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EXPERT MATHEMATICS TEACHERS' PARALLELS TO WORLDVIEWS:
INVESTIGATING PEDAGOGICAL RESPONSES TO NOVICE MATHEMATICS
TEACHERS' CONCERNS

DISSertation

Presented in Partial Fulfillment of the Requirements for the Degree
Doctor of Philosophy in the Graduate School of
The Ohio State University

By
Terri Teal Bucci, M.A.

* * * * *

The Ohio State University
1999

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ABSTRACT

In this study, the observed practices of three expert teachers and their verbal responses to the concerns of novice mathematics teachers were analyzed with possible alliances to the ontology, epistemology, and methodology of three research paradigms; positivism, interpretivism, and critical theory. The lenses of the paradigms afford the reader an opportunity to see expert mathematics teachers from differing worldviews. What worldview do the experts act from and do these worldviews remain constant or vary for each situation? Is there a particular worldview that is prevalent among all experts even when demographics are different? How do experts deal with the daily problems and challenges of a mathematics classroom?

The experts in this study were selected through recommendations from the administrators, counselors, and mathematics teachers from three demographically different schools. The issue of expert is addressed, at length, in this work.

The grouped data of the experts reveals worldview parallels that are distributed throughout the 'ologies. In the area of ontology, the interpretivist views are clearly less prevalent. In the areas of epistemology and methodology the interpretivist parallels hold a slight majority. Positivist methodologies are less prevalent in this collection of data. Additionally, when looking at the data as a group it is apparent that there is a relatively
equal balance of ideologies shown from each of the worldviews. This varies with individual experts.

On an individual basis, each expert’s recorded data showed an underlying alliance with one of the paradigm principles. Each expert in this study had a different underlying worldview parallel. This lead to an interesting juxtaposition of expert responses to novice mathematics teachers’ concerns.

The intended audience for this study is novice and pre-service teachers, teacher educators, and current mathematics teachers. I have presented the information gained through this study in a text that can be used as a resource for beginning and preservice mathematics teachers. This study provides its readers with a reference or resource to use when determining the most effective solution for his/her students. The final work provides the reader options and raises questions about educational philosophy and differences in pedagogy.
Dedicated to my family and my faith
ACKNOWLEDGMENTS

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I am truly grateful to my husband and my children for giving me the support I needed to realize my dream.

I also wish to thank my family and friends for the support to finish this venture and the assistance, when needed, in covering the daily tasks that are sometimes forgotten when so grossly involved in research and writing.

Lastly, I thank the schools and participants of this study. Without their support, I would not have had such an incredible opportunity for personal and professional growth.
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FIELDS OF STUDY

Major Field: Mathematics Education
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PRELUDE

Before you read this work, it is important for me to explain its progression and emergent nature. My personal philosophical travels throughout the duration of my work on this project directly influenced what you are about to read. Because of this, I feel compelled to write about those travels and their effect on my life and writing and thus, on your reading.

My initial idea for this study came from my reliance on the book, *What to Expect when You're Expecting* (Eisenberg, A., Murkoff, H., & Hathaway, S., 1991) and the series that followed on parenting. I am the mother of two small children. I have read each of the books in this series and found them to be quite helpful with my questions on birthing and raising children. The series is easy to read and contains research and ideas about common concerns of parents and expectant parents. My appreciation for this text series made me think that it would be useful to provide a similar text for novice mathematics teachers. Wouldn’t it be nice to provide research and advice from expert mathematics teachers in response to the common concerns of novice mathematics teachers; a sort of, “What to Expect While Teaching Mathematics,” text. That was the birth of my work.

After deciding to use this idea for my dissertation research, I began taking a series of courses on qualitative methodologies. Wow! Most people would not imagine that the
experience of taking a series of classes on research methodologies would be life changing. Well, that is exactly what happened to me. The enormous effect of these courses could, in no small part, be the product of my dynamic instructor, Dr. Patti Lather. Dr. Lather, a leading methodologist, and her discussions of the varying principles of the paradigms of qualitative methodologies ignited an explosion of excitement in my research and me. I remember sitting in her class with three pads of paper out on my desk. One pad was for ideas about my teaching, one was for ideas for my research, and one was for taking the class notes. This outpouring of ideas was stemming from my introduction to the research paradigms of positivism, interpretivism, critical theory, and deconstructivism. I knew I was fascinated by the definitions and principles of the varying paradigms and their relations on my life, but I wasn’t sure why.

Finally, I went to my esteemed professor and asked, "why?" Why was I so intoxicated with the principles of the research paradigms? Her response was simple; "You’ve found your worldview." This was exactly right. I had found my worldview. It just so happened that my worldview was the complexities of the varying worldviews of the research paradigms. My worldview, what I look through to decipher my world, was the realization that there are different ways to see the happenings in our lives. It was the realization that many of our actions and words stem from or could be placed within the ideologies of the paradigms we had been discussing in this course. From that point on, when I spoke to fellow teachers in the teacher’s lounge, when I discussed my children with my husband, and when I made decisions concerning teaching strategies, I had the varying paradigms and their representative ontology, epistemology, and methodologies in mind. It made sense to me.
Searching deeper into my fascination with the varying paradigms, I came to a self-realization. I felt liberated by the study of these paradigms. It wasn’t simply a worldview; it was a ticket to step out of my box. It allowed me to be what I wasn’t and to see that that was okay. You see, I always thought of myself as a positivist. Well, I didn’t call myself a positivist; I didn’t even know what a positivist was. But, I was very structured in my teaching and personal life. I always thought that consistency was one of the main foundations for good teaching and for fair living. Consequently, I didn’t see how you could be consistent without having a right and a wrong way of handling situations? My study of the paradigms allowed me to see that there are other ways of looking at things. It gave me permission to get out of my positivistic box and see the world from other dimensions. I don’t think positivistic ideologies are bad or inappropriate for all cases, I simply no longer think they are the ONLY ideologies. Yes, I can still have some views that may be positivistic, but I can also have opinions and act in ways that parallel other paradigms and that is okay, maybe even natural.

Today, I find myself making conscious decisions about my personal and professional life based on the tenets of the paradigms. I try to bring the philosophies of varying paradigms into my teaching. I try to give my students and others in my life a wider view of happenings and conditions in their lives. I try to look at individual situations and analyze which paradigm has the philosophical answer for that situation. And, often, I find that there isn’t ONE answer but a multitude of ways to respond to the situations and then I need to make a decision about how I feel I should respond.

By being aware of the ideologies of the varying paradigms and “seeing” (through the stories and varied data displays in this study) I hope you can experience the wonder
and complexities of teaching and the varied methodologies of the classroom. This is the intent of this work. I hope that by reading this work you can see the effects of the varying worldview parallels in your life and in teaching. My feeling is that by opening the door to other paradigms and seeing them at work in the experts in this study, you can allow yourself to step out of your box and see the effects of all ideals. Enjoy!

So, why do you need to know this up front? Well, in keeping with the ideologies of qualitative research, this study has emerged from my original idea of writing a question and answer text to developing a text that not only shows varying methods of reacting to certain situations in the classroom but also varying ideas of what an expert is and what worldviews these experts are acting from. I could have simply removed the portion of this work that related to particular responses of the experts in this study to novice concerns and concentrated on the experts' parallels to the worldviews. It just didn't feel right. I think it is useful to see how these experts reacted to certain problem situations and their individual parallel to the worldviews furthered the ability for readers to see similarities or dissimilarities with a particular expert in a particular situation. I believe that by writing about how this study developed into more of a philosophical interpretation of the experts from a more superficial analysis of their responses to concerns gives the study breadth without eliminating what has become vital data.
INTRODUCTION

If you want to develop a good golf swing, whom better to ask than Jack Nicklaus? If you wanted to create a magnificent painting, it would be wise to study the works of Leonardo da Vinci. Making a creme brulee that is “to die for”? Asking Julia Child for some pointers would be a great place to start. Why, then, would being your personal best at teaching be any different? If you are a novice teacher or simply one who could use a jump-start, investigating the pedagogy of expert teachers would be a logical place to find guidance. This rationale uses similar points as Vygotsky’s (1978) learning theory and Zone of Proximal Development (ZPD) with its focus of using experts to guide those, who are not quite “there yet,” to their personal best. Vygotsky determined that there is a difference between an individual’s actual development of knowledge and the level of development that can be attained through the assistance of a higher knower. In this study, the expert teachers are the higher knowers who will assist the lesser knower (for the purposes of consistency), to the heights of accomplishment. The accomplishment in this case is that of being your personal best at the skills and talents of teaching mathematics. In this, ZPD, we find the theory that supports the purpose of this study.

This is a study of expert mathematics teachers and their responses to problem situations of novice mathematics teachers. The journey began with a grounded theory
approach (Strauss & Corbin, 1994) to determine the problem areas of novice and preservice teachers. I found, through surveys, research literature, and thirteen years of personal experience, that there are recurring issues of concern for novice mathematics teachers.

The focus of this study was the investigation of the pedagogical dealings and varying responses of three expert teachers to novice mathematics teachers' concerns. The concerns of the novice mathematics teachers ranged from delivery of mathematical concepts to management tactics particular to a mathematics classroom. To put an interesting edge on the otherwise overdone expert-novice study, the verbal responses and observed practices of the experts were analyzed with possible alliances to the ontology, epistemology, and methodology of three research paradigms; positivism, interpretivism, and critical theory. The use of the paradigms as lenses demonstrated the varied methods of dealing with certain problem situations that occur in a mathematics classroom. What worldview do the experts act from and do these worldviews remain constant or vary for each situation? How do experts deal with the daily problems and challenges of a mathematics classroom? How do the varying pedagogical practices of the experts differ, blend, or equate?

I selected the experts through a recommendation process that involved input from the administration, counselors, and mathematics teachers from three demographically different schools. I thought about including parents and/or students but after having had several conversations with fellow teachers, I decided that the process may become too political and might offend those who were not selected. I expected to hear the students' voices through the counselors' recommendations in this process. The purpose of the
three components to the recommendation process was to give breadth to the idea of expert. Each branch of the school may have found varying qualities of teaching to represent expert status. For example, an administrator may have selected a teacher who emphasizes managerial control in the classroom. The counselors may have selected teachers who receive high marks from the students, not knowing if the high marks were born from quality teaching or simply lighter homework assignments. The last component to the expert selection was mathematics teachers. Those in the field of mathematics may have focused more on the conceptual knowledge aspect of teaching mathematics. This collection of recommendations brought one teacher to the top of the expert list and through the use of this process, the possibility of concentration in one particular sector of the community was avoided. Of course, I realize I must closely examine the issue of expert. I will do so, at length, later in this writing.

The substantive portion of this work is in the analysis. The lenses of the paradigms afford the reader an opportunity to see expert mathematics teachers from differing worldviews. Do the experts differ in their worldview depending on the specific situation? Is there a particular worldview that is prevalent among all experts even when environments are different?

The textual format of the response portion of this work leads with a quote from one of the surveys of the novice teachers or from contemporary research. Following this quote, which indicates an area of concern, are the responses of each expert. The data presentation is in varying formats; poems, plays, troubled realist stories, and interpretive vignettes. Following this will be a juxtaposition of the experts' responses.
The intended audience for this study is novice and pre-service teachers, teacher educators, and current mathematics teachers. I have presented the information gained through this study in a text that can be used as a resource for beginning and preservice mathematics teachers. An instructor could use the issues and pedagogical styles of the participants, along with the worldview parallels as a discussion stimulus for the development of educational philosophy and individual pedagogical preferences for novice teachers. How do the readers, novice teachers, see themselves? The text could be used in two successive courses where they could then talk about where their (novice teachers) alliances connect with the participants' and then see if their actions parallel their pedagogical views. Of course, there is no absolute solution for any particular issue. This study does, though, provide its readers with a reference or resource to use when determining the most effective solution for his/her students. The final work provides the reader opportunities to help to develop individual educational philosophies. Does the reader connect with a specific worldview? Is it vital to remain faithful to a pedagogical style that parallels one worldview or are there circumstances that allow, or demand, movement from view to view?
CHAPTER 1

LITERATURE REVIEW

Problem Situations for Novice Mathematics Teachers

* Student apathy was difficult. Many students would not participate in
group or class work. Motivation was very tough.

* Discipline was very difficult. Students knew I was a
first year teacher and tried everything.

* We had a lot of after-school activities we must attend.
Weekly staff meetings should be cut in half.

* I wanted to do activities that are more fun and projects.
However, there's a lot of pressure ...to finish
a certain amount of work (fulfill the curricular requirements).

* I'm trying to collect the homework, grade it, and hand it back with
comments. I'm feeling overwhelmed by the amount of paper work
this creates.

The preceding comments were taken from a survey distributed to first year
teachers of mathematics and from participants of a teaching seminar. They typify some
common problems of novice mathematics teachers found in research literature (for
examples, see Borko & Livingston, 1989; Irwin, 1994).

Teacher education has traditionally sought to identify specific “truths” of
education; answers to the common problems and questions of beginning teachers of
mathematics (Welker, 1991). Unfortunately, simply relaying information as a
prescription for mathematics instruction can limit variety and creativity of teaching. Realizing this, how can researchers and experienced teachers give assistance to these beginning mathematics educators?

**Looking to “The Experts”**

One possibility is to borrow the idea of an educated “knower,” as described by Vygotsky’s theory of learning. We have used the idea of guided instruction and cooperative groups in our classrooms, why not extend this idea to teacher learners through the medium of text? That is what this study intends to do; give novice teachers a view of the classrooms of expert teachers. How do the experts handle motivation? How would an expert teacher deal with curricular demands when his/her students are struggling with the concepts? Through this work, I intend to provide suggestions to these and other common concerns for first year teachers of mathematics.

First, it is necessary to consider the general idea of expert. Are there expert teachers? Is there a norm by which we can measure expert teachers and classrooms? To answer this question, you must consider the varying ideas of teacher education and advancement in mathematics education. Sternberg (1996) defines characteristics of expert teachers in the three areas of knowledge, efficiency, and insight. The study indicates that although there can be a prototype of an expert, this prototype is not fixed and is dependent upon what an individual values, troubling the idea of specifying expert qualities. This is in contradiction to Ball (1996) who states that the “style show” mentality (individuality) of mathematics teaching is a deterrent to the development of standards (norms) of mathematics teaching.
I must respond by asking, who’s standards? Can we have a standard for teaching mathematics? The quick response would be, yes. Why else would we have created the Professional Standards for Mathematics Education (1989)? I am concerned though, that in doing so we are not practicing what we preach. How can a constructivist teacher impose a standard of teaching? Is your truth my truth? If not, whose truth is THE truth? We are all creating teaching knowledge and developing our own expertise through a variety of experiences. Ball (1996) also suggests that by “allowing” individuality among mathematics educators, we inhibit critique and thus, diminish the forum for debating and improving understandings. I believe it is through this individuality and possible debates and defenses of our unique methodologies of teaching that growth occurs.

This study does not rely on a “true” answer. Instead, I propose that the solution to a particular problem or question be addressed in a multitude of ways, dependent upon the experiences and immediate environment of the reader. The ontology of this work is one of interpretivism; a query of truth, a truth that is constantly changing, never fully defined. This is a journey through the experiences and situated wisdom of three expert mathematics teachers via stories and data display. The design is to give insights, not answers; possibilities, not prescriptions.

The experts in this study are from secondary schools. Nevertheless, many of the tactics and social and environmental issues they deal with and address in the interviews and observations could provide options for all classrooms. Read on. Try to associate some of the vignettes and expert responses to issues and concerns from your classroom. Have a conversation with the experts in this text, through reflection and dialogue with other mathematics teachers after reading.
As stated earlier, the purpose of this work is to create opportunities for learning and experiences, through the stories of experts, to guide you, the reader, to a deeper understanding of teaching, learning and the complexities of education. It is my belief, through the theory of social interactionism (Voigt, 1996) that each reader will interpret this writing in varying ways. Further, I expect that each time you read this work it will yield different reactions and connect with distinct experiences of your teaching career. By continually adding to the experiences of you own classroom and their connections to the classrooms of the experts in this study, the list of possible solutions to problems in the classroom grow and allow movement from situation to solution to be more fluid.

**Previous Expert Studies**

Previous expert studies have offered information such as the need for more thorough teacher education programs and professional development as indicated by a group of Teacher of the Year recipients (Pollard & Tomlin, 1997). In this study, teacher of the year recipients responded to questions concerning what they believed to be deficiencies in the field of education. Still another study, taking a different approach, got to the “whys” of expert teacher actions (Brandt, 1986). On another tack, Welker (1991) troubles the idea of expert all together. Hitchcock (1997) gives an interesting, historical view of expert teachers of mathematics. His work takes the reader through a tour of a variety of mathematics classrooms beginning from 1870 through 1970. In a study of award-winning lecturers, Pollio & Humphreys (1995) found that connection, relevance, and relationships are important aspects to student and teacher learning.
Distinctions of This Study

How is this study different? First, it considers the varying qualities of experts as determined by administrators, counselors, and mathematics teachers in a particular school (the selection of the experts). The emergent expert teacher is not simply one that conforms to the norms of an expert from the administrative division of education. The experts in this study are teachers who have the managerial (administrators), conceptual (mathematics teachers), and social (counselors) qualities we, educators, consider vital to quality teaching. Another aspect of diversity is the selection of sites. By choosing an expert from an urban, suburban, and private school, I intended to reach a broader range of experiences of the readers.

Second, this work incorporates, throughout the text, the underpinnings of social interactionism. I firmly believe that what we learn is highly dependent on our past experiences, immediate experiences, and dialog with others in our field. These factors will initiate varying developments of knowledge as you read and re-read this work.

Third, this work examines the experts with respect to the idea of worldviews as defined by the research paradigms including positivism, interpretivism, and critical theory. How are the experts situated? Do they travel between worldviews? Is the travel connected with content, environment, and/or personal experiences?

The final aspect of difference between this work and the previous expert studies is the absence of answer. I do not assume that there is any one correct solution to any particular problems in education. There are only varying degrees of acceptance. What is acceptable to you may not be to me. What is acceptable to you today may not be acceptable to you tomorrow. This work will provide options. The intent of the stories
and data display is to stimulate growth. The development of your journey and growth through this work will be as individual as you. Can there be a right or wrong to this?
CHAPTER 2
THEORETICAL CONSIDERATIONS

Introduction
Novice mathematics teachers grapple with many issues in their early years of teaching and this struggle is the focus of much research literature (for examples see Borko & Livingston, 1989; Borko & Livingston, 1990; Irwin, 1994; Weinstein, Woolfolk, Dittmeirer, & Utpala, 1994). My struggle was to develop a method of addressing the issues of concern for these novice teachers that is not prescriptive, but experiential. I attempted to do this through my text, stories of the experts, absent of the reader's physical presence in the classrooms.

Again, as stated earlier in this writing, I have analyzed the responses of the experts according to possible alliances to the ontology, epistemology, and methodology of three research paradigms; positivism, interpretivism, and critical theory. Using the paradigms as lenses helped to demonstrate the varied methods of dealing with certain problem situations that occur in a mathematics classroom. What worldviews are the experts in this study acting from and do these worldviews remain constant or vary for each situation? How do the varying pedagogical practices of the experts differ, blend, or equate? How do experts deal with the challenges of a mathematics classroom?
Ball (1988) writes "...learning about teaching (while) in the classroom is much more effective than learning about it in university courses." I have attempted, through my qualitative presentation of data, to place you, the reader, in the classrooms of these experts. Through this, I am attempting to cross that barrier of the university classroom and get a little closer to the actual experiences of the experts in this study. My hope is to place you in the classrooms of these experts to give you experiences you can draw upon in your own classrooms.

The parallel of the response to a paradigm view, and comparisons with recent research on the topic lends an interesting vista to the experts' responses. The lenses of the paradigms afford the reader an opportunity to see solutions to typical problem situations from differing worldviews. *Do the experts differ in their worldview depending on the specific situation? Is there a particular worldview that is prevalent among each expert even when demographics are different?*

This study initiates a symbolic formation (van Oers, 1996) and creates an assimilation paradigm (Davis, 1996) through the stories of the expert teachers. Davis describes an assimilation paradigm as follows:

> When some form of data that requires processing confronts any of us, our first attempt is to see if it can be made to match something that we already know. If so, the "something that we already know" is an assimilation paradigm (p. 8).

The final work will provide the reader opportunities to view situations from varying points of view and differing solutions will demonstrate the merit in each view.
What is an expert?

It is imperative to speak to the issue of expert. What is an expert? If I feel someone is an expert, is s/he an expert in your eyes? This is not necessarily so. I cannot define expert for another. In doing so, I would be imposing my biases of pedagogy onto the reader, you. Expert, then, is a *hyperglossia* (Lather, 1998); a term with many and varying meanings, dependent upon the social and experiential travels of the rhetorician.

In other words, we each have our own *a priori* notions of an expert teacher.

Nevertheless, I will not throw up my hands to the meaning of expert. I will simply try to define expert for the purposes of this writing.

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<tr>
<td>Static vs. Dynamic (Pirsig through Evans, 1994)</td>
<td>Constrained elaboration</td>
<td>Pushing the limits of artistry while staying “in check” with governing forces.</td>
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**Dichotomy of Expert Terminology** *(Bucci, 1999)*

Table 1

I begin my interpretation of the term *expert* by discussing three sets of dichotomies common to the vernacular. The three studies used in my juxtaposition are from papers written from a philosophical frame. In my study of experts, I attempt (as
have others) to create a fusion of the binary definitions posed by past research to define the term, expert. It is through this fusion combined with options of the more traditional definitions of expert that I analyze the experts in my study.

Berliner, in an interview about his study of expert teachers was asked to define expert (Brandt, 1986). In the interview, he stated that it is necessary to distinguish between good and effective teaching. In short, he said that the notion of effective is measurable, whereas the notion of good has no criterion that is measurable. I am assuming that good and effective both have positive meanings to you. They do to me. The taxonomy of the terms in their relation to expert is what I must define. I believe there is some way of quantifying a teacher in a subjective way. I also believe, though, that there are many effective teachers who are not recognized as such because their effectiveness was not within the current classification of productive skills.

For example, how would you measure the positive effect a teacher has on her students with respect to social consciousness? Is this effect any less valuable than being able to add fractions? Whether you think it is or is not, there are many accessible ways to measure conceptual learning of fractions whereas the social and philosophical learning of students is much more difficult to measure. Because of this, the latter type of effectiveness goes virtually unseen by the administrating factions of a district. Is the teacher who excels in the social cognizance of her students less valuable? The restrictions of the society may measure her as such. In Berliner's terms this would categorize her as simply good, not necessarily effective. The hegemonic views of the quantitative world in which we live limits our notion of expert. It would be naïve to think that this focus on the "measurable" could be remedied, but it is my personal goal to try to
do so in future writings. From this binary, I wish to introduce the notion of *situated effectiveness*, the ability of individual teachers to be effective to students with respect to the student’s world, not the world of the measuring majority.

The second dichotomy of terms that represent my notion of expert comes from Evans (1994). In this article, Evans attempts to contrast varying, opposing ideas of the term quality, as stated by Martin & Sugarman (1993). Evans writes of two contrasting traditions in the conceptualization of the relationship between teaching and research. First, he explains the tradition of the *Aristotelian view*. This view is of an emergent nature. It searches for regularities, absent of *a priori* notions. Once regularities are detected, it interprets events through the lenses of these regularities. Conversely, the *Galileian* approach is paraphrased as a, “... function of unseen laws which operate from a directly inaccessible deeper structure (p. 304).” He writes of an active affinity between constructs and events, made through theoretical propositions. This relationship is shown through empirical work.

Later in this paper, when I describe the varying paradigms, you will be able to see these two conflicting views as of the interpretivist and positivist worlds (respectively). My interpretation of expert would fall within the Galileian frame, by my use of recommendations, and thus, their empirical judgement of their a priori notion of expert. I am though, using the emergent nature of the Aristotelian view by remaining detached as a selector of the expert within the school, allowing the cultural influence of the particular school to determine the parameters of expert. By this, I would introduce the notion of *emergent measure*, using the a priori notions of expert of those surveyed (Galileian
approach), but letting those notions form through the specific society of the school, or emergently (Aristotelian approach).

The third dichotomy of expert-related terms comes from the same Evans (1994) article as the preceding dichotomy. Here he compares the notions of static and dynamic as it relates to quality. I will parallel this description to the term expert for the purposes of this writing. Evans describes Pirsig's integration of the two seemingly opposing ideas of static and dynamic quality (expertise). He writes, "Static quality (expertise) is based on cultural patterns derived from established laws. Dynamic quality (expertise), on the other hand, is completely simple, always concerned with freedom, which is its only perceived good, and its only perceived evil is static quality itself" (pp. 307-308). Well, this sounds much like the other two dichotomies in that there is extreme differences between two opposing views of expert. As in the other cases, I am striving for a blend. What would a blend of dynamic and static be? How do you measure freedom? Do we want to? What would this definition of expert teaching be? I envision this as a fusion of the freedom or creativity of teaching and delivery of concepts within the confines of the reality of the school, stated curriculum, and the political aspects of education. I will call this constrained elaboration, pushing the limits of the artistry of teaching while staying "in check" with the politics of education. All of this led to my interpretation of expert and the qualities of expert relevant to this study, as organized in Table 1.

As you may have realized, the conflicting ideas of expert definitions shown in my table and my attempt to explain them further represent varying worldviews. The left column from the table seems conducive to quantitative measurement while the right
column resembles the ideals of qualitative research methodologies. This leads me to the
differentiation between my study and previous expert studies.

What is the lens of the analysis?

This study addresses the ideologies of quantitative and qualitative worldviews.
Similar to the conflicting representations of the term expert, quantitative and qualitative
methodologies bring opposing aspects of the world of education. The lenses of the
worldviews can shed interesting light on the field of mathematics education. In this study,
I concentrate on the paradigms of positivism, interpretivism, and critical theory. There
are many variations of these paradigms. However, I have limited myself to the basic
three mentioned above. I have also used the terms worldview and paradigm
 interchangeably. I will define the paradigms by first examining the writings of two
qualitative researchers, Guba & Lincoln (1994). I will then parallel their definitions of
the worldviews to a graphical representation intended to make the complexities of the
paradigms more easily accessible. Last, I will relate the paradigms to the study of
education, specifically, pedagogy.

The theoretical bases for the analysis of the data of my study lies within the
ontological, epistemological, and methodological views of the three research paradigms;
positivism, interpretivism, and critical theory. I would like to note that there is typically
a fourth category within the qualitative realm, deconstructivism, that I will not address.
This worldview is newly developed (in relation to the three I will be discussing) and I do
not feel confident in its parallel relation to teaching and education.
The postmodern times brings new questions to the hegemonic positivist and sometimes known as “pure science” reign in scientific study. With the questioning of the positivist theories of research comes a defense of alternate methods of research.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Ontology</th>
<th>Epistemology</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positivism</td>
<td>Naïve reality — masterable truth</td>
<td>Dualist, objectivist</td>
<td>Experimental, manipulative</td>
</tr>
<tr>
<td>Interpretivism</td>
<td>Relativism — multiple, local, and specific constructed truth</td>
<td>Transactional, subjectivist</td>
<td>Dialectical, emergent</td>
</tr>
<tr>
<td>Critical Theory</td>
<td>Virtual/historical reality — inequitably masterable truth shaped by culture, gender, economic, political values</td>
<td>Value-mediated, subjectivist, influential</td>
<td>Dialogic, dialectical, transformative</td>
</tr>
</tbody>
</table>

Paraphrased Definitions from Guba & Lincoln (1994)
Table 2

I begin by paraphrasing the work of Guba and Lincoln (1994). I have provided their representation of the three paradigms and their standard definitions of the terms ontology, epistemology, and methodology in Table 2. I am aware that there are many
interpretations of the paradigms I have chosen to study. I am also aware that these definitions vary greatly dependent upon the author and her particular methodological frame. Nevertheless, I will use the model of Guba and Lincoln as a springboard in this study.

I will demonstrate my idea of the three paradigms in terms of the symbolic representation in Figure 1 (p. 24). In this graphical representation, I have assigned each of the three paradigms a geometrical representation. The representation of the geometric figures is necessary to relate the qualities of the paradigm in a more clear and concrete manner. The idea of the representation of the paradigms in a graphical sense comes from an assignment given by one of my instructors at Ohio State University, Dr. Patti Lather. This assignment was to represent the research paradigms in a non-hierarchical manner to avoid appearing biased. It was a difficult task and several of my colleagues and I struggled to find an appropriate representation. Our small group decided to use different types of triangles, with their varying characteristics to represent the paradigm views (Atkinson, Balas, Bucci, and Wetzel, 1997). I have altered this representation to the use of three different geometric figures: square (blue), triangle (red), and circle (yellow). There is no significance for the assignment of a particular color to any particular paradigm.
Paradigm Polygon Relational Perspective
Bucci (1998)

Figure 1
Through this graphical representation, it is possible to move from one worldview to another. The blending of the colors and the shapes indicates that it is possible to act from many worldviews at a time. For example, if an act is similar to the ideologies of a positivist ontology but contains the methodologies of an interpretivist, that act would fall in the green range; or a blending of the yellow interpretivist circle and the blue square of the positivist principles.

First, I chose the square to represent the positivist paradigm. I favored the square because of its unyielding form. Considering the perimeter, the square is composed of two parts, vertices and edges (four of each). This is my representation of the binary focus of ontology within the positivist paradigm. In the positivist paradigm, knowledge or truth, is either right (a vertex, which in a square is always a right angle) or wrong (in this context, not right or an edge). This relates to the immutable reality of the positivist paradigm as suggested by Guba and Lincoln (1994).

With respect to epistemology, I found the square as inflexible as the positivist paradigm. You cannot alter the shape of the square (with the exception of its size). You cannot change an angle or make one side longer, without having to change many other components of the polygon to revert to the original or a similar square. This relates to the epistemological definition of the positivist paradigm by Guba and Lincoln (1994) that states, “When influence in either direction (threat to validity) is recognized, or even suspected, various strategies are followed to reduce or eliminate it (p. 110).”

The methodology of the square is simple. A square has restricting guidelines. If any one of the conditions of the polygon is absent, it is reverted to a more generalized quadrilateral, not a (more specific) square. This parallels Guba and Lincoln’s (1994)
definition of the positivist methodology in that it too, has a priori procedure, “...hypotheses (that) are stated in propositional form and subjected to empirical test to verify them (p. 110).”

The right triangle represents my idea of critical theory. A right triangle contains one right angle. This right angle can be any of the three angles within the triangle, but once chosen, the other angles cannot be right. If the measures within the triangle shift and a different angle becomes the right angle, the other two angles are now of lesser measure. This is similar to the ontology of the critical theory approach. In critical theory, the historical realism consisting of situated structures is limiting and confining (Guba & Lincoln, 1994). In short, there is a dominant construction of reality that perpetuates inequality. This reality is one that is designed through the historical, social, and cultural confines, similar to the partially restricted dimensions of the right triangle. Any angle can be the “right” angle, but once decided the other angles have restrictions.

The epistemology of the critical theorist is one of transactional subjectivity. The knower and the would-be-knower are interactively linked (Guba & Lincoln, 1994). They work together (praxis) to promote social change. The goal of the critical theorist is emancipation (Lather, 1998). Once emancipated, the previously marginalized yields to a new marginalized group. This is similar to the “play” of the right angle in the triangle. The measures of the angles are dependent upon each other.

The methodology of the critical theory approach requires communication; a dialectical nature intended to transform ignorance and historically constructed restrictions (Guba & Lincoln, 1994). The intent of this methodology is to evoke change for the marginalized community or individual. This is similar to the possibility of each angle
within the triangle having the opportunity to hold the “right” position, although only one angle can have that quality at a time.

I believe the circle best represents the interpretivist paradigm. To me, the circle is impartial and there are no specific distinctions of “right and wrong” as there are in the square and triangle. The circle has a perimeter that is unbiased. All points on the perimeter of the circle are equidistant from the center. This parallels the interpretivist (constructivist) paradigm in Guba and Lincoln’s (1994) work that states that the constructivist ontology is one of, “...multiple, intangible mental constructions, socially and experientially based...elements are often shared among individuals (p. 110).” The points on the perimeter of the circle share their distance from the center, but the number of points on the perimeter is multiple.

The epistemology of the interpretivist paradigm is similar to that of critical theory. The interpretivist relationship between the knower and the would-be-knower is interactive. Unlike the critical theory epistemology, though, the interpretivist relationship has no specific agenda. The findings of an interpretive investigation are “...literally created... (p. 111),” or emergent (Guba & Lincoln, 1994). This is similar to the perimeter of the circle in that there is no one superior point like there is no one truth in the interpretivist paradigm. There are multiple ways of investigating an issue in the interpretivist approach just as there are infinitely many ways of rotating a circle and viewing the relationship of a point on that circle’s boundary with any other point on the circle’s perimeter. I do see at least one flaw in this analogy. The flaw is that whichever way you rotate the circle, the view of the center is always the same. In the interpretivist
approach, the outcome of an investigation (view of the center) is drastically different depending on the emergent nature of the investigation.

The methodology of the interpretivist approach is instrumental, where individual constructions are elicited through interaction, "...between and among...(p. 111)," the investigator and the respondent aimed at reconstruction of formerly constructed ideas (Guba & Lincoln, 1994). The circle demonstrates this in its relationship between points within a circle. For every point within a circle, there are infinitely many points that have a similar construction of the center (the output of the study).

How does this relate to pedagogy? I have adjusted the definitions of ontology, epistemology, and methodology to fit the connection with pedagogy in Table 3. I have also stated the criteria I will use in the taxonomy of the experts’ responses to their paradigm parallel. In these definitions, I am using the parameters of Guba and Lincoln’s (1994) definitions along with my symbolic interpretation of the paradigms.

I believe that teachers travel from one worldview to another. This trekking is dependent upon many variables such as but not limited to: content, culture of the classroom, and past experiences of the teacher. It is important to clarify that there can be travel between worldviews. The movement from worldview to worldview in, among, and intersections of is represented in Figure 1 by the blending of the colors that represent each polygon. The blending of the colors is to emphasize that not only can a teacher be within many views, but also that s/he can be within two or all three worldviews at a single moment. With a single action, a teacher can be both a positivist and an interpretivist. Similarly, s/he can make pedagogical decisions that fall within the parameters of all three ideologies. Those of us who believe we are constructivist teachers
or feminist teachers may debate this hypothesis. Are we, though, truly homogeneous in our ontological, epistemological, and methodological alliance to these worldviews?

<table>
<thead>
<tr>
<th>Definition</th>
<th>TEACHER ONTOLOGY</th>
<th>TEACHER EPISTEMOLOGY</th>
<th>TEACHER METHODOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positivism</strong></td>
<td>What is the nature of the reality of the delivery of mathematical concepts and what is the nature of the reality with respect to student learning and discipline</td>
<td>teacher is a giver of knowledge, students are passive recipients</td>
<td>lecture, multiple choice, true/false, “book” tests, knowledge is given</td>
</tr>
<tr>
<td><strong>Critical Theory</strong></td>
<td>process more important than product, teaching directed at manipulations through conceptual knowledge</td>
<td>teacher-as-facilitator, student directed learning, teacher encourages student-taught lessons</td>
<td>cooperative learning groups, discovery lessons, knowledge is constructed</td>
</tr>
<tr>
<td><strong>Process over Product</strong></td>
<td>belief that all students can learn all math, realization that there are societal, historical, and gender-imposed obstacles that impose inequities, emancipatory ideas are emphasized and openly addressed in the classroom</td>
<td>teacher-as-coach, teacher is higher knower but encourages students to follow their lead</td>
<td>group projects related to issues, history of mathematics is prevalent, knowledge is accessible</td>
</tr>
</tbody>
</table>

**Worldview Definitions as They Relate to Pedagogy**

Bucci (1999)

Table 3
Personally, my pedagogical alliances are most firmly within the interpretivist frame. I am a promoter of cooperative learning groups. I try to allow student interest and inner motivational needs to drive my curriculum. Still, I have limitations that do not allow this to carry completely into my teaching. Is this not a blend of the critical theory and interpretivist ideology? At the same time, I believe I must address the issues of inequity that are prevalent in the scientific world, mathematics specifically. I do this through the study of history and gender and racial bias in my classroom. So, am I an interpretivist or a critical theorist? Must I be one or the other? I think not.

**How can we learn from expert teachers?**

So, how can this study of experts and their alliances to one or various worldviews help the novice or struggling teacher? Simon and Chase (1973) conducted a well-known study of expert chess players. In this study, they found that master chess players could look at a midgame chessboard for a brief time, seconds, and reconstruct the positioning of the pieces on an empty board. The novice players had some difficulty doing the same. Oddly, though, when randomly placed chess pieces were about the board, not in an actual game, the master players and the novice players had no difference in the skill of remembering where the pieces were placed. What does this say? Leinhardt and Putnam (1988) deduce that this study indicates that, “The expert appeared to have built up a system of knowledge that allowed him to recognize familiar patterns... (P. 7).” The intent of my study is to do just that. Through the stories of the experts in this study, I will build a knowledge base; I will call it a *pseudo-experiential* knowledge base on which to create a foundation of familiarity with common occurrences in typical mathematics classrooms.
You may be thinking, “How can you gain experiences from a text?” I will explain through an analogy.

If you have never sailed, can I, having sailed competitively for fifteen years, teach you to sail simply by writing down directions? Can you experience the freedom and relaxation of sailing by reading about it in a manual? Can you feel the cool breeze on your face and the systematic rocking of the vessel beneath you? Can you sense the gentle pull of the water as you hold the slender tiller in your hand, hoping to guide the boat through the depths of the vast seas? That depends on the text. Is it a manual or a story? Is it drawn from actual experiences or simply from the physics and mechanisms of sailing?

Let us say that before your first trip aboard a sailboat, you read a book about sailing. I am not speaking of a directive text, but one that incorporates poetic messages and inspirational stories of travels and adventures of sailing from those who have had many experiences, relaxing and severe, of sailing. One that highlights the travels of many sailors with varying experiences. Imagine that on your first venture out in the seas you encounter a problematic jibe (turning of the boat away from the wind). Jibes can be dangerous. The wind can come from behind you and slam the boom (named for the sound it would make if it hit you) full force into inexperienced heads, arms, and bodies knocking you overboard. Back to the jibe at hand. If you never encountered this activity, could you rely on the ideas offered through the text by an experienced sailor? Would you remember the written words as you are in the heat of the jibe? Possibly. Now, would this information be as helpful as if another experienced sailor or I was with you?
Probably not. However, would you recall some of the words you read in the book?

Probably, yes. So, there is merit in reading the experiences of others.

Let us say that you made it through this first outing and the intimidating maneuver. Would you, at the next instance of a similar jibe, be better prepared? I believe you would. Not simply because you have experienced the activity yourself, but because you now have personal experience and the residual knowledge from your first reading of the book. If you read the text again, having experienced sailing for yourself, would you gain new insights to the sport? Would you be able to connect more readily with the poetic nature of the words or the events of the experts in the stories? I believe you would.

My study will do much of the same. Through the stories of the experts, I will place the reader in their classrooms. I am not trying to bond the reader with expert knowledge, but rather with experiences that can connect to previous experiences of the reader or become newly constructed, owned by the reader. The intent is to create an assimilation paradigm (Davis, 1996) through the experiences of the experts.

In my study, the assimilation paradigms grow through the stories of the experiences of the experts. They are heightened through the parallels of these experts and the worldview paradigms. The variety of types of stories and various views of the experts give breadth to the assimilation process, because each reader comes to the reading with varying experiences of teaching and learning.

The assumption that the different experts will each bring their own solutions to problems is based on the theory of symbolic interaction. Because different teachers have individual constructions of meaning, they will interpret the stated problem situations
differently and thus the course of interaction will vary (LeCompte & Preissle, 1993), leading to a variety of solutions to be examined in the analysis of data. The basis for my learning theory (shown in figure two, page 33) comes not only from the idea of an assimilation paradigm as described by Davis, but also from the theory of symbolic interaction. Blumer (1969), one of the pioneers of the social interactionism writes that symbolic interaction is the interplay of individually created symbols with experiences and events and it rests on three basic premises.

1. Human beings act on things based on the meanings that the things have for them.
2. The meaning of such things is derived from social interaction with others.
3. Meanings are adjusted and modified through interpretation of the individual.

My study relates to the three premises of the symbolic interactionist theory as follows:

1. Readers will react to the stories of the experts in a variety of ways. The experiences of the experts will come from a variety of experiences that have, in them, different symbolic meanings.
2. Social interaction will be constructed through the conversational manner of experiences of the experts.
3. Reader meanings can be adjusted and revisited through the varying stories of each expert to each problem situation and each world view application.

There are a variety of “solutions” to certain problem situations. Each solution will/could yield varying symbols and symbol modifications for the reader. Not only will the experiences of the reader, thus their symbol identification with events, be of paramount importance, but the experiences of the experts and me also come into play in the development of meaning. In addition, the immediate experiences of the writer and
the reader will have an effect on the meaning development and, thus, on the symbol modification. Not only do past experiences and cultures of the classroom affect learning, but also the immediate culture and experiences of a teacher may alter the ability to learn at one’s highest potential. I believe that a spontaneous action or crisis in a teacher’s classroom immediately before reading my work may alter the potential of obtaining new knowledge.

I have demonstrated the effects of experience and spontaneous events in Figure 2. The reader, the experts and I all have a great deal to do with the meaning obtained by this text and the symbols created by the reader. I call this theory of learning the social assimilation interchange; a social, assimilation, experiential approach. This learning theory not only incorporates the ideals of symbolic interaction, but it includes the process of assimilation and the influence of the symbolic interaction of others on an individual’s symbolism.

How will the study of experts guide the reader to creating assimilation paradigms and symbols that can be drawn upon while in the classroom? The theory behind the rationale for expert stories comes from the basic tenets of Vygotskian theory; the assumption that individual learning is dependent on social interaction (van Oers, 1996). More specifically, in my study, the inclusion of an expert (higher knower) will influence the reader’s (learner’s) meaning of the text and, thus, of pedagogical practices. The influence of this expert will allow the reader to achieve a meaning of teaching and pedagogy that will guide him/her to a higher level of knowing (pedagogical practice).
- Immediate "frame of mind"
- Past experiences
- Biases through past societal influences

- Immediate classroom experiences
- Past experiences

- Social atmosphere of observed class
- Past experiences

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Learning Theory for Expert Study

Social assimilation interchange:
A social, assimilation experiential approach

Figure 2
This is typical of Vygotsky's idea of Zone of Proximal Development (ZPD). The interpretation of Vygotsky's work gives the following definition of the ZPD:

It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1934, translated in 1978, p. 86).

Through this definition, it is clear to see that the inclusion of the expert experiences and the stories of their classrooms can be seen as a motivator for a potentially higher development for the reader. The expert is the adult guidance or more capable peer. The stories are the vehicle of the expert's guidance. I am the messenger.

Vygotsky's ZPD and through it the figure of the more capable peer, is very similar to the idea of apprenticeship. Apprenticeship and the relation of the apprentice with the expert are the initial intention of the work of Lave and Wenger in their book, Situated Learning: legitimate peripheral participation, (1991). In this text, they write of a derivative of situated learning, legitimate peripheral participation. Where situated learning is based on theoretical perspectives, negotiated meaning, and dilemma-driven concern, legitimate peripheral participation is, "...a way to speak about the relations between newcomers and old-timers (p. 29)." Now, I am certain that the experts in my study would debate the use of the term, old-timer. However, you can see the connection.

Lave and Wenger (1991) go on to stipulate that legitimate peripheral participation differs from apprenticeship in that it is not simply learning by doing. They write that learning is a social practice. The process of legitimate peripheral participation is one in which the newcomer is enculturated into the community of professionals; meaning that
the newcomer is not simply repeating the actions of a higher knower, or old-timer. The newcomer is growing to know the social and cultural atmosphere of the situation and using this knowledge to better react and act in certain situations.

In relation to my study, the experts are most assuredly the transport for the concern-driven learning of the reader. The varying stories they tell and the options of solutions provided will guide the reader to find a connecting symbol(s). Once formed, these symbols can grow and fuse with new experiences and future stories of experts. This study is the beginning. A beginning built of experiences, known and told, but experiences that form into meaningful learning and growth as educators of mathematics.

How is this study situated?

Who is Terri Teal Bucci? Why do you need to know? I feel it is important for you, the reader, to know who I am and what my experiences are. I believe it is important to put my intentions and views into perspective. I am a firm believer in the theory of social interaction, as related earlier in this paper. Because of this, the social and cultural experiences of my teaching and learning are a vital component of the analysis of this study. Through my writing and representation of the data, I am the measuring instrument of this work.

I am a mother, teacher, learner, and partner. I come from a middle class background where my father, an engineer, worked and my mother worked in the home, raising my older brother and me. I have always been a good math student and the concepts usually came easily to me. I have a BA in Elementary Education and an MA in Mathematics. Both degrees came from large universities in the Midwest. I tell you this because our experiences of learning have much to do with our practices of teaching.
I have taught middle school mathematics, health, and science and high school mathematics for the past fourteen years. I have developed as a teacher through many hours of professional development and many conversations with teachers I felt have interesting and productive ways of sharing knowledge and experiences.

I began as a lecturer: insistent on a silent room and little-to-no disturbances from daily routine. I have since changed. After an initiation with methods of cooperative learning, I have grown to be a teacher who values teacher-student and student-student interaction. I believe I travel from the ideals of interpretivist, positivist, and critical paradigms in my teaching and my daily interactions.

I have developed a fascination with the varying worldviews, as is evident in this writing. It is through this passion that I have found a path out of the positivist, dualist, right or wrong, mathematically hegemonic views of my pre-Lather self. This is a vital part of who I am becoming. Although my knowledge is at a neophyte level, I intend to continue to grow as a worldview expert. I am certain I will continue to dissect conversations and actions of others and myself through the lenses of the paradigms. This excites me. This excitement will, most definitely, affect my writing and through that, your reading.
CHAPTER 3

METHODOLOGY

Introduction

Any research design serves as a foundation for the understanding of the participants' world and the meaning of their shared experiences (Janesick, 1994). Is that meaning the same for all? Many constructivists would give a resounding, "No!"

Because of this, my study of experts (participants) and their reactions to problem situations of novice mathematics teachers provides a situated meaning to those who read.

The methods for making sense of experience are always personal.
One learns about method by thinking about how one makes sense of one's own life (Denzin & Lincoln, 1994).

Let this quotation be your guide while reading the purpose and methodology for my study. Join me on a journey through the experiences of expert mathematics teachers and their responses to problem situations of novice mathematics teachers. Take from it what you can, what your personal experiences allow.

This is a qualitative phenomenological study of the experiences of three expert mathematics teachers as they relate to problem situations indicated by novice mathematics teachers and contemporary research. How do experts deal with the daily problems and challenges of a mathematics classroom? What worldviews are they acting from and do these worldviews remain constant or vary for each situation? How do the
varying pedagogical practices of the experts differ, blend, or equate? The essence of this study is in the data analysis. Responses are juxtaposed and the experts’ pedagogy are examined through the lenses of the research paradigms (worldviews) of positivism, interpretivism, and critical theory and their related ontologies, epistemologies, and methodologies.

The quotation in the introduction has a constructivist edge, which is telling of the emergent design of this work. However, it also allows for an interpretivist methodology. This phenomenological study follows the interpretivist paradigm as shown by the interactive and relational epistemology and methodology of interviews, observation, and emergent design. It is a productive and re-productive process that contains multiple meanings of the events and experiences of the experts studied.

Interpretation is transformative, enlightening, and refining (Denzin & Lincoln, 1994). Its usefulness or transformability is relative to the reader and, in some part, to the writer. Be aware of the positivist trap. The intention of this work is not one of generalizability, although you will find later in my writing that I do use the findings to generalize to a certain extent. Nevertheless, the primary intent is transferability. I have attempted to put the data collected in this study in a format easily accessible and, therefore, accessible to a variety of readers. The target readers are novice mathematics teachers, mathematics teacher educators, and practicing (novice and experienced) mathematics teachers. Its purpose is to aid in the educators’ development of an individual teaching style that is productive and distinct by relating practices of a varied (by pedagogy and worldview) selection of expert teachers, contemporary research, and world views.
Pilot Study

I found in my pilot study that I needed a focus during my observations of an expert teacher. There are many issues and situations to observe in a classroom, as anyone who has observed a classroom well knows. I needed to find a few issues of importance to a large number of novice and pre-service mathematics teachers. That realization led me to the grounded theory approach for developing a list of concerns of novice mathematics teachers. Grounded theory, as a methodology, is one based on data systematically gathered and analyzed (Strauss & Corbin, 1994). Because the topic of this study concerns an experience and the phenomenon as a process, I used a grounded theory approach (Morse, 1994). The grounding is of the areas of concern for novice mathematics teachers. I developed a simple, open-ended survey that asked novice mathematics teachers to indicate areas of concern; situations that troubled them in their first year of teaching. I sent this survey to first year mathematics teachers from a variety of demographic locations. The responses ranged from situations involving delivery of concepts to professional relationships. Through the grounded survey, focus issues emerged. The data collection targeted these issues. I obtained data, through observation, that indicated how the experts solved such problem situations. If I could not observe the experts’ responses, or if it was inappropriate to do so, I elicited possible problem solutions through interview. There were three sources of grounding for this study.

First, I surveyed novice teachers to find areas of concern. Second, I incorporated my personal experiences with pre-service and novice teachers. Finally, I reviewed literature on areas of concern for novice teachers. After compiling the varying resources
of inputs, I developed a list of concerns to address, by observation and interviews of the experts. This list is, of course, "in progress."

The grounding of the concerns has allowed me to travel farther down a focusing funnel for my study. I have used it to concentrate my efforts of research of literature and on observational interests. The use of the grounded theory approach has allowed me to get to areas with more substance, as indicated by Strauss & Corbin (1994). Of course, in keeping with the emergent nature of qualitative study, I expected some topics to fade while others appear throughout the course of the study.

Methods

I felt it was important to this study to obtain data through interview and observation, specifically, two interviews and four observations of each participant. The interviews provided an introduction to the study and to me. I provided the participants with a copy of the interview questions so they would feel comfortable with the topics and have time to reflect on their teaching and experiences that relate to the questions. The interviews provided information that allowed me to create a foundation of understanding for the philosophy of the expert. In the introduction interview, I asked about the participant’s teaching ontology, epistemology, and methodology (as described in the framework of this study). This delving into the educational systematic view of the participant was vital in the data analysis chapter where the participants' parallel to the ‘ologies of the four stated research paradigms are considered. I also asked about the participant’s thoughts and ideas for possible solutions to the problem situations determined by the grounded survey. I believed it is interesting, and telling, to compare
these initial responses to the actual practices of the experts. This brings us to the reasoning for the observations.

There is, at times, a difference between the practices and the philosophies of teachers as they react to situations in their classroom. Because of this, it is necessary to include observation in this study. I observed each expert four times and, while remaining emergent, tried to observe the expert’s reactions to the stated problem situations. I say while remaining emergent to avoid becoming too focused on the indicated situations and missing possible substantive data. I conducted the observations in the following manner. First, I observed different classes and classes at differing times of the day. This is to create opportunities for differing classroom communities to bring forth what may be varying responses of the experts. The actual collection of the data was recorded on index cards. There was one index card for each of the predetermined problem areas for novice teachers. To prevent the study from becoming too structured and thus out of character for qualitative methodology, I also had an emergent card. This card will contained any rich data that did not “fit” the headings of the pre-determined cards.

The use of the cards aided in the coding of the raw data. I am a firm believer in the mixing of tasks. The collection of data on the cards took the data one step further by intertwining the collection of data with the categorizing. I tried this with my pilot study and it worked great. I brought the participant further into the analysis of the study through mini-conferences after each observation simply by handing over the cards. This idea came to me after my first interview in my pilot study. The teacher I observed was peering at the cards as if they held secrets about her teaching. I wanted to develop trust
and I needed clarifications on some of the events I had observed. This was accomplished by showing her the cards. This act seemed to comfort the anxious look. The cards initiated conversation between the participant and me and this also occurred in subsequent interviews.

The final interview was a summative interview of the expert. In this exit interview, I asked the participant about any unresolved issues, specifically, problem situations that observations did not contain. Yes, in some instances, the experts already responded to these issues in the first interview, but the recap lent authenticity to the experts' responses since I could not verify their problem situation solutions by observation. In keeping with the philosophies of a qualitative researcher, I used this time to invite expert input. I asked the expert how he/she sees his/her teaching. How or why does the expert believe he/she reacts or implements certain practices in the classroom?

Alder and Alder (1994), describe observation as gathering impressions of a surrounding world through direct contact with subjects and the fact that the researcher must actively witness the phenomenon being studied. This definition lends credibility to my use of observation in my study. I was directly involved in the phenomenon of the expert's world because of my repeated observations of his/her class. I tried to remain as inconspicuous as possible. I placed myself in the room where I could see as much as possible without disturbing the natural flow of discussions and lectures. I was a peripheral member of the class as defined by Alder & Alder (1994). I believe I benefited from my insider perspective on the workings of a classroom in the appraisal of the teacher observations.
I will keep all recommendations confidential. I have also used pseudonyms for the participants. All notes and tapes will be destroyed at the end of the study or subsequent studies relating to this topic.

**Format for Analysis**

The focus of process-product research on teaching and the production of generalized data seems inappropriate to interpretivist researchers (Erickson, 1986). Because of this, the interpretation of data addresses the following questions:

1. What is happening here?

2. Are there significant similarities and differences of happenings as they pertain to the paradigm parallel?

3. What do these happenings mean to the expert teachers, students and audience of this work?

As stated earlier, this is all relative to the reader. One engaging component of the data analysis is the juxtaposition of the expert responses and the experts' parallel to a particular paradigm. This examination yielded some fascinating results, regardless of individual worldview or experiences.

Still, what I perceive as being even more exhilarating is the escaping of the realist tale. The realist tale; one composed simply of “comings and goings”, theoretical coverage, and account of the “whys” (VanMaanen, 1988) could be considered a shortcoming, if left untroubled. I have attempted to avoid this shortcoming by escaping of the realist tale. After producing the realist tale as described in the following figure, I have complicated it by imposing my personal perspectives, political goals, and professional limitations to my juxtaposition. I have “troubled” the standard or typical
analysis of this tale by taking the data and its surface analysis and asking the “whys,” not of the data or participants, but of me, the researcher.

The textual design of the data analysis begins with a heading. The headings are from the problem situations found in the grounded survey. Following each heading is:

1) The observation and interview data for a particular participant in varying formats

2) The juxtaposition of the three participant’s responses and contemporary research on the indicated problem situation

- This process will repeat for several problem situations.

Analysis Format
Figure 3
As an interesting approach to data representation, several of the problem situations and the experts’ responses to those situations are displayed using alternative methods of data display. Poems, plays, and vignettes lend creative and motivational aspect to the reading. This is an attempt to engage the reader at a deeper, more personal level. Reader involvement is a necessary part of this work.

The “escape” is a culminating feature to this writing. It disrupts the realist tale, attempting to uncover my personal biases, and to get you, the reader to think about biases that my effect your teaching and hinder your growth as an educator. It initiates thinking about the deeper context of personal experiences and how those experiences effect the reading of the data.

Validity/Credibility

Triangulation is a buzzword in qualitative research. Morse (1994) writes of triangulation of methods to gain a more holistic view of the data. Janesick (1994) writes that triangulation of data, investigator, theory, and methods increase validity. This view of triangulation has an underlying meaning of developing a “truer” result. I am not searching for that which is “true.” My ideology tells me that true for one is not necessarily true for all. Because of this, the purpose of triangulation in my work will be to create a wealth of inputs. I have used this variance of triangulation in many areas of this study and will, from this point forward use the term multiplicity.

The first multiplicity (variety of information) of this study was in the composition of the problem situations. As stated earlier, I have developed issues of concern from surveys of current novice teachers, contemporary research, and professional experience. This multiplicity should provide a variety of issues typically found throughout the
resources. Of course, I continued to foster the emergent nature of this study and allowed issues to arise from interviews and observation.

Morse (1994) states that selecting two sites for the distinct purpose of compare and contrast increases the strength of the product. This brings us to the second area of multiplicity, the multiplicity of sites. I decided to work with an expert from a parochial school, an urban school, and a suburban to school. This decision invokes purposeful sampling, more specifically, intensity sampling. Intensity sampling, as described by Patton (1990), is one where the researcher searches for information-rich cases to exhibit a phenomenon intensely. This is the case in the site selection. Part of the reason for this selection was to try to broaden on the experiences and milieu of the readers. A variety of experts will have a greater instance of relational or situational meaning to the readers. I am confident that the purposeful selection of a suburban, urban, and private expert added to the depth of this study.

The selection of experts has raised several issues. There are many ways of choosing the experts. One method used in The Dreamkeepers (Ladson-Billings, 1994) is that of parent and administrative recommendations. In keeping with the multiplicity theme, I wanted to incorporate student input. In discussing this option with my colleagues, I discovered that including student recommendations might cause resentment or conflict among the staff and thus, limit entry to sites. This political limitation required additional thought as to the process of purposeful selection of experts to use in the study. I decided to include the recommendations of counselors to act as student representatives.

The process of determining experts was as follows. After gaining permission from the administration to conduct the search, I distributed the recommendation forms.
The forms were very simple. I found in my pilot study that teachers, administrators, and counselors all appreciate simple tasks that require little time. I distributed the forms that ask the recipient to recommend one mathematics teacher that they feel is an "expert teacher." The form also asked for a brief description of the reason for the nomination. I needed this information in my analysis. I anticipated that there may be varying ideas of "expert." Because of this, I wanted to see why each expert was recommended. I felt that an administrator would consider a teacher that requires little intervention on his/her part to be expert to a certain extent. Further, I felt that a counselor might recommend a teacher whom the students speak highly of: whether the student influence is based on personality or degree of difficulty. These feelings came from my biases breed from years of teaching experience. Through the multiplicity of the experts, I expected to find a recurrence of recommended teachers. This determined a teacher that had the many varying qualities and perceptions of expert. This multiplicity of the determination of the experts demonstrated purposeful sampling in that it stratified the recommendations among the "participants" of a school. Both the multiplicity of experts and that of expert determination exemplified maximum variation sampling (Patton, 1990).

The last form of multiplicity was one of data collection. I used methods of observation, interview, and surveys in my study. This is typical of qualitative methodology and is effective because it incorporates a multitude of "voices" of data.

In this study, I collected data from expert teachers as determined by district and in-house school recognition of talent and expertise in the field of mathematics education. There were four observations of each expert and two interviews of each teacher. As stated earlier, I used a variety of data collection methods to include interview,
observation, and survey. Finally, this study involved a variety of sources of information; three expert teachers, applicable research literature, and me.

**Ethics**

Some of the issues of ethics and morality of qualitative research are the changing ethical climate for all research. Collaboration, and researchers’ dependence on personal relationships for much of their data (LeCompte & Preissle, 1993). These issues are of particular concern for me. As a current practitioner and thus identifying with participants and researchers, it is evident that teachers are skeptical of research stemming from “ivory tower, out of touch” academics. I suspect that this attitude may affect the climate for research where educators are participants. It was a challenge to address this with the participants of the stated study. The fact that I am a practicing teacher (like the participants) could have had a positive affect on rapport. I believe the participants saw me as a competent and knowledgeable ‘partner’ in education.
CHAPTER 4

PARTICIPANT INTRODUCTIONS

Introduction

I would like to introduce you to our experts. You may remember that the administrators, counselors and mathematics teachers in their buildings recommended each of them. Each expert is different in many ways. Because of this, I will introduce them in varying methods. This is how I saw them; through interviews and observations. On occasion, I will interject some of the personal struggles I came across as I wrote up the introductions and in the process by which I will introduce them to you.

I will conclude each introduction by displaying a graphic of the expert’s room. I believe this will help you to become more of a participant in the world of the experts. Along with seeing how they have their environment set up, I have included direct quotes taken from my observations of the classes. I think you will find it telling to see what was said and what the overall tone of the class was through these graphics. Here are the experts.
Meet Sue (pseudonym).

Expert One, Sue:

Sue is a white, middle class, female in her middle forties. She is married and is a mother of one small child. Sue has been teaching for 20 years. Sue is originally from a small southern town. She is teaching in a large suburban school that has had much recognition for innovative teaching methodologies. This school has a diversified schedule where students may choose to be in blocked and non-blocked courses. This school is composed of 8% minority, 92% Caucasian students, grades nine through twelve.

The Expert

All students can learn math!
The parameters of the school day and the school year don’t allow that to happen.

Some students weren’t successful in the classroom.
I worked with them on an individual basis.
They got it!

I can teach all students.
I really do think that.
They understand the mathematical concept.
That’s really important to me.

I have good rapport with my students.
I have an open classroom
My students understand that it’s OK.

I’m very willing.
I’m very interested in my students.
I take a very personal interest in them.
There is a degree of respect there that goes both ways.

I encourage students.
The parameters have to change.

Legend

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<th>Focus</th>
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<tbody>
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<td>Teacher focused</td>
</tr>
<tr>
<td>Blue</td>
<td>Student focused</td>
</tr>
<tr>
<td>Purple</td>
<td>Teacher and student focused</td>
</tr>
<tr>
<td>Green</td>
<td>Society focused</td>
</tr>
</tbody>
</table>

52
The words of this poem come from an interview with Sue. I chose to introduce Sue through a poem because she emits a feeling of gentle freedom and self-expression. Sue was nominated as an expert mathematics teacher from administrators, mathematics teachers, and counselors from her large suburban high school. Some of the comments from those that recommended Sue read:

- High expectations of students
- Demands class participation
- Combines a multitude of teaching techniques
- Encourages students to try more than one method to problem solving
- Asks students to think on their own
- Has vast patience
- Willing to do whatever it takes to help her students

Let me start my saying that Sue is a teacher in the school where I am teaching. I respect her a great deal and I find that her comments and responses in my interview and her actions in the observations are genuine and typical of who I know her to be as a colleague and an expert teacher. I agreed whole-heartily in her emergence as an expert in this school. I respect her opinion and her integrity as a teacher. Sue did indicate that she felt nervous when I observed her. I am uncertain if this is simply in her nature or if the nervousness was stemming from the fact that I am a teacher in her building. Our school has many visitors and observers in our building and I am sure that she is used to having other teachers in the room. On one occasion, Sue felt it was necessary to explain why she taught the quadratic formula the way she did because she thought I might not have agreed with her technique. This technique was to give the students the formula. Sue said that
she typically will have the students derive the formula but she did not have time to do so because of an adjusted schedule that day.

In this first interview, Sue was talking about her relationship with her students, her educational philosophy, and her progression as a teacher. She spoke with conviction and modesty. She does not consider herself an exceptional teacher. She implied through her humble reaction to her recommendation as an expert, that she believes that the way she teaches and the passion and time she puts into teaching is "the norm."

Sue stated that she was originally a teacher who taught with authoritarian methods and techniques; desks in rows and the like. She said that probably more than anything else, the use of cooperative learning has contributed most to her evolution in teaching styles through the years.

It was evident from the moment I walked through the doors of Sue’s classroom that her students respected her and valued her instruction. Students were attentive and seemed at ease. Students were involved in Sue’s lesson. She would lead the discussion and introduce a concept briefly and then it was up to the students to pull the extensions of the concept from their previous knowledge base and experiences. Sue would constantly relate new material to what the students had learned the day before, the week before or the course before the course she was teaching. Although the students were a large part of the discussion in the classroom, Sue remained the center of the instruction.

Through the interview, Sue made it clear that she takes a personal interest in her students and their success in the classroom. Although, she did temper this by saying, "sometimes when a student fails, it’s not always directly the teacher’s fault." This seemed to be the exception not the norm, in Sue’s mind. Sue believes, as stated in the
poem, that all students can learn math but that the parameters of the school limit the number of students that reach their highest potential. She said that if she had optimal conditions, she could teach all students the skills of mathematics.

Throughout the interview, Sue seemed nervous, as if she were taking a test on teaching. At one point, she asked if she was, “failing.” I replied by saying that there was no failing this interview. Nevertheless, I never had the feeling that Sue was giving answers or replying to my questions because she thought her reply was the “right” answer. In fact, Sue often expressed that her focus was more on her students than on whether or not her colleagues or others thought she was, “right”, in her teaching. One example of this came when she said that she, “is a firm believer that it is the quality of the understanding not necessarily the quantity of the material that you cover (that is most important).” When I asked her if that meant that she would be willing not to teach as many concepts as long as the ones she taught were solid, her reply was, “Right, I’m really guilty of that.”

Sue uses a mix of teaching strategies and is in-tune with the varying academic and developmental levels of her students. Sue prefers to use methods of discovery whenever possible. She says, though, that she can use this preferred method more in her blocked classes. She says that, “(a) blocked (class) lends itself to more of a discovery (approach).” Sue uses cooperative learning, group work and discussions in her classes. She also tries to get the students involved by getting them up to the board to do problems and help others. She says, “I have found that students, even at the high school age, like to get up out of their seats.”
This methodology was demonstrated in my observations, as well. Students were involved in the lesson and the direction it took them. She says that the general direction of the progression on concepts is generated by her but that, "the needs of the students dictate which curricular ways I head." This is evident throughout the observations as well. Often, students came up with the examples used in the lesson and the process taken to solve them. Their questions guided the extensions on the lesson. They were helping each other and Sue praised them for doing so.

Sue sees herself as a coach. It is obvious, by the casual conversation and respectful courtesies shown from student to teacher and teacher to student that the relationship with her students is a vital part of her teaching. Her genuine concern for her students and teaching is cast through the course of the interview and continued in the observation.
I want to make sure you are set up for success! Taking Jake's idea of...

Please, please, please use your time wisely.

Does that seem logical?

Can you explain to me why nothing is on your desktop?

Will it give us a reference angle or a complete angle?

I was trying to figure out how to use the graphing calculator to check this problem.

I put smile faces next to the ones I got right! Did you get number six? Get rid of some of that crap in the equation.

I'm trying to figure it out.

Hey, what are you doing this weekend?

I'm not sure. What are you doing?

A day in Sue's Room

Figure 4
What is it like to be in Sue’s class? Well, there are posters surrounding the room with positive sayings. The door is open. There is an air of cooperation; students to teacher and student to student. There are constant but quiet conversations going on throughout the class. When Sue is giving instruction at the head of the class or if a student is addressing the class, the others give the speaker the respect of listening. On occasion, they may turn to those sitting in their trio and talk about what they just heard.

I found one instance where the students in the back trio (as indicated in the figure) were not on track as far as content goes. Sue addressed this “problem” when she was finished with the classroom instruction/discussion. She simply went to the students and talked about why or why not it was in their best interest to pay attention. I will address this further in the section that follows on motivation and discipline. The temperament of both the teacher and the students in this classroom is one of respect and a cooperation. This is a room where you would feel comfortable asking a question, provided you were paying attention to the speaker.

The class was investigatory even when a “discovery lesson” was not the intent. What I mean is that the students and teacher were trying to find methods of solving a new problem by thinking back to how and why they solved previous problems. The experiences of the students determined the methods of presentation of material and solutions to problems posed.

Sue used first names, not only when calling on students but also when addressing their concerns and reflecting on their comments. Sue gave ownership to student’s ideas and tried to use them again in the lesson. Students do not raise their hands, they put their
names on the board when they have a question that someone in their group cannot answer (this, too, will be addressed later).

Meet Dee (pseudonym)

Expert Two, Dee:

Dee is a white, middle-class, female in her early thirties. She is single and was a former professional basketball player. Dee has been teaching for six years. She is from a teaching family; her father, a brother and herself are teachers. Dee is teaching in large urban school with a trimester schedule. This school, ranging from grades nine through twelve, is composed of 80% minority students and 20% Caucasian.

Okay, so I went to Dee's office, which she shares with all of the other math teachers and found her at a counter in the corner talking to a female student about fractions. The girl seemed to be having trouble with a particular problem and Dee was turned, facing her and giving the girl her undivided attention. She briefly looked up to see me at the other side of the room and continued working with the girl. I busied myself with some papers and waited, patiently for the opportunity to talk with this interesting and remarkably different teacher.

Had it not been for the fact that Dee was about 6'2" with an unusually confident air in both manner and speech, I may have mistaken her for a student. Her terminology, dress (a Tommy Hilfiger shirt), and casual stance portrayed a belonging with the students in this school. I continued to wait until the bell rang to change classes. Only after the girl stood up to go her next class did Dee come over and put out her hand. I shook the strong and firm grip of a confident and athletic woman who has managed to mesmerize not only her students and their
parents but me, in this short time. Dee directed me to the library where I thought I would conduct an interview.

Little did I know that Dee would be in the driver’s seat of this task. I suppose that is good because such is the methodology of this study but I was still having a hard time letting go. If you were to look at the interview transcripts, you will see little occasion when I spoke. I rarely had to ask a question. Dee went into a story about everything; not the kind of story that you anxiously wait to end, but the type that keeps you at the edge of your seat. Yes, she was quite captivating with her stories of education and her sincere goal of emancipation for her students. I know that my labeling Dee as an emancipatory teacher is to put her in the critical ideology. Further, I know that this labeling may cause you to think that she is critical in thought in every aspect of her teaching, still, emancipatory is THE word for this teacher.

After asking her to describe her teaching philosophy she, without hesitation told me that her basis of teaching is all about self-esteem. Her exact words were, “Self esteem is the bottom line. Anything I do in my classroom is how will it effect the self esteem of my students.” Stereo-typically, this response does not come from those of us who teach math, but from those who teach Social Studies or Language Arts. Yes, many of us (math teachers) interested in the math anxiety that is prevalent among our students and the equity issues that are finally coming to the forefront in the mathematics education’s courses. However, Dee’s response seemed to have nothing to do with math. It was, from
that point on, a conversation about students, not teachers, and had little to do with mathematics.

I feel I must interject here with a little information about the school where Dee was selected as an expert. This school is in a large urban district. This district houses students who, at the ninth grade level, only 10% of the students have passed the ninth grade proficiency test. Dee chooses to teach the geometry B course, this is the second lowest level course in the school. Back to my story.

So, as we were talking I stopped taking notes. Yes, I stopped taking notes. The energy in Dee’s stories and the uninhibited nature of Dee as a storyteller was irresistible. She talked of her personal struggle with the concepts in mathematics and the fact that that struggle causes her to look differently at the subject and her students than would a teacher whom had no struggle at all.

Dee talked, at length, about her conversations with the parents of her students. She calls them all, every two weeks. Yes, every ten school days! Moreover, I do not for a moment, think that she is exaggerating. (After you read the section following on parental contact in the next section of this work, you will see why.)

Dee’s methodology is simple. She gives no homework. It made me cringe at first, but listen to the rest of Dee’s story. She gives no homework because she says, “I’m gonna work you (them) hard enough when you’re sitting in my class that you don’t have to take it home.” You may be thinking, “Well, what about the study habits and the working to get want you need?” I thought these things too, until I saw what happens in Dee’s class.
So, how does Dee teach math? Does she use algorithms, discovery methods, or cooperative learning groups? Well, she uses a bit of each of these methods but I would call her most prevalent method of delivery, relational stories. Dee told me of the story she was working on at the time. She was teaching her students how to solve equations and what follows are her words from our interview. Her story goes like this.

When you’re solving an equation, the letter is a hoochie mamma, and people are trying to break up with her and she has all these people around her. You know (she’ll say to the guys), as soon as you find out that your babe is dating somebody else what do you do? Break up. Yeah, you break up. Okay, how do you break up? (The students respond by saying), I do what she doesn’t like me to do. Exactly. So then, a positive 8 to break him up becomes a negative 8. Right, so let’s shove him over there because we want to get as far away from hoochie as we can (and they laugh).

Dee continued with her story to me by saying:

But, they are all on it then. They are all paying attention. And in class I can say, who’s the hoochie? And they’ll say, c. The other day, actually, they got a big kick because the letter was the letter u, and I didn’t realize that and I said who’s the hoochie, and they said, U. And I was like, hold on, and everybody started laughing. And the mom actually came that night to conferences and I said
your child called me a hoochie today. And we were laughing.

The End

I wanted to introduce you to Dee with a story because that is how I saw her. She is energetic and captivating. She invites you into her world and her room with her actions and words. Her room is filled with young, men and women (specifically, 14 black females, 3 white females, 7 black males and 3 white males) in their mid to late teens. Just across the hall is a class of similar students who are sleeping and simply not "in tune" with the teacher. Dee's students are attentive, active, laughing and look to be enjoying the time they spend with her.

Dee was nominated as an expert mathematics teacher from administrators, mathematics teachers, and counselors from her large urban high school. Some of the comments from those that recommended Dee read:

- Dee has an exceptional ability and gift of relating to students
- She is able to "hook" each individual that is placed on her roster
- The excitement and learning that is present in her classroom is truly energizing
- Dee is an excellent motivator
- She focuses on making sure that the students are successful
- She uses a variety of teaching styles
- She has an ability to integrate and fuse projects into her courses
Although her methods are quite traditional in that she gives a few examples and has the students work on individual problems, Dee’s presentation is far from “the norm.” Her scripted methods of solving problems (algorithmic) are tempered with her relational stories of how to get the work done, solve problems, work through proofs, etc. Dee also uses projects in her classroom to get kids involved and initiate critical and analytical thinking. Some times the projects having little to nothing to do with the content that is being covered. Her goals are strictly to get the kids involved and active in learning.

Dee has a special relationship with her students. It is obvious, not only from the interview but also in the reality of the classroom that her students relate to her and respect what she says. It is through this relationship that Dee is able to cross the line of simply being a math teacher and delve into the role of philosopher and leader.

Dee’s introductory story on the first day I observed was about the Janet Jackson concert she attended the night before. Dee said that she uses these introductory stories to get the kids settled down after changing classes. They get the focus on her and let the kids in on her life and, thus, giving them a connection to her and her philosophies and teachings. She had gone to the concert with some friends, in fact, she made reference that she had seen several of the students there too. She was talking about the gyrations of the singers and one of her students said that a particular singer was a “fag.” She took this opportunity not to reprimand the student for using an inappropriate term, but to go deeper into the issue of who we are. Her exact response was, “He’s being whatever the media wants him to be.” She continued by saying, “You either like people or you don’t. Do you like people because of who they are; nice, mean or what they are, black, white, homosexual?” Now, I know that there are many teachers that would have a hard time
with this topic and conversation. Some of us might not want to take the precious math time away from our students by talking about such things. However, Dee chose to use this time to teach the students about self-concept and dignity. She was able to do so because of her relationship and it worked because the students identify with her. This is emancipatory education. It might not be math specific, but it is emancipatory.

Dee also touched on the issue of smoking pot in this story of the concert. She said that she saw a pregnant mother smoking pot. Her response was, “I think that is ignorant.” What she was saying was, DON’T SMOKE POT, but the message did not come through preaching and dictating. She portrayed her message across through leadership and relational stories. The students were listening and had thoughtful expressions. There were even some faces of disgust.

Dee is a prime example of constrained elaboration and situated effectiveness as described in my introduction of what an expert is, or can be. Although, Dee is minimally constrained; pushing the limits of what is “acceptable”, she is definitely teaching with her students’ experiences and situations in the forefront. She is situatedly effective; effective for the students of her classroom.
You can do it!

Teacher's desk

Odds are for me, evens are for you.

This is a screwed up sheet. Some of the answers are in decimals.

How many 3's fit in 27?

Don't you be-copying our ideas!

Are we doing a project today?

I want to do the dry erase board again. That was fun!

I'm so proud of myself.

Do you guys are being rude.


Show me when you got it.

Come up to me at the game and I'll see how many of you are there.

Ms. H I'm so proud of myself.

A Day in Dee's Room

Figure 5
What is it like to sit in Dee's classroom? Well, it is not quiet. It is happy, positive, and active. Dee has wallpapered the room and is in the process of painting a window on the back wall (there are no “real” windows). The room has a definite home-like appearance. Students' desks are in rows, but there are students sitting at lab tables and computer tables on the outside edge. There are tennis balls on the feet of the desks to reduce noise when the desks are moved. This is only necessary because the desks are often moved around to form groups.

After a short introduction of material, which follows the lead-in story of the day, Dee is traveling around the room watching as the students work on problems on their dry erase boards. There is a constant hum of, “Ms. H” around the room as students eagerly wait for the, “good job”, or “try that one again” response from their obviously respected leader. Students are talking positively about the material and with each other. Everyone is involved. Dee, in the interview, pointed out that there are some of the, “worst behavior problem students in the school in this class.” I have no idea who these students are. Everyone is involved, eager, and helping those around them. It is exhilarating!

Dee tries to initiate a competition between her class and the next class to see whose class could get the most students to the football game that night. Again, she does this in an attempt to have a positive influence over the students, but with something that they could identify.

There is a radio in the corner of the room that is playing popular music. The radio was turned on by students on some of the days that I observed and by Dee on others. Students, on occasion, will stand and move a bit to the rhythm of the music or comment on their preference, or lack of, to a particular song. The music, although a definite
presence in the room, does not seem to be disturbing the mathematics thought of the students.

Meet Joe (pseudonym)

Expert Three, Joe:

Joe is a single, white, middle-class, male in his late twenties. He coaches track and In-The-Know. Joe has been teaching for seven years. Before teaching high school mathematics, Joe taught at the college level. He is teaching in small parochial school. This school, ranging from grades nine through twelve, is composed of 5% minority students and 95% Caucasian.

- What follows are direct quotes from interviews with Joe.

  Joe, the teacher: I try to make it as enjoyable as I can for the kids. It sounds egotistical but the kids want to be in my classes. I don’t think kids will learn unless it’s fun or unless it’s something that they feel is going to be useful to them.

  I lecture a lot, that is definitely true, but I like to throw other things in (too). I think the lecturing is important to get the concepts across. I think the other things (methods) are more exploration beyond math, applying the knowledge. Most of the times I guess I find it easier to lecture because I can control what is being taught and what is being discussed and what is being presented.

  Joe, the friend: I think a lot of kids like having me as a teacher. I’m their friend but I’m not their best buddy. I don’t let anyone do that (call me Joe), because then you’re getting on a one-on-one thing where it’s like you’re a good pal or something.
They trust me... and they know they can come to talk to me about anything. I’ve had quite a few kids say, “You know, you’re a better father to me than even my own father is.” They can tell if you are just a teacher that is here to teach and then gone. I tell them I will push aside any of my work to help them out... and they respect that. I think that’s one of the things here that I do that really gives them the impression that I give a damn about what they are doing, I make sure that I leave time to tutor them in the mornings and in the afternoons. I try to treat them as adults as long as they are willing to act like adults. I try to make my presence known at a lot of other activities.

**Joe, the learner:** Student teaching isn’t long enough to teach you anything. You can only learn so much in college. You learn more from the experience and teaching out there and working with actual kids than anything else. It’s just a matter of experience. I know still today, I’ll say stuff that I shouldn’t say and I know I’ll do stuff that I shouldn’t do and like I said, it’s all a learning experience.

**Joe, the coach:** I think (coaching) has a lot of influence (over my relationship with my students) because a lot of kids interact with me outside of school in other activities. In the morning, since I am here so early anyway, I have (In-The-Know) practice.

**Joe, the community member:** I work in a furniture store over the summer to make extra money and I didn’t have time (to read the journals) and when I did, I was too tired. So, it’s kind of hard with the workload to keep up. I used to take my work home and work on it at nights. I decided that once I go home, school doesn’t exist. I don’t grade any papers at home.
Joe, the mathematician: I think that just about every kid that you have that comes into a math class will probably tell you, “Math is stupid. Why do I need to learn math, it has nothing to do with anything.” I think it really motivates them (students) to show that I am really interested in math.

Joe, the time manager: It's really hard to get in touch with them (parents), even when I get phone calls. I wish I could have more time to go and explore the Internet and get things off the Internet, but with my load here I just don’t have the time. It’s just a time factor. That’s my problem with everything. There is just no time to do anything. I get home 6:30-7:00 and there is just time to eat maybe watch an hour of TV and go to bed (laughing). (Then), I get up at 5:00(am) and it starts all over again.

I used characters to introduce Joe because I saw him as having to meet the demands of many roles. Joe is an assiduous man. He was constantly grading papers or completing some sort of task. This occurred throughout the interview and while the students were working on seat work.

Joe was nominated as an expert mathematics teacher from administrators, mathematics teachers, and counselors from his small parochial school. Some of the comments from those that recommended Joe read:

- Joe has always been a “bell to bell” teacher.
- His students are always academically engaged and on task.
- I have never had a single parent or student complaint about him.
- Joe has always had great control and discipline in his room.
- He has outstanding knowledge in his subject area.
• He cares about what he does and her cares about the kids.
• He comes in very early in the morning and leaves many hours after school because of all of the coaching, tutoring, and extra work that he does.
• Joe is an enthusiastic, energetic, “bell to bell” teacher.

Bell-to-bell is a hyperglossia term, a word with varying meanings to many people. Two common and contrasting interpretations of this term are efficient with time and lecture-and-leave-them. To some, it may mean lecture oriented, teacher-directed, little individuality, far from constructivist. To others, it could mean efficient, productive and effective. It was apparent that Joe’s teaching held the second definition. Joe used every moment to show examples of new material to his students.

Joe was always in control. He said it in the interview and it showed up in the recommendations. This is how he gets the job done. Moreover, it works for him and evidently for the many of his students. He says that the students like having him for a teacher. Students seemed to treat him with respect. Still some used a nickname (one that paralleled his last name) when addressing him which demonstrates a friendly nature in their relationship. Does the respect stem from admiration or an authoritarian stance? Does it matter?

Joe says that he spends a lot of time tutoring students in the morning and after school. This was also a comment on his recommendations. He also said that in the morning he coaches In-The-Know and, “catch(es) up on supply work; copying papers and things like that.” In the afternoon, he makes himself available to his students and is
willing to, "...push aside any of my (his) work to help them out." He is also busy with coaching in the afternoon and sometimes leaves school early to go to meets and such.

Joe’s teaching methodologies are very teacher directed. He is a self-declared lecturer. Joe said that he likes to lecture because it gives him control over what is being taught and presented in the classroom. It is interesting how the issue of lecture came about in my interview with Joe. When I asked Joe about his philosophy of teaching, he said he tries to, “Make it as enjoyable as I can for the kids.” He was recalling his years as a student in a mathematics classroom and said that it was boring because his math teacher, “Didn’t present in a way that was interesting.” He continued by adding that all he did (as a mathematics student) was listen to lectures, take notes and take quizzes. Surprisingly, he continued by adding that he lectures a lot but that he likes to throw in other things.

On the other hand, Joe mentioned CBL labs and the use of technology. He said that he has only gotten to do one CBL lab this year but that he intended to do more and tries to do one with each class at least a couple of times a quarter. He says that, “They (his students) get a lot more out of that (hands on activities) than me lecturing all the time.” He does use the graphing calculators and from the skills demonstrated by the students in class, it is apparent that they use the graphing calculators often. Like Sue, Joe uses a graphing calculator overhead display during his instruction.

During his lectures, Joe asks students to explain processes he has shown. Often, he would interject comments/corrections into student responses when a student was explaining the process and make corrections or use different terminology. At times, it
was apparent when Joe asked for student input, he was looking for a particular idea or suggestion.

Joe believes that he makes his class more interesting by letting his students know that he likes math. He has no doubt that his personality helps him to make the class more enjoyable. Joe also is of the opinion that the use of technology is an important aspect of motivation for his students. Much of his professional development time has been spent on the use of technology in the classroom.
How much time do we have? Great, we have time to do two more examples.

Math is fun, right?

This is pretty easy.

I would say eliminate the x or y.

No!

You’re not chewing gum, are you?

Mrs. F’s class was fun.

When are we going to get our tests back from last week?

You know what was fun about Mrs. F’s class was that you could get her off track and talk about other stuff all the time.

Eliminate the terms.

A day in Joe’s Room

Figure 6
What is it like to be in Joe's class? Joe says that there are usually posters up but that he has had no time to do this this year (it is October). Joe does travel using several rooms during the day but he does have one room that is considered his. There is one athletic poster at the front of the room. The door is open during class. There are religious posters in one of the rooms that Joe uses.

There is little talking. The room is quiet, calm, and allows for student concentration. The students are directed to work on their own when given an assignment on one observation. The students are not allowed to discuss problems with each other. My observation notes read, “Students are sitting at desks working on a handout. Students are not allowed to discuss problems with each other. This behavior is not questioned and seems to be well-practiced.” The room is in control. There is little laughter, little talking. The teacher tries to interject that this is fun but the response is grumbles. Nevertheless, the students felt safe enough to respond honestly.

During another observation, the teacher remains at the head of the class giving instruction. The students are asked individual questions periodically and occasionally will call out an answer when a question is directed to the class. The students are attentive and they are all working on the task at hand. Joe asks the students questions periodically during the lecture. It is apparent that he is searching for that correct response. At one point, the teacher points out an incorrect response that was yelled out by a student and asks the student to correct the response. The student does not answer and another member of her class answers for her.

Students are doing some work on their graphing calculators. Each student has a graphing calculator. They are looking at different ways to graph an equation. Joe asks
them to enter a parametric form of the equation and then he asks them to graph it in function form. The students respond easily and it is apparent that they use the technology of the graphing calculator often.
CHAPTER 5
PARADIGM PARALLEL

Introduction

Do we remain loyal to one worldview? Do we abide in the ideologies of a particular ontology, epistemology, or methodology? Is it necessary to do so to be considered an expert? In this section, I will venture into this territory. As I said in chapter 2, I consider myself an interpretivist. I see that there are many ways of reading truth and that truth to one may not be, and often is not, a truth to others. I also believe that a cooperative relationship is necessary to elicit motivation and interest among my students. However, do I always remain in this mode and develop lessons that are strictly emergent and discovery by nature? If I were a pure interpretivist, the answer would be, yes. My point is that we may consider ourselves to be of one paradigm when we actually travel between and among the varying ideologies.

When I began this study, I thought I could find a positivist teacher, an interpretivist teacher, and a critical theorist teacher. I further thought that these teachers would come from an innovative school, an urban school, and a parochial school, respectively. During my pilot study, I was disappointed to find that in my first 15
minutes in a class with a teacher whom I thought to be strictly positivistic, the teacher traveled from one worldview to another depending on the issue and the circumstance. I was resolved to the fact that I would not find a representative from each of these three paradigms. In addition, I was resigned to the fact that this was “true.” I now believe that I may have been too hasty in my conclusion.

Although I do think that we all travel among the paradigms’ tenets, I am convinced that we may very well have overriding alliances to one of the paradigms. After much analysis of the three experts in my study, I feel I could easily and with confidence put these three teachers into the categories of interpretivist, critical theorist, and positivist. I want to be very clear. I DO NOT believe that these teachers only act within this ideological frame. Nevertheless, there is an underlying parallel to a particular paradigm that is unmistakable.

**The parallel**

What are the experts’ alliances? Where do their ideologies take them in the classroom? I interpreted the information gained through this study in terms of particular statements or actions in the classroom. I have categorized each relative statement or observance in the following charts. After the chart, I have put the alliances in the form of a graph to give a more holistic picture of the alliances and parallels of each expert. You may want to refer to the Pedagogical Worldview Definitions chart from chapter two (page 29) to help you see how I placed each statement or observance. I have provided the definitions of ontology, epistemology, and methodology as they pertain to teaching.
DEFINITIONS AS THEY RELATE TO TEACHING

<table>
<thead>
<tr>
<th>ONTOLOGY</th>
<th>EPISTEMOLOGY</th>
<th>METHODOLOGY</th>
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<tbody>
<tr>
<td>What is the nature of the reality of the delivery of mathematical concepts and what is the nature of the reality with respect to student learning and discipline</td>
<td>What is the relationship between the teacher and the student?</td>
<td>How do the students in the class seek out knowledge?</td>
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<td></td>
<td>What are the processes of knowledge gain in the students? What is the delivery method of the teacher?</td>
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</table>

The ‘Ologies as they Relate to Teaching
Bucci (1999)
Table 4

What follows are particular examples of representations of the ontological, epistemological, and methodological definitions according to my interpretation from earlier in this writing as I saw them through interviews and observation. All quotes are taken directly from interviews. Any statements not in quotes are from observations. If you had written this work, you may have interpreted the statements and actions of the experts in a different way. Remember, what you get from this analysis is dependent upon your immediate and past experiences.

There may be some questions about why I chose certain comments or actions to be placed in each section. When analyzing my data, I went through each group of transcripts and observation notes with a definition in mind. For example, I would have the positivistic definition of ontology in mind. I would read the transcripts for a participant and that participant’s observation cards and I would pull out any comment or observation point that corresponded to that particular definition. I would then place it in the chart and move on to the next definition. This continued throughout the analysis and for each participant. I found that by reading the data through a particular worldview, it allowed me to look at the
that by reading the data through a particular worldview, it allowed me to look at the comment or observation point in a pure sense. This could be an area of conflict if the comment was taken out of context. To avoid this, I tried to include the entire thought of the participant or the entire action of the participant.

I want to interject here that the process by which I am displaying this data and analysis is positivistic by nature. I understand that by labeling an act or comment as positivistic, interpretivistic, or critical theorist is to place it in a type of dichotomy (or in this case, tricotomy). I also understand that in doing this I am positioning this portion of the analysis within the positivistic frame. Nevertheless, this is a purposeful decision that is aligned with my assumption that we travel between and among the varying paradigms. For I am a declared Interpretivist. I am aware that by categorizing the events and responses of these experts, issues of context may arise. I will include an explanation when necessary to help bridge this dilemma.
<table>
<thead>
<tr>
<th>Ontology</th>
<th>Sue</th>
<th>Dee</th>
<th>Joe</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;It is really important to me that they understand the concept.&quot;</td>
<td>&quot;I know the kinds of things I want to cover.&quot;</td>
<td>&quot;Lecturing is important to get the basics across.&quot;</td>
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<tr>
<td>About Algebra 1: &quot;That's what you are trying to teach is just the skill.&quot;</td>
<td>&quot;They know my boundaries and when they're out of line, they're gonna know it.&quot;</td>
<td>About notebook: &quot;I basically page through them and see if they've got all the notes.&quot;</td>
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<tr>
<td>&quot;I favor quality of understanding over quantity of material covered.&quot;</td>
<td>&quot;I do a lot of steps.&quot;</td>
<td>When a student gives an incorrect answer, Joe goes directly to another student for a response.</td>
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<tr>
<td>&quot;I grade for attempt.&quot;</td>
<td>&quot;I bring them up to my desk and (I have them) do one problem and they either get all 10 points or zero.&quot;</td>
<td>&quot;If they (kids) are doing something wrong, you (I) approach them as an adult and let them know why it is wrong.&quot;</td>
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<tr>
<td>&quot;I think the mathematical logic needs to be there. I think they have to understand, intuitively, what they are doing and why they are doing it...&quot;</td>
<td>The teacher checks the students' dry erase boards and tells them, &quot;yes,&quot; or &quot;no.&quot; (referring to whether the problem is right or wrong)</td>
<td>Often when students respond to questions, Joe re-states the students' response to use his words although the meaning is the same.</td>
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<td>&quot;All students can learn math.&quot;</td>
<td>&quot;I try to make sure that they are understanding it themselves.&quot;</td>
<td>About students doing poorly on a test: &quot;(I would) explain...some of the concepts I was trying to get at, some of the basic ideas and how they should have applied them.&quot;</td>
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<tr>
<td>&quot;I think that work ethics overall have declined in society. The same thing (is happening) in the classroom.&quot;</td>
<td>&quot;I sometimes have them write a paragraph (about) why they're doing something.&quot;</td>
<td>&quot;How many types of methods do we have for solving systems?&quot;</td>
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<td>&quot;I try not to make them all learn exactly the same way I learn.&quot;</td>
<td>&quot;My room is organized, their folder is organized, and it cuts one hassle out of their life.&quot;</td>
<td>&quot;In your notes, I want you to show how you found y.&quot;</td>
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<tr>
<td>&quot;I just feel like every day you walk into a classroom and you are cheating someone. You're either not going fast enough for the really bright or you're going too fast for the really slow. I think that's the biggest problem in education.&quot;</td>
<td>&quot;If they (parents) buy their kid a pair of tennis shoes just because I called, at least its them doing something positive for their kid to show their child that they are proud of them.&quot;</td>
<td>About grading test problems: &quot;If they make a mistake at the beginning of the problem, I go through the rest of the work and make sure that they've done it correctly from there.&quot;</td>
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<tr>
<td>&quot;Sometimes they are just so bogged down with personal issues that the curricular issues are just really not so important.&quot;</td>
<td>&quot;These kids are coming from an unbelievable environment. They don't have rules...they don't have guidelines.&quot;</td>
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<tr>
<td>&quot;The parameters of the school day and the school year don't necessarily allow that (all students learning math) to happen.&quot;</td>
<td>About not having a seating chart: &quot;You know, their boss isn't going to tell them where to sit, they know where they need to sit.&quot;</td>
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<td></td>
<td>&quot;My class is based on self-esteem.&quot;</td>
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<td></td>
<td>&quot;I do everything I can to make the environment a comfortable environment.&quot;</td>
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<td></td>
<td>&quot;This girl was talking about (her) pregnancy and I (said), here are your options...think of the long term of each option and then pick. Let's go call your mom.&quot;</td>
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<table>
<thead>
<tr>
<th>Positivism</th>
<th>Red ***</th>
<th>Interpretivism</th>
<th>Purple ***</th>
<th>Critical Theory</th>
<th>Blue ***</th>
</tr>
</thead>
</table>

Table 5
<table>
<thead>
<tr>
<th>Epistemology</th>
<th>Sue</th>
<th>Dee</th>
<th>Joe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sue showed a simple problem to demonstrate method</td>
<td>&quot;I know the kinds of things I want to cover.&quot;</td>
<td>&quot;I think it really motivates them to show that I am really interested in math.&quot;</td>
<td>Students are sitting at desks, taking notes during entire period</td>
</tr>
<tr>
<td>&quot;I encourage students if they have comments or things to add.&quot;</td>
<td>&quot;They know my boundaries and when they're out of line, they're gonna know it.&quot;</td>
<td>Joe often uses the statements, &quot;I want you to...&quot; &quot;What I want you to do...&quot;</td>
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<tr>
<td>&quot;The needs of the students dictate which curricular ways I teach.&quot;</td>
<td>&quot;I do a lot of steps.&quot;</td>
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<tr>
<td>&quot;There is a degree of respect there that goes both ways.&quot;</td>
<td>&quot;I bring them up to my desk and (I have them) do one problem and they either get all 10 points or zero.&quot;</td>
<td>&quot;I find it easier to lecture because I can control what is being taught and what is being discussed.&quot;</td>
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<tr>
<td>&quot;Every time you ask for another approach...you're trying to open up or show different ways of looking at a problem.&quot;</td>
<td>The teacher checks the students' dry erase boards and tells them, &quot;yes,&quot; or &quot;no&quot; (referring to whether the problem is right or wrong)</td>
<td>Student answers a question in appropriate mathematical term and Joe corrects to use another mathematical term with same meaning</td>
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<tr>
<td>&quot;The students will generate the examples we use.&quot;</td>
<td>&quot;I try to make sure that they are understanding it themselves.&quot;</td>
<td>&quot;I'm a friend, but I'm not their best buddy.&quot;</td>
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<tr>
<td>&quot;I have an open classroom where the students understand it is okay to ask a question.&quot;</td>
<td>&quot;I sometimes have them write a paragraph (about) why they're doing something.&quot;</td>
<td>&quot;Sometimes, I'll even have the kids go read the book and see what they can pick up.&quot;</td>
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<tr>
<td>During a lesson, Sue uses a theory developed by a student to continue on a problem. Specifically: &quot;taking Jake's idea of...&quot;</td>
<td>About not having a seating chart: &quot;You know, their boss isn't going to tell them where to sit, they know where they need to sit.&quot;</td>
<td>&quot;I (tell the kids), if you are having problems, you can come in and talk to me if you want to. I'll just sit here and listen.&quot;</td>
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<tr>
<td>&quot;(I see myself in) more of a coach-type of a leadership role than an authoritarian.&quot;</td>
<td>&quot;I do everything I can to make the environment a comfortable environment.&quot;</td>
<td>&quot;I tell them it is not my responsibility to make sure you are doing all of the homework right, it is your responsibility.&quot;</td>
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</tr>
<tr>
<td>&quot;If they are not being successful with the style that they are using, then maybe they need to change their style.&quot;</td>
<td>&quot;These kids are coming from an unbelievable environment. They don't have rules...they don't have guidelines.&quot;</td>
<td>About students going to the board: &quot;...he'll come up to the board and show the class how to do it (the problem).&quot;</td>
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<tr>
<td>&quot;My class is based on self-esteem.&quot;</td>
<td></td>
<td>Joe coaches In-The-Know and track</td>
<td></td>
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<tr>
<td>&quot;If they (parents) buy their kid a pair of tennis shoes just because I called, at least its them doing something positive for their kid to show their child that they are proud of them.&quot;</td>
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<td>&quot;This girl was talking about (her) pregnancy and I (said), here are your options...think of the long terms of each option and then pick. Let's go call your mom.&quot;</td>
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<tr>
<td>&quot;My room is organized, their folder is organized, and it cuts one hassle out of their life.&quot;</td>
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Table 6

Positivism – Red *** Interpretivism – Purple *** Critical Theory – Blue ***
<table>
<thead>
<tr>
<th>Methodology</th>
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<tbody>
<tr>
<td>Sue</td>
</tr>
<tr>
<td>In a single block class: “The delivery method would be introduction of a concepts, modeling examples.”</td>
</tr>
<tr>
<td>In a single block class: “Some cooperative learning where students are working together.”</td>
</tr>
<tr>
<td>In a double block class: “…lends itself more to cooperative learning.”</td>
</tr>
<tr>
<td>During classroom discussions, when asking for student input, questions are open ended and not directional.</td>
</tr>
<tr>
<td>After showing a simple problem to demonstrate method, Sue continually referred to this simpler problem and past classes to demonstrate connectedness.</td>
</tr>
<tr>
<td>“Tell me what the directions mean to you.”</td>
</tr>
<tr>
<td>“I like to use board work and I have found that students, even at the high school age, really like to get up out of their seats.”</td>
</tr>
<tr>
<td>“I think you can tie it (trigonometry) with some really neat outdoor activities...so they can get the gist of where it’s gonna be applied.”</td>
</tr>
<tr>
<td>“I think it’s really important that they can write and put the math together.” Ex. Compare and contrast a hyperbola and an ellipse</td>
</tr>
<tr>
<td>“I call it a homework hotline. If you’re having trouble with the homework, you have someone to call.”</td>
</tr>
<tr>
<td>“One of my assets as a teacher is that I am available for students.”</td>
</tr>
<tr>
<td>“They might come in before a test and I’ll give them problems (then) we’ll critique them...so that’s a technique to show them one way of studying.”</td>
</tr>
<tr>
<td>Dee provides every student with a calculator.</td>
</tr>
</tbody>
</table>

| Positivism - Red *** Interpretivism - Purple *** Critical Theory - Blue *** |

Table 7
Let's look at some of the correlation of the data presented thus far in this chapter. Looking at the experts as a whole, it is apparent that the experts in this study have worldviews that are distributed throughout the 'ologies. In the area of ontology, the interpretivist views are clearly less prevalent. This trend changes in the areas of epistemology and methodology where interpretivist parallels hold a slight majority of the instances recorded in this data.

I believe that it is important to point out that there were roughly equal numbers of instances of data in each of the three 'ologies; ontology-34 data points, epistemology-35 data points, and methodology-32 data points. This was not intentional although it does show that the observations and interviews did not tend to concentrate on one aspect of pedagogy.

It is also clear that positivist methodologies are less prevalent in this collection of data. That may not hold true for individual experts. But, there is a clear deficiency in positivist parallels in the area of methodology as there is in interpretivist parallels in ontology. Again, it is vital to remain focus on the fact that this is a composite of the three
Experts in this study and does not necessarily represent the expert mathematics teachers singularly or as a greater whole (all in the field of mathematics).

Additionally, it is apparent that, with the experts in this study, there is a relatively equal balance of ideologies shown from each of the worldviews. Remember that this is the compiled data from all three experts. This varies with individual experts.
<table>
<thead>
<tr>
<th>Sue</th>
<th>Ontology</th>
<th>Epistemology</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;It is really important to me that they understand the concept.&quot;</td>
<td>Sue showed a simple problem to demonstrate method</td>
<td>In a single block class: &quot;The delivery method would be introduction of a concepts, modeling examples.&quot;</td>
<td></td>
</tr>
<tr>
<td>About Algebra 1: &quot;That's what you are trying to teach is just the skill.&quot;</td>
<td>&quot;I encourage students if they have comments or things to add.&quot;</td>
<td>In a double block class: &quot;...lends itself more to cooperative learning.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I favor quality of understanding over quantity of material covered.&quot;</td>
<td>&quot;There is a degree of respect there that goes both ways.&quot;</td>
<td>In a single block class: &quot;Some cooperative learning where students are working together.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I grade for attempt.&quot;</td>
<td>&quot;Every time you ask for another approach ...you're trying to open up or show different ways of looking at a problem.&quot;</td>
<td>After showing a simple problem to demonstrate method, Sue continually referred to this simpler problem and past classes to demonstrate connectedness.</td>
<td></td>
</tr>
<tr>
<td>&quot;I think the mathematical logic needs to be there. I think they have to understand, intuitively, what they are doing and why they are doing it...&quot;</td>
<td>&quot;The needs of the students dictate which curricular ways I head.&quot;</td>
<td>&quot;I like to use board work and I have found that students, even at the high school age, really like to get up out of their seats.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;All students can learn math.&quot;</td>
<td>&quot;The students will generate the examples we use.&quot;</td>
<td>&quot;Tell me what the directions mean to you.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I try not to make them all learn exactly the same way I learn.&quot;</td>
<td>&quot;I have an open classroom where the students understand it is okay to ask a question.&quot;</td>
<td>During classroom discussions, when asking for student input, questions are open ended and not directional.</td>
<td></td>
</tr>
<tr>
<td>&quot;The parameters of the school day and the school year don't necessarily allow that (all students learning math) to happen.&quot;</td>
<td>During a lesson, Sue uses a theory developed by a student to continue on a problem. Specifically: &quot;taking Jake's idea of...&quot;</td>
<td>&quot;I think you can tie it (trigonometry) with some really neat outdoor activities...so they can get the gist of where it's gonna be applied.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;I think that work ethics overall have declined in society. The same thing (is happening) in the classroom.&quot;</td>
<td>&quot;(I see myself in) more of a coach-type of a leadership role than an authoritarian.&quot;</td>
<td>&quot;I think it's real important that they can write and put the math together.&quot; Ex, Compare and contrast a hyperbola and an ellipse</td>
<td></td>
</tr>
<tr>
<td>&quot;Sometimes they are just so bogged down with personal issues that the curricular issues are just really not so important.&quot;</td>
<td>&quot;If they are not being successful with the style that they are using, then maybe they need to change their style.&quot;</td>
<td>&quot;I call it a homework hotline. If you're having trouble with the homework, you have someone to call.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;One of my assets as a teacher is that I am available for students.&quot;</td>
<td>&quot;They might come in before a test and I'll give them problems (then) we'll critique them...so that's a technique to show them one way of studying.&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pedagogical Parallel - Sue

![Bar Chart: Ontology, Epistemology, Methodology]

Paradigm Pie - Sue

![Pie Chart: Critical Theory, Interpretivism, Positivism]

Figure 7

Figure 8
<table>
<thead>
<tr>
<th>Ontology</th>
<th>Epistemology</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I know the kinds of things I want to cover.&quot;</td>
<td>Dee directs the students. Ex: &quot;When I said difference, you should have put minus.&quot;</td>
<td>Dee starts the lesson with a quick review of a concept (lecture)</td>
</tr>
<tr>
<td>The teacher checks the students' dry erase boards and tells them, &quot;yes,&quot; or &quot;no.&quot; (referring to whether the problem is right or wrong)</td>
<td>&quot;I'm never sitting down. I'm always working with them or working out loud.&quot;</td>
<td>About asking for help during test: &quot;Come up and talk to me if you're not sure about one.&quot;</td>
</tr>
<tr>
<td>&quot;They know my boundaries and when they're out of line, they're gonna know it.&quot;</td>
<td>&quot;I tell stories... and that's how they get to know me.&quot;</td>
<td>&quot;If they're burnt out, then I'll do a project... a hands-on project.&quot;</td>
</tr>
<tr>
<td>&quot;I do a lot of steps.&quot;</td>
<td>&quot;My kids go to the chalkboard.&quot;</td>
<td>In-class practice is often in small group</td>
</tr>
<tr>
<td>&quot;I bring them up to my desk and (I have them) do one problem and they either get all 10 points or zero.&quot;</td>
<td>Dee asks a student to help the student next to her.</td>
<td>&quot;I make comments on every paper.&quot;</td>
</tr>
<tr>
<td>&quot;I sometimes have them write a paragraph (about) why they're doing something.&quot;</td>
<td>&quot;I think it's important that these kids know that you've been in (difficult) situations but yet, you are taking your life to another level and that's what you expect from them.&quot;</td>
<td>Students work in small groups and pairs on projects.</td>
</tr>
<tr>
<td>&quot;I try to make sure that they are understanding it themselves.&quot;</td>
<td>&quot;As soon as they buy into my thing, I can give them anything. I can give them algebra 2 work and they will try it and most of them will succeed.&quot;</td>
<td>About a straw tower project: Dee poses question to students, &quot;Think first, what will make the straws stand?&quot;</td>
</tr>
<tr>
<td>&quot;My class is based on self-esteem.&quot;</td>
<td>&quot;I feel like I'm the school social worker.&quot;</td>
<td>Dee provides every student with a calculator.</td>
</tr>
<tr>
<td>&quot;I do everything I can to make the environment a comfortable environment.&quot;</td>
<td>&quot;Students are not intimidated by me. They are not embarrassed to give a wrong answer.&quot; (paraphrased)</td>
<td>Dee uses many projects related to real-world issues and critical thinking.</td>
</tr>
<tr>
<td>&quot;These kids are coming from an unbelievable environment They don't have rules...they don't have guidelines.&quot;</td>
<td></td>
<td>Dee gets concepts across by using relational stories and slang.</td>
</tr>
<tr>
<td>&quot;If they (parents) buy their kid a pair of tennis shoes just because I called, at least its them doing something positive for their kid to show their child that they are proud of them.&quot;</td>
<td>&quot;(I use)... multicultural workbooks.&quot;</td>
<td></td>
</tr>
<tr>
<td>About not having a seating chart: &quot;You know, their boss isn't going to tell them where to sit, they know where they need to sit.&quot;</td>
<td>&quot;I give everyone a folder and a pencil.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;This girl was talking about (her) pregnancy and I (said), here are your options... think of the long terms of each option and then pick. Let's go call your mom.&quot;</td>
<td></td>
<td>Dee calls parents every ten days to encourage parental involvement in the student's education.</td>
</tr>
<tr>
<td>&quot;My room is organized, their folder is organized, and it cuts one hassle out of their life.&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pedagogical Parallel - Dee

![Bar chart showing percentages for Critical Theory, Interpretivism, and Positivism across Ontology, Epistemology, and Methodology.]

Figure 9

Paradigm Pie - Dee

![Pie chart showing percentages for Critical Theory, Interpretivism, and Positivism.]

Critical Theory 48%
Interpretivism 33%
Positivism 19%

Figure 10
<table>
<thead>
<tr>
<th><strong>Ontology</strong></th>
<th><strong>Epistemology</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>About students doing poorly on a test: &quot;(I would) explain ...some of the concepts I was trying to get at, some of the basic ideas and how they should have applied them.&quot;</td>
<td>&quot;I think it really motivates them to show that I am really interested in math.&quot;</td>
<td>Students are not allowed to discuss problems with other students when working on a handout.</td>
</tr>
<tr>
<td>About notebook: &quot;I basically page through them and see if they've got all the notes.&quot;</td>
<td>Students are sitting at desks, taking notes during entire period.</td>
<td>About students and incomplete assignments: &quot;...you get a zero, re-do it for me for half credit.&quot;</td>
</tr>
<tr>
<td>&quot;Lecturing is important to get the basics across.&quot;</td>
<td>Joe often uses the statements; &quot;I want you to...&quot; &quot;What I want you to do...&quot;</td>
<td>&quot;I lecture a lot.&quot;</td>
</tr>
<tr>
<td>&quot;If they (kids) are doing something wrong, you (I) approach them as an adult and let them know why it is wrong.&quot;</td>
<td>Student answers a question in appropriate mathematical term and Joe corrects to use another mathematical term with same meaning.</td>
<td>Joe remains at the front of the room for the entire period. This happens in all classes.</td>
</tr>
<tr>
<td>Often when students respond to questions, Joe re-states the students' response to use his words although the meaning is the same.</td>
<td>&quot;I find it easier to lecture because I can control what is being taught and what is being discussed.&quot;</td>
<td>About homework: &quot;...if they can't figure out how to get the answers in the back of the book or figure out what they did wrong, then we go over the questions first thing in class...&quot;</td>
</tr>
<tr>
<td>When a student gives an incorrect answer, Joe goes directly to another student for a response.</td>
<td>&quot;I'm a friend, but I'm not their best buddy.&quot;</td>
<td>Joe gives each student a TI-92 calculator to use.</td>
</tr>
<tr>
<td>About grading test problems: &quot;If they make a mistake at the beginning of the problem, I go through the rest of the work and make sure that they've done it correctly from there.&quot;</td>
<td>&quot;I (tell the kids), if you are having problems, you can come in and talk to me if you want to. I'll just sit here and listen.&quot;</td>
<td>&quot;I make sure that I leave the time to tutor them in the mornings and in the afternoons if they need the help and they know that I will push aside my work just to help them out.&quot;</td>
</tr>
<tr>
<td>&quot;How many types of methods do we have for solving systems?&quot;</td>
<td>&quot;Sometimes, I'll even have the kids go read the book and see what they can pick up.&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;In your notes, I want you to show how you found y.&quot;</td>
<td>&quot;I tell them it is not my responsibility to make sure you are doing all of the homework right, it is your responsibility.&quot;</td>
<td></td>
</tr>
<tr>
<td>About students going to the board: &quot;...he'll come up to the board and show the class how to do it (the problem).&quot;</td>
<td>Joe coaches In-The-Know and track</td>
<td></td>
</tr>
</tbody>
</table>
Pedagogical Parallel - Joe

![Pedagogical Parallel Chart]

**Figure 11**

Paradigm Pie - Joe

![Paradigm Pie Chart]

**Figure 12**
Now that I have represented the data in individual and group form, let’s look at the correlation. As I said earlier in this chapter, the interpretivist parallels were least prevalent in the ontologies of the experts. Regardless of the experts overriding paradigm parallel, the interpretivist instances of data are not greatest in number.

On the other hand, the interpretivist ideologies in the area of epistemology are high with all experts in this study. Only Dee had an epistemological parallel in critical theory that was near equal to interpretivist. Even in this case, Dee had an equally, or near equal, prevalent showing of interpretivist views in the area of epistemology.

In the area of methodology, each expert in this study had at least a moderate showing of critical theory ideologies. This is not true for any other paradigm. For instance, Joe showed a fairly small number of parallels with interpretivist methodologies and Dee and Sue showed a minimal parallel with positivist methodology.

What follows is a rationalization of my decisions on the points I believe may be in question. I have placed comments or observations that may cause confusion in the following chart. Next to the comment, I have written my interpretation and my reason(s) for placing it where I did. I used the Worldview Definitions as they relate to the Pedagogy chart, developed in the earlier part of this study, to guide this analysis.

First, with respect to the ontological parallels, my overriding determination was about truth or the existence of truth, the truth of mathematical knowledge and the truth of classroom and teacher. In the positivist classroom, truth is clear. There is a right and a wrong, there is no gray and the value in the classroom comes from product not process. The teacher determines the truth and there is no room for debate. I weighed each statement and action as to its parallel to whether or not the comment or action was binary in nature. In an
interpretivist classroom, reality of issues and mathematical ideas are debatable. The how and why of mathematics is valued and the process outweighs the product. In the critical theorist classroom, the predominant issue is emancipation, realizing that obstacles exist and working to overcome them.

Second, with respect to the epistemological parallels, my overriding determination was about relationships, relationships between teacher and student and students and mathematical knowledge. In a positivist classroom, there is a hierarchical relationship with the teacher at the top. The teacher is the giver of knowledge and the students receive what is given. The teacher is focused on content rather than student. In the interpretivist classroom, there is a horizontal relationship, a give and take. The teacher sees the students as a working partner in education. The teacher is focused on students and students’ needs as opposed to teacher and teacher needs. In the critical theorist classroom, the relationship is vertical where the teacher is a higher knower, but the working relationship is cooperative and its purpose is to elevate the student to the teachers’ level of understanding. The teacher is focused on students and conditions that limit student success.

Third, with respect to the methodological parallels, my overriding determination was about processes of teaching and learning, the method of delivery. In the positivist classroom, the students are passive recipients of knowledge given by the teacher. In the interpretivist classroom, the students seek out knowledge and the teacher guides this discovery. In the critical theorist classroom, knowledge is made accessible by the teacher’s understanding of the obstacles that must be overcome. The teacher creates lessons that are relative to the students’ lives and struggles.
<table>
<thead>
<tr>
<th>Comment or observation</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong></td>
<td></td>
</tr>
<tr>
<td>Sue: (positivist) “It is really important to me that they understand the concept.”</td>
<td>Although the “understanding” part of the comment leans toward interpretivism, the emphasis on concept made me categorize it as positivist.</td>
</tr>
<tr>
<td>Dee: (positivist) “I know the kinds of things I want to cover.”</td>
<td>This indicates a set path for the students without regard for individual differences or cultural impositions.</td>
</tr>
<tr>
<td>Joe: (positivist) “Lecturing is important to get the basics across.”</td>
<td>This implies that there is a “right” way to teach the basics and that “right” way is through lecture.</td>
</tr>
<tr>
<td>Joe: (positivist) Often when students respond to questions, Joe re-states the students’ response to use his words although the meaning is the same.</td>
<td>This implies that there is a right and wrong way to make a statement and that particular terms must be used.</td>
</tr>
<tr>
<td>Sue: (critical theory) “I try not to make them all learn exactly the same way I learn.”</td>
<td>This shows a realization that there are other factors that could determine whether a student learns a concept.</td>
</tr>
<tr>
<td><strong>Epistemology</strong></td>
<td></td>
</tr>
<tr>
<td>Joe: (positivist) Student answers a question using a standard mathematical term and Joe corrects to use another mathematical term with same meaning.</td>
<td>This puts the focus on Joe and him as THE knower in the classroom.</td>
</tr>
<tr>
<td>Sue: (interpretivist) “Every time you ask for another approach...you’re trying to open up or show different ways of looking at a problem.”</td>
<td>I put this in the epistemology instead of ontology category because it shows acknowledgment of student input as credible knowledge presented in the classroom.</td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td></td>
</tr>
<tr>
<td>Joe: (positivist) About students and incomplete assignments: “…you get a zero, re-do it for me for half credit.”</td>
<td>The teacher gives the impression that the purpose of re-doing the assignment is to get a grade, not for better understanding. This statement could be considered ontological, but I saw it more as a process statement than a theoretical statement.</td>
</tr>
<tr>
<td>Sue: (interpretivist) After showing a simple problem to demonstrate method, Sue continually referred to this simpler problem and past classes to demonstrate connectedness.</td>
<td>This comment refers to connectedness, which is demonstrating a construction of knowledge.</td>
</tr>
</tbody>
</table>

**Rationalization of Data**

Table 9

95
CHAPTER 6

EXPERT RESPONSES TO NOVICE CONCERNS

Introduction

I have designed this chapter to be easy to read and informative while direct. This section holds the experts’ responses to some of the common concerns of novice mathematics teachers expressed in the initial survey, research literature, and issues that have been prevalent in my experience as a cooperating teacher and as a supervisor of student teachers. It is interesting to point out that the concerns of the novice mathematics teachers were for the most part not math specific. Nevertheless, the expert responses to these concerns brought the issues back into a more math-specific domain.

All data in quotation marks comes from direct quotes either in the interviews or in observation of the experts. Following the display of data, I will write a brief juxtaposition and I invite you to talk about each of the issues with your colleagues.
"Student apathy was difficult. Motivation was very tough."
-A comment from the survey of novice mathematics teachers.

- "Engaging lessons"
- "You have to get the kids involved."
- "I'm not sure if everyone can be motivated."
- "GPA... is a very motivating factor for this group."
- Sue's room has many positive-attitude-type posters
- Sue is constantly giving positive verbal feedback

- Dee uses dry erase boards and sends the students to the board to do problems.
- Dee gives her students suckers for cleaning up after a project.
- "My teaching is all self-esteem."
- "I have very high expectations for them (my students)."
- "They feel good about meeting them (expectations)."

- "Math is fun, right?"
- "I try to make it fun for them."
- "I think it really motivates them to show that I am really interested in math."
- "I don't think kids will learn unless it's something that they feel is going to be useful to them."
- "I think it's just how you present it."
How do you captivate your students? Are all students interested in the same type of lessons? Do we all need to use the same type of encouragement? According to the experts in this work, there are many ways to advance student learning and thinking. The emphasis of the experts' responses on this issue is student interest: get the students involved, give the students encouragement, and present material in an appealing manner.

The responses of the experts fall within three categories: presentation, rewards, and emotional support. In the area of presentation, all of the experts indicated that the students must be interested in the lesson and engaged in the learning process. The material needs to be relevant to the students' lives.

Sue and Dee mentioned rewards as a means of motivation. Sue's reward is traditional, grade point average, GPA. Dee's reward is more simplistic, giving the students candy for cleaning up. Could both reward systems work in every classroom? Could Dee's reward system work in Sue's class and Sue's reward system work in Dee's class? Could either of these work in your classroom?

Finally, all of the experts spoke about emotional support as a means of motivation. There were positive comments and posters in Sue's room. Dee's teaching philosophy is based on self-esteem. Joe also mentioned the fact that his students are more receptive knowing that he is interested and showing that math is fun, through example.

What type of motivation would work in your classroom?
Planning: Short term vs. Long term

- Concern raised in *Cognition and Improvisation: Differences in Mathematics Instruction by Expert and Novice Teachers* (Borko & Livingston, 1989)

**Sue:**

**Plan by the week**
- Daily plans
- First month of class

**Plan by the semester**
- Needs of the students take over
- Weekly topics

**Dee:**

- Student attitudes
- Student assessments
- Worksheets and projects that cover material that needs to be covered in the semester
- Daily lesson plan

- Outside influences (proficiency test)
The three experts planned very differently. Sue starts the year by planning weekly. Then, as the students begin to guide the lessons and the direction of the lessons, she makes adjustments to make sure that she covers at least the minimum required for the course. This does not mean that she intends to cover a minimal amount of material. She covers the material dependent upon the direction the students take. However, she does have the confines of the curriculum and to avoid missing prescribed concepts in that curriculum, she goes to overall (semester) outlines. Using the semester outlines, with weekly topics, Sue covers the material required by the district and still gives the students the ability to influence the direction of the lessons.

Sue on the other hand has a “mound” of worksheets and workbooks that she has used in the past. She has worksheets, projects, and workbooks that cover material she knows will be of value for her students. As she gets to know her students and better
defines their needs, she chooses projects, worksheets and pages of workbooks that are appropriate for that particular class.

Joe has a plan for the course for the year, required by the administration. He also has all of his plans for any particular course from years past. He can look back on past plans, reflections, and comments he has written and adjust current plans. Joe is stringent on the plans that he sets. He said that he has looked at his course plans a few times since the beginning of the course and he is only off by a few days. Joe also writes detailed daily lessons. The lesson in this writing is from one of my observation days. Each lesson was equally detailed.

What are the main differences in the experts’ planning? The most brilliant difference is one of focus. On a continuum, if student focus was at one end and book or curriculum focus was on the other end, I would place the experts as follows. Dee at the extreme student end and Joe at the extreme curriculum end with Sue in the middle. It may be important to remind you of the courses taught by each expert. Remember, Dee teaches a lower level course and Sue and Joe both teach higher level or honors courses. Is this the focus of the course an indication of the students’ needs even when the focus is curriculum? Is Joe more focused on content because his students are expected to continue in their mathematical studies? Would the experts adjust if they had a different student culture? I do not intend to imply that the methods of planning by Joe, Sue, and Dee are only applicable to the respective courses taught. I simply thought you might want to keep this information in mind.
Terri: Parental contact was an issue that each of you talked about in our interviews. Would you briefly explain how often you contact parents? Joe, will you begin?

Joe: “We have parent teacher conferences once a quarter. In terms of calling parents, usually if a parent calls me, I will definitely call them back. If a student is doing really badly, I’ll give them a call. I mean really badly, if they are borderline, not so much. I don’t think the kids like it when you go straight to call their parents.”

Dee: “I call home every ten days. To every parent.”

Joe: You’ve got to be kidding? “There isn’t time. It’s really hard to get in touch with them.”

Terri: Sue, do you call parents?

Sue: Yes, “I probably call home with more positives than negatives.”

Dee: So do I. “And the parents can’t believe that I call for positives because as teachers I think that’s our biggest weakness. We will hunt you down in Meijers if we have to tell you your child did something bad. But we don’t ever convey the positives.”
Sue: “I’ll never forget one parent who said, ‘Thank you for calling me, I was just about ready to kill him’.”

Joe: When do you find the time?

Sue: “In the evening. I never find time in school.”

Dee: “It takes me a while for the first call because I have to introduce myself and they have all these questions.” I’d say the first time it “takes me about 20 minutes a call.” It depends on the parent. “I had a mom this year, first time ever, say, ‘Can I put you on hold?’ I thought she had a call on the other line and she came back and she had dialed the Grandpa. She wanted me to tell the Grandpa that the kid was doing a great job.”

Terri: Joe mentioned parent teacher conferences. Does prior telephone contact help increase the number of parents that attend your conferences?

Dee: “Tons. I think that they want to see who this person is who is calling them. Because it’s nothing they’ve ever had before.”

Sue: “I would like to include that I think any time you have a parent teacher conference, I think it should be three-way with the student there. Because when I have a conference, I would normally just start it out and say, ‘Well, Terri, how do you think you’re doing in class?’ Then I kind of back out and the student really says everything that you would say but if the student says it the parents are not offended. They are a little more receptive of the idea.”

Terri: Thank you for your input and ideas. I appreciate your openness.
Joe calls home in cases of dire emergency. He calls homes only if the student is in threat of failing the course. He believes the students do not appreciate calls home. He also says, though, that he simply does not have time to make the calls.

Sue on the other hand calls home for positive more often than negative reasons. She said that she makes many calls home, although these calls usually happen in the evening, from her home. Sue sees the positive impact of parental contact and will not give that up because of time constraints.

Then there is Dee. She calls home every ten days for every student in her class. Dee teaches in a school on trimesters, which greatly reduces the number of students in her day. Nevertheless, if you heard what I heard in the days I spent with Dee, I believe you would find the time to make the calls. I heard many students asking Dee when she was calling home again. Yes, the students were asking the teacher to call and talk to their parents. How often does that happen? Dee, in her introductory call, encourages the parents to give rewards to their children when she calls with positive comments. The parents gladly comply. After all, for the most part, in the history of their child’s schooling, they have never received a positive comment call. Dee does talk about her concerns for her students with the parents. However, these concerns are always buffered with positive comments and therefore are taken seriously and with compassion.

Teachers are constantly assessing the use of their time. What must be done, what should be done, and what we really want to do. Keep Dee and her students in mind when making your next time assessment.
Technology: How, when, & why?
- Researcher interest, interest of many mathematics educators

Sue:
- Uses overhead calculator.
- Sue has her students key in numbers as she gives instructions.
- She has her students use the calculator to convert, check, and show variety of solutions.
- Students in Sue's class often use the calculators to check problems.
- She does many labs in her geometry classes on the TI-92 calculator.
- Sue has given an inservice on the uses of the TI-92 calculators in mathematics classrooms.
- Sue thinks that calculators allow for better discovery lessons.
- Sue does not allow the students to use calculators on all assignments. For example, Sue does not allow the students to use the calculator on their radical expression quiz because she says she wants to encourage use of the radical rules.
Dee:

- Dee provides four function calculators for all of her students to use on a daily basis.
- Dee doesn't get into the graphing calculators.
- She thinks every kid needs to get on the computer.
- Dee went to class this past summer on the use of the TI-83 but she has not used them yet in class.
- Dee said that, "The kids are so in need of me they are not in need of a graphing calculator and the chances of them to ever play around with one is minimal."
- Dee said that if she taught a higher level of mathematics she would definitely use graphing calculators.
- Dee is a, "fan of technology."

Joe:

- Every student had a graphing calculator in every class I observed.
- Uses overhead calculator.
- Joe has his students key in numbers as he or another student gives instructions.
- There are some times when Joe does not let his students use their calculators. Some times, he will give a two-day test and they may use their calculator on the first day but not the second.
- Most of Joe's professional development time, classes and seminars are about calculator use.

The issue of technology is in the forefront in mathematics classrooms and among conversations of mathematics educators. The advanced capabilities of today’s graphing calculators allow educators to explore areas that were unavailable in earlier years. Because of this, technology and its uses are important issues for the mathematics teacher. Each of the experts in this study used calculators of some kind. The variance came in the degree of the calculator use.
Sue and Joe both used overhead calculator displays in the classes I observed. Each of them had a student input the data to increase student involvement and to allow the teacher to be hands-free. Every student in each class had their own graphing calculator. Both teachers indicated that the school provides calculator rentals for students who cannot afford their own calculator.

Dee provides four function calculators for each of her students. She has attended graphing calculator seminars but she feels that her students need to experience problems that do not emphasis graphing calculators. Dee says that the likelihood of any of her students actually owning a graphing calculator is low. Therefore, why teach them to use something that they will probably never see again?

None of the experts uses computers on a regular basis. They all did say that they would like to use computers more often. However, for various reasons, none of the experts used computers in their instruction or as an activity.
"I am trying to collect the homework, grade it, and hand it back with comments. I am feeling overwhelmed by the amount of paper work this creates."

- Comment from a participant in a block scheduling workshop

<table>
<thead>
<tr>
<th>Assessment strategy</th>
<th>Sue</th>
<th>Dee</th>
<th>Joe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writes comments on assessments</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Assesses students’ progress by observing class work during class</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Gives daily homework assignments</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Has students keep a notebook or folder</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Uses one-on-one oral assessment</td>
<td></td>
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<td>X</td>
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<tr>
<td>Uses a book</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Feels they have high expectations for students</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Individual, variable grading scale</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>Checks homework daily</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Uses writing in assessments</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Uses alternate assessments (besides tests, quizzes, homework)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Grades for attempt</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Allows for second chance learning</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Encourages student collaboration on assignments</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Uses higher order questioning</td>
<td></td>
<td>X</td>
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<tr>
<td>Goes over tests/ quizzes in class</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Gives points for participation</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Uses homework quizzes</td>
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</tbody>
</table>
There are several similarities with the experts in the area of assessment. None of the teachers in this study used book-prepared tests and quizzes. Each teacher did give tests and quizzes and each teacher did, in some way, assess homework. Dee grades homework for correctness and in the other two classes, homework was graded for completeness. Sue and Joe both said that they expect their students to be responsible enough to check their own work (for accuracy) and seek help if they are having a problem with the content. Sue did mention that she felt that if she did not check homework, her students would choose not to do homework.

Each of the experts includes writing in their assessments. They each expressed a desire for the use of alternate assessments and the use of projects but Dee was the only teacher who demonstrated this in one of the observations.

There are also areas of differences concerning assessment. The experts also use assessment in various ways. Joe uses assessment for rank and order in his class. Assessment is used to assign a grade. None of the experts mentioned the use of evaluator tools to vary teaching strategies or instruction, evaluate student progress toward a goal, or as one of many methods of assessing students learning and comprehension of the overall content knowledge and application.

Although Dee did not mention the various methods of assessment that she uses as a purposeful decision, she does use a variety of assessment practices. Dee assesses her students daily as she travels the room observing her students and their methods of solving problems. She also uses individual oral quizzes, where she asks the students to come to her desk and gives them a problem for them to solve. Dee includes projects in the
assessment of her students. Dee also gives traditional tests and quizzes although these quizzes do not come from a prepared test bank.

Sue uses a more typical schedule of tests and quizzes. Sue does allow for and encourages second chance learning. Sue gives homework quizzes (quizzes over homework problems that have been discussed in class). This is to encourage engagement when going over homework and fortifies the emphasis of doing homework when assigned. Recently, Sue has incorporated more writing into her assessment policies.

Joe and Dee have their students keep a notebook (a folder in Dee’s case) with all of the notes and homework included so that they can assess the students’ progress. Joe seemed more concerned with whether or not the students had all of the components, notes and homework, rather than whether or not they demonstrated understanding. Sue does not require a notebook; in fact, she does not require a student to take notes. She mentioned that she realizes there are students who do not need to write down every word in order to understand the concept. She did say, though, that if a student is not taking notes and does poorly on other assessments, she would have a conversation with that student and guide them to the decision of taking notes to help with their understanding.

As far as questioning. Sue was probing and her questions had an emphasis on inquiry during her lessons. Dee and Joe asked peripheral questions and did not follow up with probing inquests. Superficial answers, yes and no, were sufficient.

Dee and Sue both encouraged and fostered conversations between students in their classes. Dee and Sue would often defer questions asked by students to other students in the class. Joe was more teacher-focused, would answer questions directly, and discouraged students from conversing about questions that came up in class.
"I'm analyzed organized.

"I make sure that I leave time in the mornings and the afternoons if they need the help.

"When I get home, I think it should be my family time and I don't want to cheat them, even though...sometimes it happens.

"I don't make comments on every paper and...I try to be positive.

"I spend probably on the average of 6 hours every Sunday getting things ready.

"Where do you find the time to...

"I don't grade any papers at home.

"I grade all of my papers over the weekend.

"I get up anywhere between 2:00 and 5:30 in the morning to do my paperwork.

"We have In-The-Know practice in the mornings.

"They put their (daily) work in their folders at the end of every Friday...and I take it home and grade it.

"I don't grade papers during the week unless they are quizzes.

"If you could just be in the classroom and not have to worry about all the other things, I think it would be a much nicer place to work.

"I'll use my planning period to run papers off or rearrange the room.

"I do 400 things at one time.

"It just seems like by the time that you buy your lunch and you walk to the main teacher's lounge, you just lose too much time. So, I just buy it and come upstairs and do some more administrative paperwork.

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"If you could just be in the classroom and not have to worry about all the other things, I think it would be a much nicer place to work.
How do you get everything done with only 24 hours in a day? One of the predominant qualities necessary in keeping up with the many, and increasing, responsibilities of teaching is organization. Every expert had a system. They all had specific times of the day and week that they used for particular tasks. Whether you are an early riser like Sue or a weekend worrier like Dee and Joe, there must be a time set aside for the intense paper work and planning necessary to being an expert teacher of mathematics.

It is also obvious by the responses of the experts that a teacher needs to make every minute count. These experts carry out their duties in an arranged and focused way. Every expert uses the available time in their day to do school-related activities. When I was visiting Joe, he was grading papers during his planning period, after he ate his lunch and between classes. Sue uses her lunch period to catch up on paper work, also. Dee uses much of her planning periods for student consultations, leaving her with little time to do her actual planning within the school day.
CHAPTER 7

REFLECTIONS AND CONCLUSIONS

The worldview of an expert

Is there a particular worldview that is prevalent among all experts? Similarly, is there a particular, consistent response of these experts to the concerns of the novice teachers? These are the prevailing questions that guided my study. What I found is that there are varying principles of an expert and that each expert in this study works from an underlying worldview different from the other. There are also varying solutions to the indicated problem situations of novice teachers. Is it because they are from demographically differing institutions? Or, could it be that they are simply very different people? Is there one "way to be" or are differences, in worldview and practices, to be expected or even encouraged?

Looking at the experts as a whole yields different results than when looking at the data of one particular expert. In that the group data shows a more even distribution of responses across the paradigms while the individual data is more concentrated in the underlying paradigm view. What does this mean? It could mean that a particular underlying worldview parallel is necessary to becoming an expert in a particular demographic location. It could also mean that expert teachers must be able to travel
between and among the varying ideologies of the paradigms to become a "true" expert.

Regardless of which paradigm was the overriding paradigm for a particular expert, it is clear that each expert in this study demonstrated a variety of worldview parallels. None of the experts in this study had a majority of interpretivist responses to situations in the area of ontology. This held true for Sue who emerged as a teacher with strong interpretivist parallels. The interpretivist ontology is one that stresses process over product and teaching directed at manipulations through conceptual knowledge. This emphasis is also one of the NCTM standards. Should this bother us (mathematics educators) that the experts (in this study) did not seem to show these attributes? If it does not bother us, it should most definitely alert us to the realities of the classroom in comparison to the utopian views of national organizations. I am not saying that the interpretivist ideas with respect to ontology of teaching are not valid and theoretically based. I am simply stating that none of the experts in this study, chosen from the demographically different schools, demonstrated this ideology over the ideologies of positivism and critical theory.

When consulting the data in the areas of epistemology and methodology, the interpretivist parallels hold a slight majority of the instances recorded. Could it be that the epistemologies and methodologies of the interpretivist paradigms are more readily known and more commonly studied? Remember that the interpretivist epistemology is one where the teacher is facilitator, there is student-directed learning and students are involved in lessons. Similarly, the interpretivist methodologies are involved with cooperative learning, discovery lessons, and constructed knowledge. There has been much research in these areas in the field of mathematics education.
Another note when reading the experts' data as a collected whole was that positivist methodologies are less prevalent. That may not hold true for individual experts. However, there is a clear deficiency in positivist parallels, specifically in the area of methodology. Could this be more evidence that interpretivist and critical theory ideals in methodology are more prevalent with mathematics educators and have thus reached the practicing teachers? Could our (mathematics educators) concentration on methodologies as opposed to the more philosophical ideals of ontology be reaching the classrooms while the interpretivist ontological views of NCTM and other contemporary research are less noticeable in today's experts' classrooms? Should we begin to explore the philosophical views of mathematics education as rigorously as the epistemological and methodological views?

**In search of an expert**

As I wrote earlier, I started this study by believing I could find an interpretivist teacher, a positivist teacher and a critical theorist teacher. I abandoned this notion after my pilot study. After I observed a teacher I thought to be a true positivist, I saw that she traveled between and among the ideologies of the various worldviews. This made me think that I could not find a teacher with an encompassing paradigm parallel. I now believe my original instincts were correct. I think there are teachers who have embedded alliances with one paradigm. Further, I believe you can find these teachers in schools that vary in demographics and structure. Originally, I thought I could find an interpretivist teacher from an innovative school, a critical theorist teacher from an urban school, and a positivist teacher from a parochial school. Sue, Dee and Joe are from those very schools, respectively.
What does this mean? Does this mean that if you want to be an expert in an urban school, you need to have an underlying philosophy that mirrors that of the critical theory paradigm? It may, if it does, why? The data points to this as an area of further study. It is possible that it takes a certain type of teacher to reach a certain type of student. I know this is stereotypical and that it brings in the notion of generalization, one that I fight throughout this writing. Nevertheless, Dee has a presence that is wanted, needed, and appreciated in her school. Dee has predominantly critical theorist ideals. Such preferences are also evident in the selection of Sue and Joe as experts in their schools.

There is another way to look at this. Would Joe be successful in Dee’s school? I must say that I looked into several classes at Dee’s school, at her urging, and there were teachers using positivist methodologies in rooms next door and across the hall from Dee. The students in these classrooms seemed lifeless and showed great disinterest in the teacher and the lessons taught. Yes, I know, this could just mean that those teachers are poor teachers on anyone’s scale, or that the students had a bad day. Nevertheless, they were both teaching in that lecture-only, teacher-focused style and they both had the same result.

Similarly, Dee’s philosophy of no homework and lack of “technical” terms in her lessons may cause concern in the students who are planning to attend a college or university and may need the rigor and terminology that Dee does not provide. Could the students in Sue’s classes, who have indicated that they are intending to attend an institution of higher learning, be at a disadvantage if they were in Dee’s class? Or, is Dee putting her students at a disadvantage if they go on to higher education? Finally, would
Sue's conversation and lack of structure cause problems in Joe's school where discipline and order are paramount? What kinds of assumptions are the teachers making here?

**Practices of the Experts**

Each expert in this study dealt with the indicated problem situations of novice mathematics teachers in differing ways. The intent of this study was not to come up with a BEST method for all but to provide options. Each teacher, each classroom and each school culture may dictate the method chosen. The point is to consider the many, varied ideologies of the experts in this study and choose a solution that you believe will work for you and your students.

**Whose experts are they?**

Would these three experts have been chosen if they had been teaching in each other's school? If not, how can they be considered expert? To answer this question, it is important to revisit the selection process. Remember, the experts were chosen by mathematics teachers, counselors, and administrators in each school. The selection was through *emergent measure*, using a priori notions of expertness which are formed through the specific society of the school (Bucci, 1998). I gave no instruction on what I considered to be expert. Those who recommended the experts of each school used qualities they found to determine expertness to recommend an expert. Do each of these environments use varying qualities to determine expertness? If they do not, how could such different teachers be lumped into the same expert category?

The answer to this question is in the idea of *situated effectiveness*. Remember, situated effectiveness is the ability to be effective with respect to one's own world, not the world at large (Bucci, 1998). Dee is effective in her school because she ignites a
passion for learning in many students who have never felt that passion before. Does it matter that she uses unclear mathematical terminology or is it more important that she get the students' attention? If she used the traditional lecture, teacher-centered teaching style and the inaccessible terminology found in many upper level mathematics courses, would her students even be there to hear her?

Sue has a style that emulates the vision of her school: individuality and creative innovative teaching styles. Her students are used to working in cooperative groups because it is common in this school. Her students question knowledge, its source and its destination because that is a quality found high on the charts for this school.

Joe has knowledge of his school's structures and discipline policies that allow him to concentrate on the material instead of the structure of his classroom. His students are from a school culture that expects disciplined students and has high academic standards.

Take what you need, leave the rest (advice to novice teachers)

In this era of standardization and norms, we loose the importance of diversity in our teaching and our students' learning. To say that one person could be an expert teacher to all students is ridiculous. Nevertheless, the sectors of the schools in this study have used their emergent measure to give us an idea of what their culture considers to be expert. Whether this teacher is an expert by your means is debatable. However, consider the school, the teacher, and the classroom and judge what qualities of each expert will work in your classroom.

From the beginning of this work, I have emphasized the importance of experiential learning and situated learning in the development of any teacher. I have expressed the significance of free will to choose the strategies of each expert that you
believe in, that you feel comfortable with, and that you believe will work in your classroom. This text was intended to place you in the classrooms of these experts: to give you experience in their class and to give you an opportunity to “converse” with them about teaching philosophies and methodologies. In doing so, it has become obvious that the experts from each of the differing demograpical schools are themselves, different. Learn from their differences. Marvel at their diversity. It is a beautiful thing.

What does this study mean for novice mathematics teachers? In addition to providing possible solutions to novice concerns, this study provides a mechanism for developing a philosophy of education that is individual and practical. It gives alternatives in conviction, approach, and teacher-student relationships to provide direction for novice teachers. It is a pallet containing a variety of brilliant colors of educational philosophies and methodologies. All you need is to pick up your brush and start to paint the picture of your classroom.

Implications

What does this study mean for mathematics education? It means there is no prescriptive notion of what an expert is. There is no magical formula to follow to obtain expert status or to be an expert teacher. It means that there are experts with differing worldview parallels and that that worldview, dependent upon the demographics of the school, can help to determine your expertness. Further, it means that an expert in one school may very well not be an expert in another. Still more important, it puts the constructivist path that mathematics education is taking and that the NCTM standards are advocating into question. You may be asking, "How?" By recommending teachers whose practices and strategies are often conflicting with the constructivist-laden
principles of the NCTM standards as experts, are these recommendors indicating a lack of importance to those principles? Similarly, because the experts in this study are so different in pedagogical forms, does this say that there is no “standard” for mathematics teaching excellence? Is the push for professional standards unnecessary or maybe even unjust because of the demands of situational effectiveness?

**Personal biases and questions that follow**

When I was interviewing Sue, she used the word guilty when discussing quality verses quantity of content. She said that she was guilty of favoring quality over quantity of content. I found it engaging that she used the word guilty as if teaching the material as a solid, firm knowledge base is a negative compared to teaching a multitude of concepts in a minimal way. When I questioned Sue about her choice of words, she said that she knows many teachers who think that choosing quality over quantity is just disgraceful. What are we telling our students when we, educators, stress quantity over quality? Is this the message we want to get across? If not, then why are our expert teachers feeling inadequate by teaching a firm foundation? What does that say about our curriculums?

Sue sees herself as a coach. It is obvious that the relationship with her students is a vital part of her teaching. Her genuine concern is cast through the course of the interview and continued in the observation. Her critical stance on the issue of math for all and limitations to access of this is cause for further examination. Is she a minority in this philosophy? Is her statement that all students can learn math born from a false-consciousness? What do you think?

I enjoyed the time I spent in Dee’s room. I had to get past the traditional teachings of “correct” terminology and “correct” methodology that often accompanies a
mathematics classroom. Once past this, the involvement of the students and the energy level and learning that was taking place was exhilarating. It made me think. What is the "correct" method or whose terms are "correct?" Yours, mine, theirs, do we have to agree? Do we have to standardize? Are there other disciplines that grapple with this issue? Do we need to consider the long-term goals of our students to help us to decide what is the correct or acceptable terminology for a particular class?

I had a difficult time with Joe. I never felt confident that his actions matched his words. I know this is a common finding in research: actions differing from words. Why did I feel that way with Joe? Part of my frustration came from contradictions in his interview responses and contradictions between what he said and what I saw during the observations. For example, throughout Joe's interview he commented about the amount of time he makes available to his students. His recommendations also stated that he is available to his students for extra help. Nevertheless, the first day I observed Joe, he was asked to fill in for a teacher who had to go home because of an illness. The class Joe was asked to fill in for was geometry, a class he had taught in the past. Upon entering the room, Joe told the students that this was HIS time and that he expected to be able to work on his paperwork during this time. He handed out a worksheet and told the students to work silently on their own. He sat at the front of the room and graded papers instead of teaching or guiding the students on the assignment. Now, this is where my personal biases come into play. I know that when I am asked to fill in for a colleague I treat the class as if it were my own. I instruct and guide and take on the role of teacher for that class even though it is not technically MY class. I would expect no less from an expert
teacher. Maybe that was the first time that Joe acted like that. Or, maybe, Joe feels more strongly about “his” students?

Nevertheless, this incident created a contradiction between Joe’s implied concern for students and the apparent “I come first” attitude I saw in that initial visit. Do his contradictions imply that he knows what he wants to be doing, what he thinks is a better way of teaching but that he simply hasn’t gotten there yet? Does he know that he says one thing and demonstrates another? Or, was this simply a one-time occurrence?

I was continually troubled by the negative attitude I felt toward Joe’s teaching. I had to remind myself that he was chosen as an expert from his school. This does display a situated effectiveness. Maybe Joe would not have been the best teacher for me, but he obviously is doing an effective job with the students from his school. Otherwise, so many people would not have recommended him from the varying sectors of his school. During the observations, I found myself searching for practices that I would consider expert. Maybe that was because of my newfound liberation from my positivistic past. Maybe that is it: I see some of who I was in Joe and I’m resisting the positivistic ways. Not that going there (positivism) would be a move down (to put it in hierarchy terms), but it took me a while to get out of that box and allow myself to see things differently and think that that was okay. Regardless, this school, this culture, is different from mine and it is apparent that expertise is relative.
References


Sternberg, R. J.. 1996. Educational psychology has fallen, but it can get up. Educational Psychology Review, 8(2), 175-185.


Possible problem situations for expert responses:

1. **Errors in instructional examples**
   Mrs. Daniels, a senior with a major in elementary education whose goal was to teach middle school mathematics, realized that she made an error in an instructional example. She paused for about 2 minutes, studying the board. She then decided to abandon the attempt to provide a concrete example (of division of fractions), saying:

   "Well, I am just trying to show you so you can visualize what happens when you divide fractions, but it is kind of hard to see. We’ll just use our rule for right now and let me see if I can think of a different way of explaining it to you. OK? But for right now, just invert the second number and then multiply."

2. **Planning: Short term Vs. Long term**

3. **Classroom management: Punitive or Guidance?**

   Situations 4-8 were taken from the surveys administered to first year teachers in summer of 1997.

4. **Motivation:**
   "How do you motivate seniors who ‘don’t need this class to graduate’.”

   "Student apathy was difficult. Many students would not participate in group or class work. Motivation was very tough.”

5. **Discipline:**
   "Discipline (by administrators) was inconsistent with what the teacher expected and inconsistent within itself.”

   "I had conflicting opinions on the way that the school handles discipline. (They rarely reprimanded, instead they ‘discussed’.”

   "Discipline was difficult. Students knew I was a first year teacher and tried everything.”
6. **Study habits:**
"Juniors and seniors still don’t know how to study."

7. **Administrative duties:**
"We have a lot of after-school activities we must attend. Weekly staff meetings should be cut in half."

8. **Creative lesson planning:**
"I wanted to do more fun activities and projects; however there’s a lot of pressure (I put on myself) to finish a certain amount of work. The school is flexible about this."

9. -11. Questions/issues that are of concern to novice teachers that come from my personal experiences as a mathematics teacher, inservice facilitator, and cooperating teaching.

9. **Assessment:**
"I am trying to collect the homework, grade it, and hand it back with comments. I am feeling overwhelmed by the amount of paper work this creates." (A participant in a block scheduling workshop)

10. **Use of technology:**
With today’s technology, students can find solutions to more complicated problems without knowing the algorithms necessary to compute them. Is it necessary to teach the algorithms and how do you evaluate the students on this. Should they be allowed to use the technology even when they do not know what it (the solution) means? Do they need to prove the use of technology by first showing proficiency in the computation or algorithm necessary to solve a problem?

11. **Proficiency of topics:**
"How long should you spend on a topic when the majority of the class is understanding a concept but you know there is a group of students that just do not ‘get it’?"
District Consent form

Because of the high quality of teachers in your district and your continued drive for excellence, I am requesting permission to engage in a research project involving one of your high school mathematics teachers. Your district will be one of three districts to be included in this study. Building administrators, counselors, and mathematics teachers will recommend an expert from each of the three districts.

It is my intent to engage in a partnership with the emergent expert to determine what pedagogical practices he/she evokes to deliver such expertise. The objective of this study is to produce a text to aid in the instruction of preservice and novice mathematics teachers to further the profession of mathematics teaching. I am interested in gaining information from the expert with respect to specific problem situations of novice mathematics teachers. I will use two methods of obtaining this information.

1. Interviews
2. Observations

As a participant in this study, the expert teacher has the right to:

1. Refuse to answer any question, and to withdrawal consent to participate at any time.
2. Inquire further as to the purpose of the research throughout the course of the study
3. Be given full access to any documents of the study that directly apply to your participation
4. Collaborative negotiation of interview responses, observations and documentation
5. Expect no risks or discomforts while participating in or as a result of this study

Please sign below to indicate your consent to allow this study to take place in your district. I will contact you to ensure that all district requirements of on-site research are met.

Name ___________________________________________ date ___________
Participant Consent form
Your building administrators, counselors, and fellow mathematics teachers have recommended you as an expert mathematics teacher. It is my intent to engage in a partnership with you to determine what pedagogical practices you evoke to deliver such expertise. The objective of this study is to produce a work that could be used to aid in the instruction of preservice and novice mathematics teachers to further our profession, mathematics teaching. I am interested in gaining information from you with respect to specific problem situations of novice mathematics teachers. I will use two methods of obtaining this information.

1. Interviews
2. Observations

As a participant in this study, you have the right to:

1. Refuse to answer any question, and to withdrawal consent to participate at any time.
2. Inquire further as to the purpose of the study throughout the course of the study
3. Be given full access to any documents of the study that directly apply to your participation
4. Collaborative negotiation of interview responses, observations and documentation
5. Expect no risks or discomforts while participating in or as a result of this study

Please sign below to indicate your consent to participate in the indicated study.

Name ____________________________ date __________
Expert Mathematics teachers' responses to novice mathematics teachers concerns.

The purpose of this study is to compile a list of concerns from novice mathematics teachers and address these concerns by interviews and observations of expert mathematics teachers. Surveys of first year teachers, contemporary research on novice teachers and personal experiences will provide the list of concerns. One expert from each of three area high schools will then address the concerns. The school's administrators, counselors, and mathematics teachers will recommend the expert from their school. After contacting and gaining consent from the expert, information with respect to the teaching practices of this expert will be obtained through interview, observation, and videotape. At the end of the research, all audio and videotapes will be destroyed.

The projected time for completion of this research project is one year.
Dear Participant,

As part of my study on expert mathematics teachers, I am interested in your teaching methods in a variety of areas. The areas of concern to me are those that have been indicated by first year and novice mathematics teachers. To deepen the content of my study, I would like to meet with you to discuss how you have responded or would respond to given situations. I would then like to observe you teaching. It is also important to the study that I have a firm grasp of your philosophy of teaching as it pertains to certain areas. I have provided a list of questions that I would like to ask at our first meeting. I will contact you to confirm the use of these questions and set a time for our first interview.

At the interview, I will ask your permission to tape record our conversation. The interview will last approximately one hour. I have also provided a consent form for you to sign indicating your agreement to participate in my study.

QUESTIONS:

- Philosophy of teaching
  1. What is the nature of the delivery of mathematical concepts and what is the nature of student learning and discipline in your class?
  2. What is the relationship between you and your students?
  3. How do the students in your class receive and or seek out knowledge?

- Concerns of novice mathematics teachers
  1. What type of examples do you give and how do you provide student-requested “on the spot” examples or justifications for mathematical concepts?
  2. How do you plan? Do you use any planning strategies?
  3. What type of classroom management do you use?
  4. How do you motivate your students?
  5. How would you characterize your discipline policies?
  6. How can you encourage better study habits?
  7. How do you juggle administrative duties, classroom preparations and personal commitments?
  8. Do you use projects or activities in your teaching? If so, how do you justify and evaluate them?
  9. What types of assessments do you use and how do you handle daily assignments?
  10. Do you use technology in the classroom and if so, how do you balance the skills of the student with the capabilities of the technology?
  11. What do you do when the majority of a class understands a concept but a few are just not “getting it”?
  12. How do you handle parent-teacher relationships?

Thank you for your time.
Please return completed form (in a sealed envelope) to ______________ by ________.

Date __________

________________________________________

Recommended Teacher __________________________

Please briefly explain why you recommend this teacher with a short description of their teaching style.
Dear __________________________:

I am writing to ask for your help in my study of first year mathematics and science teachers. I am a second year Doctoral student at The Ohio State University. I am studying the situations and problems that arise with the first year of teaching. I know we are all busy people, but I would appreciate any time you may be able to give. I am asking that you jot down a few examples of situations or problems you have faced in your first year of teaching.

I have given a few examples to aid you in the requested format. I am not asking that you write a complete history of the situation. I am simply requesting a comment or simple question on events or concerns that arise in any area of your teaching year. Your comments in the realm of professional relationships, classroom structure, concept delivery or reception, student relations or motivation or any other area of concern for you are of interest to me.

I have provided a self-addressed stamped envelope for you to return this to me at your earliest convenience. If you have any questions please call at 614-524-0208.

Again, thank you for your time and concern for the growth of our field and the betterment of our students.

Sincerely,

Terri Teal Bucci
• "I feel overwhelmed by the time involved in the paper duties of teaching."
• "My principal seems to have ‘pet’ teachers. How can you deal with this, professionally?"
• "My students continually come to class without their book?"
• "My students are juniors and seniors and they still cannot do fractions."
• "Some of my male students seem to have a crush on me. I’m not sure how to handle this while preventing him from being embarrassed."
• "I had one student who refused to do work for me. It became a real problem and the administrator became involved."
• "What do you do with students that get A’s on the tests but never do homework?"
• "How can you get parents more involved?"
Responses to Survey of First Year Mathematics and Science Teachers

Chemistry:

- How do you motivate seniors who “don’t need this class” to graduate?
- How can one convince students that reading a chapter in a textbook is an assignment that must be done – even if there is no immediate “reward” for doing so? (They don’t seem to link “reading the chapter” with “higher grades”.
- I felt like I was in high school again – the teachers had their own little groups of friends that I never felt welcome in.
- I had a few students who would steal or break things – then deny they’d done anything wrong
- Juniors and Seniors still don’t know how to study.

Math (7):

- A parent corrected me, writing me a formal letter. I would have been fine with it if I was really in error.
- One administrator was new. Discipline was inconsistent with what the teacher expected and inconsistent within itself.
- Students cried when nine weeks grades weren’t what they expected, possibly affecting eligibility for sports. How can I more effectively communicate this importance? Give them greater foresight?
- Copying homework was an issue throughout our entire team.
- Is it fair for a cellular phone representative to hang out in our staff eating room?
- Someone lifted the can of pop I put in the fridge for lunch. Was it a student or a teacher?

Math (6):

- …Being too careful of what I said and did because of what parent thought: the administration will do anything to make the parents happy.
- Parent conferences – what to do when parents were misinformed by their children or other adults
- I wanted to do more fun activities and projects; however there’s a lot of pressure (I put on myself) to finish a certain amount of work. The school is flexible about this.
- I did not feel comfortable around the principal. He’s very nice but I disagreed with a lot of his decisions.
- I had conflicting opinions on the way that the school handles discipline. (They rarely reprimand, instead the “discuss” everything.
- We have a lot of after-school activities we must attend. Weekly staff meetings should be cut in half.
• I began to think 6th grade wasn’t for me. I’d love to teach 8th grade and then high school. The 6th graders wear through my patience in a short time.
• Discipline…it’s hard to balance.

Algebra/Geometry:

• Initial understanding of administrative procedures. There is no handbook for forms or procedures on anything. Examples: discipline forms – I didn’t know the progression in assigning discipline or how to fill out the forms properly. This came back to haunt me later.
• The tech prep program turned out to be completely different than what was described to me in my interview.
• I felt overwhelmed by the responsibilities of meeting curriculum objectives and handling discipline follow up.
• I was amazed at the amount of absenteeism.
• Teachers handle incomplete work differently. Some just give F’s and thus, the student could still pass without doing the work.

Algebra:

• From my experience, I felt I didn’t really know about school policies.
• Discipline was difficult. Students knew I was a first year teacher and tried everything.
• Student apathy was difficult. Many students would not participate in group or class work. Motivation was very tough.

“Mrs. Bucci,

I decided to not enter the teaching profession, but went into business. I’m now working for an insurance company in Shelby, OH as an actuarial analyst. Happily, I must say it was one of my best decisions. 
Good luck in you research.”