other classes which made Zach very proud. I wanted him to feel this pride after the low self-worth he had experienced in second and third grade.

Integrating Curriculum

When the reading contest ended near the end of the school year, my class let me know we were supposed to celebrate with a pizza party lunch in the classroom. They told me how to do this by collecting money from them, ordering pizzas, and eating in the classroom. I was less than thrilled about this idea, especially because the weather was so nice and we could be outside, but we weren't allowed to eat outdoors.

During one of our inquiry-based math lessons, we were beginning to explore tenths of miles. I began linking this to what we had studied about bones, muscle, and exercise posing this question to the class, "How far away do you think Dairy Queen is in tenths of miles?" Right away, Zach and others began talking to each other comparing where the school was, where their homes were, and whether we could walk to Dairy Queen or not. Zach, a constant resource of ideas, mentioned the physical education teachers had a wheel that measured tenths of miles, so I sent him on a mission to ask if we could borrow this wheel.

We decided collaboratively that walking to Dairy Queen one afternoon would be much more fun than ordering pizza, additionally the class would learn how to calculate tenths of miles in a real setting using a new tool to measure. I had the class estimate how many miles then tenths of miles they thought Dairy Queen was from school. Tapping into Zach's strong mathematical ability, the students formed groups to decide the distance. Zach lead his group using his reasoning skills and contextual awareness of his surroundings. Students made calculations, had permission slips signed, and brought money for the sunny, warm Friday afternoon of our walk to Dairy Queen. Zach wanted to lead the

procession with the measuring wheel as we started out. Our round trip walk completed, each child was happily satiated with their treat when we returned to figure out how many miles we had walked and turned it into tenths of miles. The total was over three miles. True to form, Zach's estimate and figuring of the distance was very close to the precise measurement we logged.

Inquiry Based Mathematics

As illustrated above, Zach continued to be strong in mathematics, his reasoning skills and keen spatial relationships developing were more advanced than many of his peers. Working in small groups, Zach was a leader initiating new ideas and problem solving to tackle new concepts. Building on his strengths and outgoing personality, he volunteered regularly to demonstrate his thinking process and answers on the overhead projector during whole group instruction.

Democracy in the Classroom

I intentionally honored my students' suggestions because I believe in democratic classrooms and I watched as students gained self-confidence and became empowered as learners. Community meetings were held each day before lunch to iron out problems that occurred within the classroom. Students were to try two methods to solve interpersonal problems before bringing them to the class meeting by signing up on the agenda. Protocol and procedures were clearly set up for all students and myself to follow during meetings.

Zach had a rapid-fire temper, as mentioned earlier partly the result of being picked on by his third grade teacher, his own inadequacies, and the enormously diverse set of personalities in the classroom. He was one of the regulars on the agenda for our class meeting, and I wanted him and the other

class members to leave fourth grade with stronger conflict resolution skills. With other options to solve personal relationship issues, I felt Zach would become more confident and not so quick to flare-up.

One outgrowth of these class meetings was our exploration into the three branches of government that we were studying. The class decided that there were some issues concerning our micro-society in the classroom that would be better handled in a court of law. (The micro-society had developed out of the students exploring the classrooms and deciding to set up businesses.) We had an economic system, complete with checkbooks and bankers. Zach was one of the business owners in the classroom who felt others were not conducting themselves fairly. There were some property encroaching issues and some price hikes that needed litigation. Zach was one of the first plaintiffs and with the help of his lawyer won his case. More legitimate practices were conducted until the next case arose.

Zach had a turn to be an attorney, plaintiff, defendant, judge, and jury, roles he articulated well due to his high verbal skills. Losing was not something he did gracefully, but there were many positive social interactions and skill building.

Zach's Spelling and Writing

Fourth grade curriculum dictated that the students have weekly spelling tests with particular word lists. Because I wanted parents to be involved in their children's progress and the parents expected a certain amount of homework, I decided the standard practice of giving spelling pretests in class could better be accomplished at home. This way the parents knew exactly how many words their

child knew and could adjust the amount of time spent studying for the weekly Friday spelling test, another traditional practice I was not fond of.

Believing that students need to have immediate feedback on skill work, such as spelling so as not to learn words incorrectly, the class graded their spelling tests right after taking them. I was also cognizant that I had two children who struggled mightily with spelling and did not want other children grading their papers. To remedy this, each child took the spelling test in blue ink and graded their test in marker. This way each child could see what they had or had not spelled correctly and the incorrect imprint would not be left in their brain. Tests were given to me to record, scores were private, and students could take their tests home at the end of the day.

Zach was one of the two struggling spellers in the class, no matter what the words were, he just couldn't hold the visual picture in his mind of what the word looked like, and transmit it to paper. Not only were the words unrecognizable, the spellings were not even close, or phonemically correct. Week after week, Zach scored between 20 and 50 percent on his spelling tests, never passing. Again regular contact with his parents brought them on board, but mysteriously Zach's spelling workbook was at home when we needed it at school and at school when he needed it at home. I photocopied pages of the book for him to work on in class and take home.

I had never seen a child before with absolutely no grasp of phonics except for another classmate who suffered from drug damage prenatally. It was as if the sounds didn't exist in his head, no connections were being made between what the word looked like and sounded like. Puzzled, I did not know how to proceed,

Zach could read and I knew that any phonics-based instruction after second grade was fruitless. I also did not believe in isolated learning, such as phonics as a sole instructional tool, it needed to be integrated and contextualized. Zach had participated in all of the word-based activities as a first grader while I employed a balanced reading program using sounds in context whenever we did activities. I was stumped as to how to adapt the rigid spelling curriculum that was man-dated to Zach's needs.

Zach and the Thermostat

One of the ways Zach contributed to the classroom was using his considerable abilities to fix any piece of equipment that went awry. The thermostat in our classroom had the unpleasant characteristic of shrilly screaming like a highly pitched boiling teapot for apparently no particular reason. Trying to work through the ear deafening noise was not an option so while someone went to find the custodian, Zach began to figure out how to get rid of the hideous noise which provided some much needed relief. When the thermostat became uncontrollable and the custodian could no longer fix it, a repair person was called in. He appeared in our classroom one day and Zach's enthusiasm to talk to him and observe him was apparent. While the rest of the class was silently reading, I felt Zach's time could be well spent with this professional heating installer. I asked the gentleman if he would mind Zach watching and asking questions and he welcomed him. My past experiences in school had shown me that many times these professionals were ignored and treated as inconveniences. I felt that Zach's true talents were directed in this manner and he could benefit

from this experience. The heating repair person was remarkable with Zach, answering all his questions, and explaining what he was doing.

Did this fall in line with traditional education? No, however it is my belief that children should learn about what they are interested in also. This experience was a positive one for Zach because he learned about the inner workings of the thermostat that he found fascinating.

Networking Outside of School

While at an educational conference, I met a woman who described her grown son's learning as similar to Zach's. He struggled with reading, writing, and spelling all of his elementary years. This educator told me, her son's life turned around when he began learning Hebrew for his Bar Mitzvah while in middle school. We spoke at length and she described that Hebrew was read right to left, rather than left to right. Once her son learned to read Hebrew which happened rather easily for him, the puzzle to reading English became much easier. We discussed the possible reason that in a dyslexic brain, this other method of reading strengthened his muscles for our left to right text. I left the conference feeling hopeful, first because Zach had discussed how he was going to be learning Hebrew for his own Bar Mitzvah. Second, this possible theory resonated with me due to my own left-handed learning idiosyncrasies. I passed this information on to his parents so they were aware of this possibility.

End of the Year

Zach's parent thanked me profusely at the end of the school year, he had complained of stomachaches all through second and third grade and was irritable getting up those mornings. However, in fourth grade he was up and dressed every

morning looking forward to coming to school. I felt some measure of success knowing that I had helped shape Zach's attitude toward learning and school, his upcoming Hebrew lessons were very important to him and could possibly be the key to unlock his code.

Original Questions about Zach's Learning

Was Zach an active boy who liked learning better by working with his hands? Undoubtedly, his knowledge was so vast involving countless real world experiences he continued to have with mathematics, science, physics, and social studies. Did Zach avoid activities he felt he did not do well in? Again, yes his own internal discernment guided his choices for learning. He could read that was proven in the reading center, but he would not read to learn about the world. Was Zach going to bloom later? Another year had gone by and Zach was no more interested in reading than he had been in first grade. The hope of his learning Hebrew allowing the pieces to fall together in his reading spurred me on. Was Zach learning disabled? Yes, he was probably one of the few true dyslexics I have worked with. There was no relationship or connection for Zach between spelling and how language and reading worked. His memory, word recall, articulation, speech patterns, and obvious spark for learning in other modalities proved just how bright Zach was.

Implications for Teacher Education

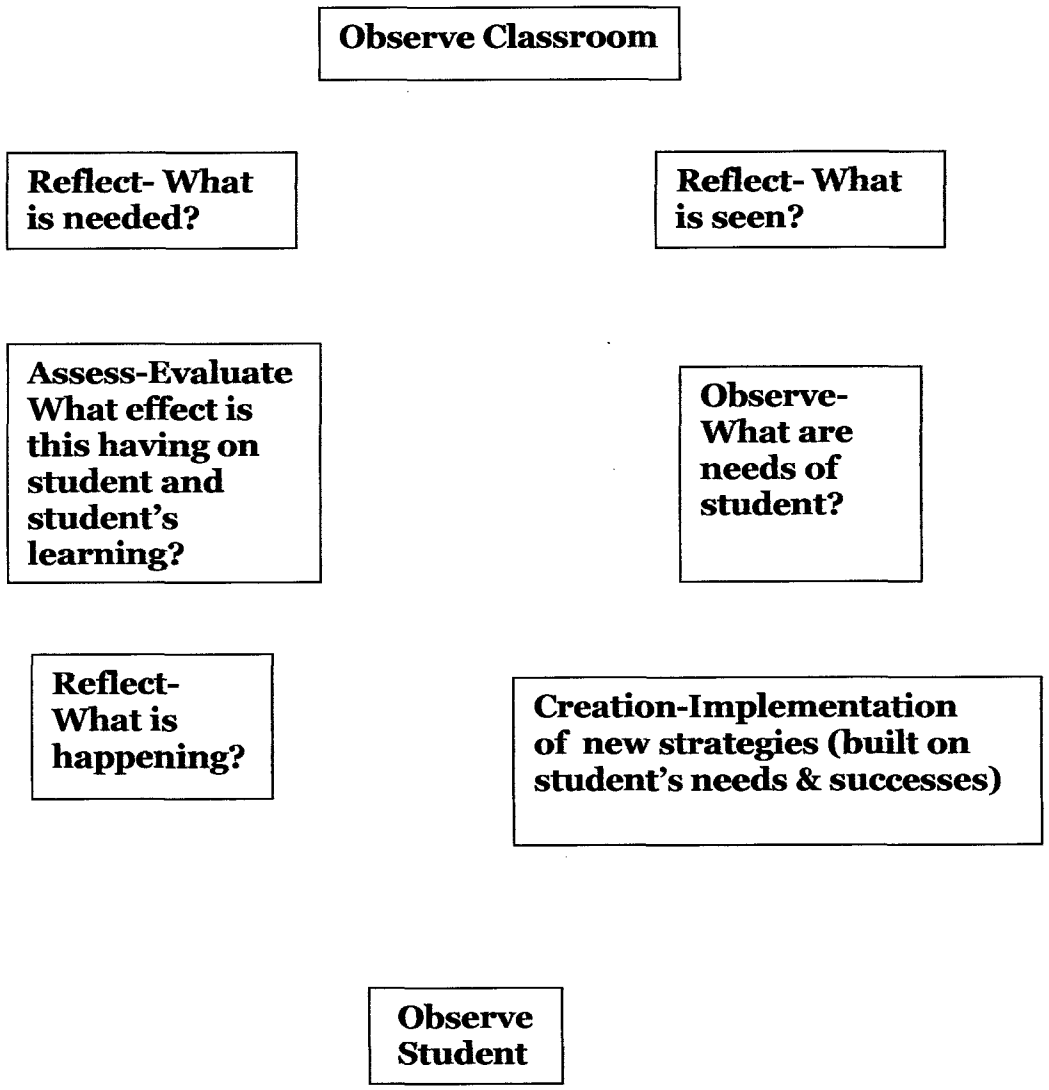
How do we guide new preservice teachers through this murky, confusing path in deciding how to work with students? Preservice teachers need to know that this is an ongoing process, we continually learn and change our approaches

to various situations by examining what has happened and what the outcome was by modeling the cycle of inquiry.

Implementing and modeling the cycle of inquiry utilizing reflective practice will enable preservice teachers to examine what is occurring within their classrooms and individual students. First, a teacher must be a careful observer, watching to see how the student reacts to the environment of learning. Secondly, these observations must be reflected and analyzed by the teacher. What was seen? What context did this occur in? Continuing to observe, the teacher must now ask what the student's needs are. By putting together what is happening in the classroom with the student and what the individual's needs are, the teacher has a place to begin to understand this student. The next step involves creating and trying a new strategy based on the student's needs and building on the student's successes. Again, the teacher observes by asking the following questions. What is happening with this strategy's implementation? What effect did this strategy have on the student? What is the student learning? Reflecting on the answers to these questions, teachers begin to assess and evaluate the progress of the student. Reflecting again, the teacher asks her/himself what additional needs the student still has. This completes the cycle, whereby observation is again initiated continuing the ongoing cycle of inquiry. A schematic of this process is on the following page.

Walking preservice teachers through situations and experiences that we have had, as well as inviting them to discuss their own personal experiences, and field experiences through reflexive discourse will enable them to build their pedagogy and become effective teachers.

Cycle of Inquiry Involving Student Learning



This model begins clockwise from the top with classroom observation and proceeds around the recursive cycle where observing the classroom is repeated.

Zach: A Case Study

The following are sources I used for each section of the case study. Complete references are at the end of this paper.

Zach's Characteristics

Brendekamp/Copple: Developmentally Appropriate Practices
Gardner: Multiple Intelligences (in Fogarty and Parry & Gregory)
Zemelman, Daniels, & Hyde: Best Practices
Fisher: Masking Questions
Kovalik: Integrating Basic Skills
Allington & Cunningham: Comprehension
Brain Compatible Learning
Costa's Fourteen Characteristics of Intellectual Growth (in Senge)
Graves: Writing
Routman: Journal Writing

Academic Concerns for Zach

Allington & Cunningham: Reading
Routman: Reading
Goleman: Emotional Intelligence
Gardner: Multiple Intelligences (kinesthetic, verbal, spatial, logical)
(in Fogarty and Parry & Gregory)
Wide range of reading materials, many choices, many levels, many topics (science, nonfiction, fiction)
Peer Modeling

Reason's for Zach's Non-referral

Dewey: Reflective Practice

Differentiated Instruction for Zach

Dewey: Constructivism
Built on Strengths- Verbal & Math
Scaffolded Weaker Areas
Zemelman et al., Best Practices
Enriching Math to Challenge
Focusing on Science
Routman: Writing
Graves: Writing
Vgotsky: Zone of Proximal Development
Supporting Skills
One-on-one help
Encouraging

Building on Kinesthetic Srtength
Brain Compatible Classroom Environment
    Setting Environment
    Adding Novelty
Costa's Fourteen Characteristics of Intelligence (in Senge)
Individualizing
Encouraging Authentic Reading Material
Developmentally Appropriate Practices
    Honoring Child's Development
    Keen Observation on my Part
Focusing and Challenging Strengths to Engage Learner
Dewey: Reflection- Continual Reflection about what I was seeing

Reflections on Zach's First Grade Experience

Developmentally Appropriate Practice
Dewey: Reflective Thinking by Teacher
    Cognitive Dissonance on my part
    Disequilibrium on my part
    Continued Reflection of Familial History
Gardner's Multiple Intelligences- Building on Learning (in Fogarty and Parry & Gregory)

Fourth Grade with Zach

Brain Compatible Learning
    Safe Environment
    Establish Trust
Inquiry-Based Learning
Kovalik's Classroom Community
    Establish Community
    Establish Democratic Classroom

Zach's Academic Progress

Dewey: Constructivism
Inquiry Learning
Multiple Intelligences
    Allowing Movement
    Hands-On
    All Forms
Brain Compatible Learning
    Authentic Learning
    Engaged
    Self-Directed
    Choice-making
    Inquiry

Differentiated Instruction
    Reading Center
    Computer
    Choice of Novels

Adaptations of Reading Curriculum

Multiple Intelligences
Brain Compatible Learning
    Choices in Projects
    Flexible & Independent Time Tables to Finish Work
Scaffolding & Differentiated Instruction
Whole Group Experience
Teamwork
Building Community

Integrating Curriculum

Dewey: Constructivism
Inquiry Learning
Collaborative Learners
Authentic Task

Inquiry Based Mathematics

Multiple Intelligences
    Logical Reasoning
    Spatial Relationships

Democracy in the Classroom

Integrating Curriculum
Dewey: Democracy in the Classroom
Social Studies in Action

Zach's Spelling and Writing

Graves: Writing Individualization
Routman: Spelling Individualization
Zemelman: Best Practices
Brain Compatible Learning- Learning from just completed work so they
    Could see correct spelling
Fisher: Writing Techniques and Visualization of Words

Zach and the Thermostat

Dewey: Constructivism

Multiple Intelligences
Modeling
Learning Another Way

Networking Outside of School

Collaborating with Other Professionals

End of Year

Keeping Parents Informed

Original Questions about Zach's Learning

Dewey: Constructivism
Multiple Intelligences
Kinesthetic
Logical
Spatial

Implications for Teacher Education

Dewey: Reflective Thinking
Cycle of Inquiry
Multiple Intelligences
Validity of Using Case Studies as an Instructional Tool in Teacher Education

References

Allington, R. L., & Cunningham, P. M. (1996). *Schools that work: where all children read and write.* New York: Longman.

Bredekamp, S., & Copple, C. (Eds.) (1997). *Developmentally appropriate practice in early childhood programs.* Washington, D. C., National Association for the Education of Young Children.

Dewey, J. (1933). *How we think.* Boston: D. C. Heath and Co.

Fisher, B. (1991). *Joyful learning: a whole language kindergarten.* Portsmouth, NH: Heinemann.

Fogarty, R. (1997). *Brain compatible classrooms.* Arlington Heights, IL: Skylight Training and Publishing, Inc.

Goleman, D. (1994). *Emotional intelligence: why it can matter more than IQ.* New York: Bantam.

Graves, D. H. (1994). *A fresh look at writing.* Portsmouth, NH: Heinemann.

Kovalik, S. & Olsen, K. (1997). *ITI: the model, integrated thematic instruction.* Kent, WA: Kovalik & Associates.

Parry, T., & Gregory, G. (1998). *Designing brain compatible learning.* Arlington Heights, IL: Skylight Training and Publishing, Inc.

Kovalik, S. & Olsen, K. (1997). *ITI: the model, integrated thematic instruction.* Kent, WA: Susan Kovalik & Associates.

Routman, R. (1991). *Invitations: changing as teachers and learners K-12.* Portmouth, NH: Heinemann.

Senge, P. (2000). *Schools that learn: a fifth discipline fieldbook for educators, parents, and everyone who cares about education.* New York: Doubleday.

Zemelman, S., Daniels, H., & Hyde, A. (1998). *Best practice: new standards for teaching and learning in America's schools.* Portsmouth, NH: Heinemann.

Appendix C

Linda's Revisiting of the Ten Questions

Math is:

- The process of setting up relationships and trying to prove those relationships
- Noticing and exploring patterns
- Putting forth explanations and conjectures
- Contextual
- Constructing models
- Discourse
- Reflective
- "Progressive schematization"

1. When teaching children who are at different levels developmentally, what is the best way to provide explorations and inquiries into math?

    - Let children use manipulatives to solve problems.
    - Let them come up with the strategy that makes the most sense to them.
    - Have them explain their thinking.
    - Provide them with structured tasks as well as choices.

2. What are some important "landmarks' and/or "guideposts" that are recognizable in children's mathematical learning? Are these grade specific?

    - Stay in line with "standards."
    - There will always be a wide range in every class.
    - Find out what they know from the very beginning. Start with the familiar!

3. How do you make word problems or context problems applicable to children's lives?

    - Take a survey and determine the interests of the class.
    - Have students offer their ideas and opinions. (Effective teaching begins with the ideas of the children, not the explanations of the teacher-NCTM Standards documents).

4. What are some of the most successful tools (Unifix cubes, base ten blocks, etc.) used with young children? Any new and cutting-edge equipment to report?

    - Almost anything can be used as a mathematical manipulative- dice, buttons, pom-poms, dominoes, cards, coins, shells, etc.

- Create binders of units that include student products and pictures.
- Invite parents to create classroom materials and to read about what is happening in class. Send home a weekly newsletter.

5. When facilitating dialogue, I really like the question: "How many of you understand the point so-and-so made and can rephrase it in your own words?" What are some other methods of gauging and assessing student understanding and interpretation regarding math concepts?

   - Use performance-based formative assessment.
   - Portfolios, checklists for all different subjects.
   - Anecdotal records.
   - Ask questions- have children explain how they solved a problem.

6. What can you do when a child simply does not understand or cannot grasp a certain concept, be it math or other related disciplines?

   - Start slow and model, model, model!
   - Allow children to work together in collaborative groups.
   - Try a different approach.

7. I would like to learn about integrating math across the curriculum and making it as meaningful as well as relevant to everyday life.

   - TERC- these lessons are wonderful! I think they apply to the concept of interdisciplinary teaching and learning.
   - Be deliberate when making decisions.
   - Be prepared.

8. How do you keep kids interested, especially those who have a difficult time with sequential and solution-driven modes of instruction?

   - Allow for more than one way of reaching a solution.
   - Practice flexible and reflective thinking.
   - Find areas of strength in every child.

9. Because many "big ideas" (like unitizing) require huge shifts in perspective, why do we expect children to understand them so readily?

   - Do not expect instantaneous knowledge or indulgent insight.
   - Establish and build conceptual connections.
   - Give hands-on examples and tools to support the concepts you are trying to teach.

10. Can I be a good math teacher if it is not the core component or focus in my classroom? How can I strengthen my mathematical mind in order to provide positive and enduring experiences for children?

    - Yes! Let math serve as the glue that holds everything together.
    - Know where my resources are. Keep a sharp eye out for any deals. Ask mentor teachers for ideas and suggestions. Take advantage of professional learning opportunities.
    - Have fun! Try new things! Take risks! Be myself! Be bold! Believe!

Appendix D

Carrie's Revisiting of Ten Questions

1. Should teachers encourage parents to use flashcards at home to help children learn addition, subtraction, multiplication, and division? Are these really helpful for young children?

   Although we never discussed this in class, the reading and types of activities we did in class helped me to have a better understanding of this question. Flashcards aren't exciting, they aren't very stimulating, and they are boring to do! While it may help children memorize important facts, there are other more hands-on, less tedious methods that parents and teachers can use with young children.

2. What kinds of visual aids are useful when teaching mathematics to young children?

   The book was extremely helpful in this area. There were samples of all kinds of work that students did, both individually and in groups and as a class. I believe all young children are visual learners to some extent, and there are many ways teachers can help children connect to what they are learning by providing them with visual images. For example, having children put their problems on the board, like we did in class, can be very helpful and show the rest of the class how the problem was solved. Actually drawing out the problems, such as how you had us draw out the Hershey bars for the fraction problem, is a great idea.

3. When a child really struggles with basic concepts in mathematics, what steps can the teacher take to help this child?

   I think providing that child with hands-on activities, using manipulatives such as unifix cubes, playing cards, and even dice, can be very beneficial. Math makes a lot more sense to children when it's not just numbers and formulas on a sheet of paper, but something they can physically work and see. Mixing in math with other subjects such as science and language arts can also be a good tool in reaching students who excel in other areas. I also think group work is a good idea because children can learn a lot from their peers and bounce their thoughts off of one another. I would still like to know specific steps that a teacher can take with a child that is just really having difficulty.

4. What do you do with a child who really excels in math, is it appropriate to give them harder work or see if they should be in a higher math program?

   Now I realize that it's possible to have children at various and different math levels but have them do the same activitiy, but with different

variations of it. For example, what you did for your student, Zach by giving him three dice to make sums instead of two.

5. Do children learn math concepts best by working in groups or individually?

   This semester I really learned the value of working in groups during mathematics. It was my experience as a young child to only do math individually, and that definitely got old. Mixing up the groups and providing a variety of tasks are the best way to do it for most concepts.

6. If parents aren't interested or claim they don't have enough time to help their young children with homework or assignments, what can the teacher do to encourage them to be involved?

   Well, I realize now that math homework isn't appropriate for young children! I think sending home activities; such as taking polls or graphing family members' birthdays is exciting and a great way for families to get involved with their child.

7. Is memorization of times tables still pushed in elementary schools?

   Yes, it is. Many schools do the same old things as when I was in school, such as memorizing facts and taking timed tests.

8. Are math tests- not timed- but regular math tests, appropriate for 2nd and 3rd graders?

   I don't believe so. There are other ways of assessing a student's math skill that will provide the teacher with more in-depth answers to what that student understands.

9. What is the best way to combine math and science together so that children see the relation between the two?

   There are lots of fun ways! For example, how you described the zucchini that your students were obsessed about in the class. They were continually weighing it and watching it decompose and things like that. Math and science are very easy to put together in lessons.

10. Can children ages 5-8 really understand graphs – like bar, line, and pie graphs?

    Yes! I love the way of having a graph for the children to do each day; shoe graphs, seashells, birthday graphs, all fun for the kids and easy to understand!

Appendix E

INDIANA UNIVERSITY – BLOOMINGTON
INFORMED CONSENT STATEMENT

Preservice Teachers' Personal Narratives: A Vehicle to Begin Discourse and Construction of Pedagogy in Teacher Education

You are invited to participate in a research study. The purpose of this study is to analyze your reflections to learn about what you think about children learning math.

INFORMATION

The researcher (your instructor) would like to use your reflection papers in a research study.

The researcher will not know whether you agreed or did not agree to be in this study. She will use your weekly reflections for the research study. Your names will be removed from your reflections, so the reflections will remain anonymous.

Your instructor will copy all weekly reflections and analyze them for her study after your grades have been posted.

If you do not wish to be in this study, the copies of your work will not be analyzed and will be destroyed. Whether you decide to be in this study or not, it will not have any effect on your course grade.

RISKS

No foreseeable risks will be involved.

BENEFITS

This knowledge will benefit educators' general body of knowledge in that I hope to see some patterns of pre-service teachers' ideologies and the growth that occurs over a semester while learning methods.

subject's initials

CONFIDENTIALITY

The confidentiality of subjects will be maintained by removing the subjects' names from the reflection copies. Subjects will remain anonymous. Reflections used for research will be kept.

CONTACT

If you have questions at any time about the study or the procedures, you may contact the researcher's sponsor, Dr. Ellen Brantlinger, 2280 Wright Building, 856-8134, or branglin@indiana.edu.

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact the office for the Human Subjects Committee, Carmichael Center L03, 530 E. Kirkwood Ave,Indiana University, Bloomington, IN 47405, 812/855-3067, by e-mail at iub_hsc@indiana.edu.

PARTICIPATION

Your participation in this study is voluntary; you may refuse to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty. If you withdraw from the study before data collection is completed your data will be destroyed.

CONSENT

I have read this form and received a copy of it. I have had all my questions answered to my satisfaction. I agree to take part in this study.

Subject's signature_____ Date _____

Consent form date: Revised 1-16-04

IRB Approved
Approval Date: JAN 16 2004
Expires: OCT 30 2004

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EDUCATION

INDIANA UNIVERSITY, Bloomington, IN
Ph.D., School of Education, Curriculum and Instruction
Dissertation Topic: Personal Narratives of Preservice Teachers Concerning Construction of Pedagogy in Teacher Education
Minor- Early Childhood/Special Education

NATIONAL LOUIS UNIVERSITY, Evanston, IL
Master of Arts in Teaching, Elementary Education

UNIVERSITY OF ILLINOIS, Urbana-Champaign, IL
Bachelor of Science

TEACHING EXPERIENCE

IUPUI, School of Education
E325 Social Studies in the Elementary School
Spring 2005
M307 Field Experience Elementary Block
Spring 2005
Indiana Reading Academy- Department of Education
Fall 2004, Spring 2005
E535/S503 Elementary School Curriculum, Secondary School Curriculum
Fall 2004

Indiana University, School of Education
E354 Early Childhood Mathematics Methods
Spring 2004 & Spring 2003
E343 Recitation, Teaching Mathematics in Elementary School
Fall 2003, Spring 2003
E535 Elementary School Curriculum, Fall 2002
M201 Early Field Experience, Math & Science
Fall 2003, Spring 2002, Fall 2001

Butler University, School of Education
ED 412 Early Childhood Curriculum, Spring 2001
ED 312 Practicum in Early Childhood, Spring 2001
Student Teacher Supervisor, Fall 2000

TEACHING EXPERIENCE CON'T.

Homewood School District #153, Homewood, IL
Fall 1986- Spring 2000
Fourth Grade Teacher 1999-2000

First Grade Teacher 1986-1990, 1995-1999
Kindergarten Teacher 1990-1995
Math Their Way graduate course in Mathematics Methods for Elementary School teachers, Fall 1991- Winter 1993

Flossmoor School District #161, Flossmoor, IL
Substitute teacher part-time, Fall 1981- Spring 1986

SPECIAL CERTIFICATION AND TRAINING

NATIONAL SCHOOL REFORM FACULTY LEARNING COMMUNITY COACHING SEMINAR
Summer, 2003

INDIANA PROFESSIONAL STANDARDS BOARD
Mentor Faculty Training, 2002
Advanced Scorer's Training of Indiana Beginning Teacher Portfolio, 2002
Proficient Scorer of Indiana Beginning Teacher Portfolio, 2002
Initial Scorer's Training of Indiana Beginning Teacher Portfolio, 2001

INDIANA STAFF DEVELOPMENT COUNCIL
Boot Camp for New Professional Development, 2002

ASSOCIATION OF CURRICULUM AND DEVELOPMENT
Linking Curriculum Standards and Principles of Deep Understanding to Problem-Based Learning and Assessment, Middlebury, CT 2001

INDIANA SUMMER INSTITUTE
C.L.A.S.S. Connecting Learning Assures Successful Students
Brainworks, TLC with Barbara Pedersen, 2000

ITI TRAINING: INTEGRATED THEMATIC INSTRUCTION INCLUDING LIFELONG GUIDELINES AND LIFESKILLS
Susan Kovalik & Associates, Portland, OR, 1999

TRAINING OF TRAINERS FOR BRAIN COMPATIBLE CLASSROOM
Skylight Training, Robin Fogarty, Chicago, IL, 1998

SPECIAL CERTIFICATION AND TRAINING, CON'T.

GIFTED TRAINING
Verified in Illinois, 1997

PRESENTATIONS

SCHOOL SCIENCE AND MATHEMATICS ASSOCIATION
How Do Preservice Teachers' Beliefs Change Regarding Mathematical Concepts During a Methods' Course? Annual Convention
Columbus, OH, October, 2003

ILLINOIS ASSOCIATION OF SUPERVISION AND CURRICULUM DEVELOPMENT - ANNUAL KINDERGARTEN CONFERENCE
Student Choices and Management in a Centers-Based Classroom
Arlington Heights, IL, March, 1996
Writing and Bookmaking in the Kindergarten Classroom
Arlington Heights, IL, March, 1995
Thematic Units in the Kindergarten Classroom
Arlington Heights, IL, March, 1994
Oceans Away! Integrating All Disciplines –A Thematic Approach
Arlington Heights, IL, March, 1993 and March, 1992

SCHOOL DISTRICT PRESENTATIONS
Engaged Learning to Program Committee, 1998
Math Education at Parents' Meeting, 1998
University of Chicago Lab School Math Program to School Board, 1996
Reading Strategies at District Institute, 1995
Integrated Kindergarten Curriculum to School Board, 1992
Hands-On Mathematics in Our Classrooms to PTA, 1991
Math Activities and Strategies at District Institute, 1989

PROFESSIONAL ACTIVITIES AND AWARDS

TERC Investigations Curriculum Revision Project Evaluation
Indiana University, 2003

August Scrivner Award, Indiana University, 2003

Department of Education- Indexing School Improvement Plans under Law PPL #221 for Indiana Staff Development Council, 2002

Title II Grant Coordinator- Butler University College of Education
Spring, 2001

PROFESSIONAL AWARDS AND PRESENTATIONS CONT'

Homewood School District #153 Mathematics Committee 1996-1998
Wrote grade level objectives to align with NCTM Standards
Wrote local outcomes based on state standards
Reviewed and evaluated several mathematics series
1998-2000
Adopted a new series- TERC
Piloted and implemented TERC into Grades One and Four

Co-authored Kindergarten District Report Card, 1993

Member of Early Childhood Portfolio Assessment Committee, 1992-1993

Co-creator of Year-long Kindergarten Curriculum, 1992
Ten interdisciplinary themes based on Science and Social Studies
Incorporating Mathematics and Literature

PROFESSIONAL AFFILIATIONS

American Educational Research Association
Association of Supervision and Curriculum Development
Indiana Staff Development Council
National School Reform Faculty