TEACHER TALK: DEPRIVATIZATION OF PRACTICE AMONG SECONDARY

MATHEMATICS TEACHERS

by

DENNIS HEMBREE

(Under the Direction of PATRICIA S. WILSON)

ABSTRACT

This postmodern study used Scheurich's (1997) theories of archaeological research to examine deprivatization of practice among secondary mathematics teachers. Deprivatization is a characteristic of professional learning communities as defined by Louis and Kruse (1995). Three teachers at a single school each hosted a student teacher for one semester. These teachers met regularly with me and the student teachers to discuss mathematics and the teaching and learning of mathematics. During these discussions, the three teachers necessarily deprivatized their classroom practices of teaching mathematics. Results suggest that these teachers shared practices around ideas related to the purpose of schooling and around classroom management, but did not necessarily use these situations of deprivatization as structures to improve their own practice. This study also attempted to define research methods and data analysis in theories of archaeological research.

INDEX WORDS: Deprivatization, Community, Professional Learning Community, Collegiality, Postmodern, Archaeology, Mathematics Education

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TABLE OF CONTENTS

LIST OF FIGURES

Chapter 1

Introduction

This is not a story. It does not have a beginning, middle, and end. The words are just writing. It is text. It cannot be, but can only become as one reads. Such is also the research upon which I base this text. This postmodern cultural study of secondary mathematics teachers did not have a beginning, but was always in the middle—always becoming.

Concepts of *the middle* are important in postmodern theories. These concepts differ from more common uses of the phrase. For example, I met with the three mathematics teachers who are participants in this study during their common lunchtime most Wednesdays for an entire semester. We sat around a collection of tables pushed together in the center of a teacher workroom. These meetings in the middle of the day and in the middle of the week seated in the middle of a room represent a common and generally accepted temporal and spatial use of the phrase, *the middle*.

Postmodern uses of the phrase, *the middle*, refer to a sense of existing in the hard-to-define spaces between things. The middle might be those interstitial spaces within rigid hierarchical and bureaucratic structures of schools in which one can locate sites to act. These spaces are within the system and yet represent a looseness, or play, in the structure that may give room to navigate the system in unexpected and productive ways. A related use of the phrase, *the middle*, is to refer to those discursive spaces that exist between people or constructs that are interacting in some way. Discursive spaces are those a priori conditions and those sites of interaction that allow and limit what can be said, what cannot be said, who is counted as the

same and who is named other, and whose truth is to be taken as The Truth (Foucault & Gordon, 1980). These postmodern middles are the sight of analysis for this dissertation research into the actions and interactions of three secondary mathematics teachers who worked with student teachers during the spring of 2005. I sought to investigate ways in which these practicing teachers did and did not share their teaching practice with each other and ways in which they did or did not allow their work with student teachers to become topics of discussion during weekly meetings attended by many of the teachers in the department, the student teachers, and me. This investigation also examined how these teachers operated in the middle of an imposed structure that attempted to initiate or sustain a deprivatization of practice by and among them. That is, these weekly meetings were a condition placed on the mentors and the student teachers as a part of the student-teaching experience. As the university teacher working at this school, I used these meetings to explore in what ways the mentor teachers did and did not deprivatize their teaching knowledge and practices.

Background

My interest in deprivatization grows from reflection on a teaching career spanning 25 years and four Georgia public school systems. My experience is that secondary mathematics teachers do not share the work of teaching in any organized manner and do not work to produce local theories of mathematics teaching and learning. I agree with Sarason (1996) that teaching "is a culture of *individuals*, not a *group* concerned with pedagogical theory, research, and practice" (p. 367, emphasis in original). Unlike other professions such as law or medicine, teachers neither control nor administer requirements for licensure and admission to the field, do not set standards of ethical or intellectual behavior, and have not worked to establish and maintain a technical knowledge base for teaching (Hiebert, Gallimore, & Stigler, 2002). There is no mechanism for

the routine examination of the work of teaching by others who do the same or similar work and that is designed to increase the local knowledge base for the teaching and learning of secondary mathematics.

In law, for example, both the actions of attorneys and the resulting dispositions of their cases are published and available to others in the profession. Indeed, these professional records set precedents and form the basis for future work in the field of law. In medicine, doctors record their diagnoses and actions, and in general, the resulting patient outcomes are known and documented. In hospital work, and especially in critical situations, cases are reviewed and studied as a matter of course. In my experience, the work of teachers on and with students has no similar study and documentation. In fact, much of our knowledge in secondary education derives from some measure of student achievement in the form of test results. It is as if we know patient outcomes or case dispositions with little knowledge of the teacher actions and decisions that may have contributed to those results.

It was beyond the scope of this proposed dissertation study to construct a systemic method or process for teachers to examine their own practice and the practice of others. Instead, within the design of a larger project, I worked to probe existing ways in which teachers in a single school shared their knowledge and practice of teaching when they shared a commonality of mentoring a student teacher and when they met together in this context to discuss the teaching and learning of mathematics. I refer to instances of public discussion and examination of the practice of teaching as *deprivatization*, and my work has been to explore acts of deprivatization within the existing culture and structures of mathematics teachers at a single secondary school. The word *deprivatization* may bring to mind ideas of collegiality or collaboration; however, I co-opt the strangeness of the word as a reminder of the purposefulness of acts of deprivatization as

well as for the availability of the verb forms, to *deprivatize* and, conversely, to *privatize* the practice of teaching. I focused this study on mathematics teachers who volunteered to host and mentor student teachers, though the roles of other mathematics teachers and student teachers cannot be disregarded or ignored.

In this postmodern study of three secondary mathematics teachers who worked with student teachers in a small-town southern school, I used interactive observations, interviews, and shared notebook entries to investigate ways in which these teachers deprivatized their practice of teaching mathematics. I acted as the university contact for the three student teachers placed at this school in the context of an ongoing project titled Partnerships in Reform in Mathematics Education (PRIME). Project PRIME was a multi-layered professional development project. For preservice teachers, the design included coordination of field experiences, a methods course, student teaching, and a concluding seminar as the final stages of preparation and licensure. PRIME also attempted to use this work of preservice teacher preparation as a site and method for the continuing professional development of practicing teachers who volunteered to host a student teacher, as well as doctoral students who worked with multiple practicing and student teachers at a single school. As a part of PRIME, I observed and participated in mathematics classrooms, worked individually with the practicing teachers as they in turn worked with student teachers, and met regularly with the group of teachers and student teachers at a single secondary school to discuss mathematics and mathematics teaching and learning.

The research questions that guided this study were as follows:

1. How are acts of deprivatization conceived? What do they look like, and how do they develop?

2. What collegial structures are produced by and among teachers who mentor student teachers and meet regularly to discuss the work of teaching mathematics?

Concepts related to teachers' deprivatization of practice are not uncommon, nor are they new, in research literature. Lortie (1975) describes the culture of teachers as individualistic and laments the socialization of beginning teachers into an occupation that seems to have little concern for building a shared technical culture. Little and her colleagues (Little, 1982, 1990c; Little & Horn, 2007) use terms such as *collegiality*, *collaboration*, and *joint-work* to discuss how teachers do or do not work together to improve teaching and learning. Hargreaves (2003), looking toward the future of teaching in an increasingly complex world, notes that past efforts to create a collaborative culture in teaching have often resulted in a contrived collegiality. He also suggests that the increasing availability of consumer choice in education has led to a corrosive individualism both among competing schools and between teachers in the same school or school system. McLaughlin and Talbert (2001) suggest that relative to cultural change, mathematics teachers in particular are constrained by a perceived stasis in their subject matter, and therefore, by perceptions that their instruction is predetermined and that their job is routine. These perceptions, along with commonly held beliefs among teachers of mathematics that mathematical knowledge establishes a hierarchy of possible interactions between those who have and those who do not, limit mathematics teachers' collaboration with colleagues as a normal part of the teaching practice. I suggest that though the researchers discussed here use different terminologies and come from a variety of backgrounds and philosophies, they discussed the same phenomenon, namely, deprivatization of the practice of teaching.

The term *deprivatization* was introduced in the education research literature in an attempt to apply to education both the sociological research on professionalism and the research on

community (Kruse & Louis, 1993a). This and related work from the Southwest Educational Development Laboratory (Hord & Cowan, 1999; Kruse & Louis, 1993b; Louis & Kruse, 1995; Louis, Marks, & Kruse, 1996) introduced the term *professional learning community* (PLC) for this intersection of the previously distinct ideas of professionalism and community. The SEDL examined the work of teachers at schools recommended to them as oriented toward reform and with a high level of student achievement. From this examination came a set of common teacher stances and relations across the faculties at these schools, and these common characteristics became a working definition of a PLC. My particular interest is in the characteristic of deprivatization of practice, described by Kruse and Louis (1993a) in the following passage:

> Teachers within professional communities practice their craft in public ways. Teachers can share and trade-off the roles of mentor, advisor, or specialist when providing aid and assistance to peers. It is within these relationships that teachers work to define and develop their own practice and control their own work in public, de-privatized ways. …Teachers grow in their teaching practice by developing skills and routines for describing, analyzing, and executing the instructional act, and they develop a shared common language with which to discuss these tasks. Thus, teachers deepen the levels of trust, respect, and openness to improvement within the school community, thereby reinforcing the value base and assumptions the school community is built upon. (p. 12)

The quoted passage seems to suggest that the practice of teaching secondary mathematics is limited to "the instructional act" and hence deprivatization of practice to the observation and discussion of these acts. I take a larger view of the practice of teaching mathematics, to include the mathematical knowledge needed for teaching and its acquisition, pedagogical knowledge and its acquisition, planning for student learning, analysis of student thinking and its relation to

teacher decisions, and reflection on the intended, enacted, achieved, and abstracted (Steffe, 1990) curriculum. Thus, I take deprivatization of practice to mean any words or actions by a teacher, intentional or not, that open an opportunity for others to respond to that teacher relative to any aspect of his or her practice of teaching.

In their work lives, teachers exist in complex systems in which "knowledge, activity, and identity are caught up in one another" (Davis & Sumara, 2001, p. 94). In postmodern theories, knowledge and identity cannot be said to reside in an individual, nor can we suppose that an individual possesses knowledge or identity. Rather, knowledges and identities are the becoming products of activities. The words *activity* and *activities* are not used here in a simple sense of doing, but rather to encompass a much more extensive idea of the discourses in which actions and interactions occur. The concept of discourse is near ubiquitous in modern philosophy; however, I use it here in the Foucauldian sense, described by Lather (1991) as:

> A conceptual grid with its own exclusions and erasures, its own rules and decisions, limits, inner logic, parameters and blind alleys. A discourse is that which is beneath the writer's awareness in terms of rules governing the formation and transformation of ideas into a dispersal of the historical agent, the knowing subject. (p. 166)

Discourses are those historical preconditions in which we live and theorize. Discourses limit our actions and thoughts, but also provide the very ways and means we have to act and think. Discourses control us and yet can never be so rigid as to preclude room to maneuver. My desire in this dissertation research was to observe and theorize with and about practicing mathematics teachers as they were asked to discuss and reveal practices of teaching mathematics.

Theory is something you live (St. Pierre, personal communication). Theory is a map through which we move; it is "an experimentation in contact with the real" (Deleuze & Guattari,

1980/1987, p. 12). Through a particular theory we see structure and play, conformity and resistance, and a structure of relations. Postmodern theories described by Deleuze and Guattari (Deleuze, 1990/1995; Deleuze & Guattari, 1980/1987; 1991/1994) are an overlay onto the interactions of myself and the participants in my study, as well as onto the structures and play within project PRIME and within the culture of the mathematics department at Grant-Union High School[1]. These theories suggest that a centralized, arborescent model, consisting of a primary taproot or trunk along with ever smaller, connected subdivisions, is a poor analogy for our existence in the world. Rather, we should consider ourselves and our existence as rhizomatic and interconnected, like the growth of grasses that spread underground from no identifiable original. With a rhizomatic view, we might make a map of connections between events and intensities, but there is no hope of tracing an event or an intensity to some root cause or central defining idea or moment. Rather than ask what things mean, we should rather ask what they do and how they operate.

Postmodernism(s) may be thought of as incredulity toward metanarratives (Lyotard, 1979/1984). This rejection includes, especially, modernist beliefs that an objective reality is determined and knowable. Postmodernism explores the idea that everything is in play and that "everything is dangerous" (Foucault, 1983/1984, p. 313). Truths and identities are situated in discourses and are "defined by the values, politics, and desires of problematics[2]" (St. Pierre, 2000, p. 498). With this view of the world, truth and identity are not only mutable across different discourses, but are also dynamic and discontinuous creations of the immediate. There is

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[1] Pseudonyms are used throughout this text for the name of the research site and for the names of research participants.

[2] A *problematic* is any framework or system that determines what questions may be asked, who is allowed to ask the questions, the methods by which such questions may be investigated, and the acceptability and use of the results of these investigations.

no truth and no identity, but only a *becoming* truth and a *becoming* identity (Deleuze & Guattari, 1980/1987).

This nondeterministic and becoming view of reality provides a framework to investigate the concepts and created structures of deprivatization of practice. By any conceptualization, deprivatization occurs outside any individual and within the spaces between[3] individuals. It is a product and process of interaction. However, deprivatization also occurs within and through a multiplicity of problematics. The setting of this study provided a discursive site to test and refine the application of postmodern theories to the everyday work of secondary mathematics teachers. The questions I asked in this study were designed to explore Deleuzean conceptions of becoming, ideas of events and individuals as multiplicities of intensities, the rhizomatic nature of reality, and structure and play in the space of working with student teachers.

Purpose of the Study

Through this dissertation study, I hoped to accomplish several things. First and foremost, this study was a personal investigation of events in my own career as a teacher of mathematics. It was embedded in what I consider a doctoral program of reflection on ways that I did and did not operate as a teacher and as a constructive member of a profession. Second, recent descriptions of professional development for teachers of mathematics each include a component related to learning from and with colleagues in a professional community (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; National Council of Teachers of Mathematics, 2010). For the larger field of school education, Hiebert et al. (2002) discuss the possibility of a knowledge base for the teaching profession and suggest that this professional knowledge of teaching must be created by

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[3] "Between things does not designate a localizable relation going from one thing to the other and back again, but a perpendicular direction, a transversal movement that sweeps one and the other away, a stream without beginning or end that undermines its banks and picks up speed in the middle" (Deleuze & Guattari, 1980/1987, p. 25).

teachers and with the "intent of public examination, with the goal of making it shareable among teachers, open for discussion, verification, and refutation or modification" (p. 7). Also, "most teachers have not accessed what others know and must start over, creating this knowledge anew" (p. 11), and therefore have not benefited from any accumulated or shared knowledge of the profession. These calls for new approaches to the work of teaching suggest nothing less than a change in the culture of teaching, and cultures are highly resistant to change (Stigler & Hiebert, 1999). Cultural change will not occur by design without some understanding of the existing culture and existing ways teachers already deprivatize the practice of teaching. This study offers a view of one existing culture of teachers and their interactions around the practices of teaching. Third, this study attempts to locate postmodern theories in a local practice of teaching mathematics. Postmodernism rethinks relations between participants in a particular discourse and challenges the presumptions of the accepted and seemingly ordinary. It explores those middles where action is possible and asks not only what is possible, but also what is not possible, what is said and what is left unsaid. My intent is to contribute both to the extension of postmodern theories and also to the application of those theories in mathematics education.

Chapter 2

Literature Review

This dissertation study investigated the construct of deprivatization of practice by and among three secondary mathematics teachers who each mentored a student teacher for one semester. I attempted to use the postmodern archaeological framework and methodologies suggested by Scheurich (1994; 1997) as I met with the teachers, analyzed data, and wrote this report. In this chapter I review the literature around theories of postmodernism, archaeological methodologies and methods of research, and deprivatization of practice within the context of professional learning communities.

Postmodernism

The postmodern turn represents a questioning of structures associated with theories typically identified with what I shall refer to as humanism. In Europe, the term *postmodern* is used to identify a particular style in the arts and in literature, whereas the term *poststructural* is used for the philosophies and methodologies that I use in this dissertation. However, the tradition in the United States is to use the term *postmodern* whether one is referring to a period or style of art, an approach to writing or literary criticism, or to a philosophy. I will follow the endemic convention and use the terms *postmodern* and *postmodernism* in this dissertation to identify any of the general theories that developed in the latter part of the last century and that break with the presumed certainty in the structures and representations of humanism. For a general discussion of the differences between postmodernism and poststructuralism, see for example, Rajchman (1987, November–December) or Lyotard (1979/1984).

With the term *humanism*, I do not intend to reference a specific philosopher or any particular philosophical position that might include the word *humanism* in its title. Rather, by humanism I only wish to reference those philosophies that, either explicitly or implicitly, take reality to be objective, knowable, and meaningful; see human subjectivity as identifiable and central; and reify text as essence. Research from a humanist philosophy, then, assumes that the researcher and research subjects are independent and autonomous entities or subjectivities. That is, the researcher can distinguish him or herself from others and can control or least identify his or her interactions with the research setting and participants. Further, research from a humanist position assumes that logic will carry the day—that research methods will record objective data and that those data can be analyzed, can be interpreted, and will reveal some meaning. Finally, humanist research assumes that the results of analysis can be reported so that valid and trustworthy meanings are accessible to others.

Postmodernism questions each of the humanist assumptions in the previous paragraph. I take the view that reality is contingent and open. This is not to say, for example, that the paper or computer in front of you does not exist or exists only if you think about it or touch it. Rather, by reality being contingent and open I suggest that events, objects, people, and so forth cannot be essentialized and fixed in meaning and purpose. If reality is contingent and open, then the question of meaning becomes moot. The important question then, becomes one of what things do rather than what they mean.

Humanist research assumes that the I of the researcher and the they of the participants can be identified, separated, and objectified for discussion. This objectification has even been given the title of subjectivity as an identifying noun, naming either the I or the they. The researcher discusses himself or herself as a subjectivity, identifying relations, biases, and truths

relative to the research participants. In effect, the humanist researcher creates an encapsulated, compartmentalized version of events and people and confesses that certain relations and biases and truths may or may not have affected the data or the analysis or the research report. From a postmodern perspective, subjectivities—the I and the they—are indistinct and confounded, and there is no possibility of disentangling the people or the data or the writing or the reading. Interactions are "flows meeting other flows" (Deleuze & Guattari, 1991/1994, p. 9) and necessarily splash and eddy.

Archaeological research in the postmodern.

I work within a postmodern framework that considers the nature of reality as rhizomatic rather than arboreal (Deleuze & Guattari, 1980/1987). Arboreal beliefs and approaches to research attempt to trace meaning or to trace causality. They ask to what larger branches do smaller branches attach, and what are the main trunks that gave rise to these branching ideas and events—what are the root causes and what does it all mean? Tree models imply original sources and deep, but simply bifurcated, structures. In contrast, grasses provide a model for rhizomatic beliefs and structures. Rhizomes are not reducible to any simply structured branching. There is no identifiable parent structure. "Rhizomes connect any point to any other point" (p. 21) without tracing through any essential trunk or root. Rhizomes have no beginning or end, but only a becoming middle. They are "composed not of units, but of dimensions, or rather directions in motion" (p. 21). Rhizomatic research does not seek to identify units, define meaning, or infer causality, but rather asks what is the direction, what do these events do, what do they enable, and what do they disallow?

Consideration of reality as rhizomatic is not a rejection of structure. Rather, structures are local and contingent, with multiple entryways, possibilities of looseness and play in the system,

and interstitial spaces provided in, but not governed by the structure. These local structures may be traced on small portions of a rhizome but do not define nor contain. Rhizomatic structure is a convenient concept and aid for discussion, but should not be taken as some essentialization of the real. The concept of structure allows us to do some work, but only in a nonrigid way, like "a flow meeting other flows" (Deleuze & Guattari, 1991/1994, p. 9). Structures that allow talk about teaching and teachers are products of the discourses of teaching and teachers, rhizomatically extant in discourses of schools and schooling, role and identity, culture and enculturation, "and…and…and…" (Deleuze & Guattari, 1980/1987, p. 25). Structures flow and morph as the boundaries of these various discourses migrate.

Scheurich (1997) suggests that not only should we consider reality rhizomatic, but we should also consider that it has always been so. That is, not only does a rhizomatic structure metaphorically describe our present perceptions and interactions, but the rhizomatic structure extends into our pasts as well. Ultimately then, our very cultures are infinitely and intractably complex in their origins as well as in their operations, consisting of a three-dimensional rhizome extending the breadth of the culture and extending backwards through time. Scheurich defines the concept of *category* as any of the possible concepts one might encounter within a culture, such as love, money, boat, or vision. Of course, within a given culture some of these categories are generally seen as more important than others, and it is this difference in importance that creates differences in cultures. For example, a culture with a relative importance on the individual and on individual success and achievement could be radically different from a culture in which individual success and achievement is subservient to that of the larger group and even the culture itself. After Scheurich, I will refer to any relatively coherent collection of categories as a *formation.*

A formation is any group of people that, for whatever reason, has been socialized or enculturated in some particular way over a period of time. Examples of formations could be working class Americans, females in Korea, African American men, members of the Benevolent and Protective Order of Elks, and so forth. Of course, any individual person is constituted by various categories from many multiple formations. Using myself as an example, I am an Anglo American male, born working class and living my adult life as middle class, born and raised into a southern family with particular social and religious norms, educated in Georgia public schools, a graduate of particular institutions of higher education, and employed for almost 30 years as a public school teacher in Georgia. Therefore, I am constituted by the dominant Anglo American male formation, the dominant middle class formation, the nondominant working class formation, and so forth. This is not to say that any individual with a similar formational set must be identical to me, but simply that in a broad, general sense individuals with the same formational set share certain norms of beliefs and behaviors. As Scheurich (1997) puts it, "what it is, then, to be this individual, to think/reason, to act, to know reality, all of these are constituted by this formational positionality and not by any romanticized individual choices" (p. 168).

Given Scheurich's (1997) archaeological view of reality and given structure as rhizomatic, how does one conduct research? What does it now mean to collect data, use and analyze data, and report findings? Are these even concepts that exist in a postmodern world, or are these concepts produced only in and by the humanist paradigm? Scheurich is only vaguely helpful here. He does point out that any dichotomous view of humanism versus postmodernism is simply inappropriate, since it is the current archaeology that is producing both. The current dominant archaeology of academe has enacted researchers and researchers must do what the archaeology speaks. Researchers are enacted to "audiotape, systematically code, and do pattern

or thematic analysis of data. These latter practices are the practices of reason, and they are assumed to accord with a researcher-trained mind" (p. 172). However, what the researcher actually does is at once an enactment of the archaeology and a study of the archaeology in terms of the archaeology itself. As Scheurich describes:

> The lens constructs the world according to the nature of the lens, and, in the archaeological view, the archaeology constructs the lens. In this regard, the difference between archaeology and realism is that archaeology knows this, while realism imperially thinks its lens is a window onto the really real. Realism assumes it is able to achieve a purchase above or outside its historicized context, while archaeology assumes it is an enactment wholly within and of the archaeology. (P. 174)

I interpret Scheurich's comments to indicate that, while certain researchers who consider their work archaeological are compelled by the archaeology to do certain procedures enacted within and by academe, these researchers necessarily think differently about the research process and therefore about subjectivity, data, data analysis, and reporting of results.

Scheurich (1997) uses the term *archaeology* to refer to his ideas about reality and about postmodern research, but he acknowledges the influence of the French philosopher and historian Foucault (1969/1972), who introduced archaeology as a method of research. Foucault discusses archaeological research as posing the question, "How is it that one particular statement appeared rather than another" (p. 27)? Archaeology does not try to define what is "concealed or revealed in discourses, but those discourses themselves. It is not an interpretative discipline: it does not seek another, better-hidden discourse. It refuses to be allegorical" (p. 138). Archaeological research does not try to identify the moment of emergence of an idea or an event, or to

"recapture the elusive nucleus," but rather to examine how a discourse puts into operation a set of rules that is "irreducible to any other" (p. 139).

Kendall and Wickham (1999) suggest that differences between realist/humanist research and archaeological research are not necessarily ones of data and data collection and analysis, but rather are related to what researchers do with that data, with the goal being an attempt, as much as possible, to be noninterpretive. From an archaeological perspective, collecting and coding data do not have as their goal the essentialization of data, but rather try to analyze relations between one statement and other statements and to describe places and limits within which things are named and acted upon. Archaeological research looks not for meaning, but for conditions of possibility that allow formal knowledges to emerge out of less rational and less formal broad arrays of local practices and informal knowledges (Scheurich & McKenzie, 2005). If we cannot (yet) escape the processes of data collection and coding, we can at least use those processes in different ways and under different representations. We cannot currently escape the signifiers of humanism, but we can at least use these signifiers *sous rature* (Spivak, 1976) to acknowledge that we speak and act with a given text even as we protest its use.

Professional Learning Communities

The phrase *professional learning community* (PLC) first appeared in education literature in the early 1990s in an attempt to merge sociological definitions of the so-called professional occupations with the idea of communities as supportive environments for individual development (Kruse & Louis, 1993a). The traditional professional occupations of doctor, lawyer, and the clergy have been characterized by a technical knowledge base not easily accessible to a layperson, control over entry into the profession from within the profession, and an altruistic or at least client-oriented emphasis (Johnson, 2005). Outside the professions, the concept of

community evokes shared values and norms of interaction, a sense of responsibility for the common good, and extended relationships of caring (Grossman, Wineburg, & Woolworth, 2000; Lave & Wenger, 1991).

Kruse and Louis (1993a; Louis & Kruse, 1995) suggested a framework for analysis of school-based professional communities of teachers. This framework is composed of five characteristics that researchers observed to be common in urban schools that were in a process of restructuring in terms of student achievement and teacher satisfaction. These characteristics include a shared set of norms and values among teachers, a practice of engaging in reflective dialog among teachers, a deprivatization of the practice of teaching, a school-wide focus on student learning, and an emphasis on collaboration between teachers. Certainly these characteristics are not necessarily independent, nor do any of them have an absolute measure by which to assign a discrete value to the presence or absence of that characteristic. Nonetheless, this set of five characteristics became the primary descriptor for the existence and operational characteristics of a PLC.

Brief descriptions of the characteristics of PLCs appear in educational literature as researchers investigate the role of PLCs in increasing student achievement (Louis & Marks, 1998; Southwest Educational Development Laboratory, 1997), study how PLCs are created or sustained (Andrews & Lewis, 2002; Buysse, Sparkman, & Wesley, 2003; Grossman, Wineburg, & Woolworth, 2001; Hord & Cowan, 1999; McLaughlin & Talbert, 2001), examine the role of PLCs in teacher professional development (Andrews & Lewis, 2002; Cochran-Smith & Lytle, 1999; Little, 2002; Lord, 1994), or characterize the student teaching experience as either an introduction into an existing PLC or as a site for the creation of a PLC across beginning and experienced teachers (Frykholm, 1998; Rhodes & Hembree, 2005; Silva & Dana, 2001). Each of

these cited works presents some form of the five characteristics of a PLC identified by Kruse and Louis (1993a), with perhaps an increased emphasis on one or the other. Through the past decade much of the emphasis on PLCs in schools has shifted toward the role of supervisors and administrators in creating and sustaining PLCs and the phrase *professional learning community* has become ubiquitous in that area of educational literature (Mullen, 2009). In fact, Grossman et al. (2001) begin their article with the sentence, "The word community has lost its meaning," and state in the same paragraph that "community has become an obligatory appendage to every educational innovation" (p. 942).

The previous paragraphs are not to say that ideas of the five characteristics of community described by Kruse and Louis (1993a) originated totally within their research, but simply that Kruse and Louis identified this set of five characteristics as ways and means of operating of a certain set of schools and gave these characteristics the name *professional learning community*. Certainly the investigation of any one of the five characteristics predates the work of Kruse and Louis and continued after their definition of a PLC and independent of that definition. My dissertation study involved only the characteristic of PLCs described by Kruse and Louis as deprivatization of practice. Below I discuss the literature relative to that one dimension.

Deprivatization of practice.

Deprivatization of practice refers in general to the idea that teachers, to a greater or lesser degree, share with other teachers their teaching practices and therefore their beliefs about teaching and learning. Deprivatization includes, but is not limited to, teachers formally or informally observing colleagues as they are active in classrooms, working with other teachers to plan lessons and assessments of lessons, discussing students' interactions with curriculum, or other public sharing of teaching knowledge or practice. The idea that teaching is an isolated and

isolating profession is well recognized and noted. Lortie (1975) is most often cited in the context of teachers having served an apprenticeship of observation, but his work also contains powerful comparisons between the induction of teachers into the profession of teaching and the induction of professionals into the workplace in other fields. He notes that in other professions, academic or otherwise, there is often some shared ordeal that initiates and legitimizes the individual as a member, whether it is preparation for some entry examination or an extended apprenticeship in which senior members of the profession certify the neophyte and extend a generational trust that certifies readiness and membership. Although the ordeal of student teaching may be shared, one of its primary goals and indeed its typical culmination is not the acceptance of the teacher into a group, but the isolation of the neophyte teacher as the only adult in the classroom. "The 'sink-or-swim' pattern is individual, not collective; there is little to suggest that it induces a sense of solidarity with colleagues" (p. 159). This isolation is likely to continue throughout a teacher's career and unlike other professions, without a series of identifiable steps of increased status that increasingly legitimize competence and confidence. "The career line of teaching gives the occupation an unusual quality; once tenured, a person can work for years without public recognition for his greater mastery of core tasks" (p. 161).

Others have more purposefully examined the culture of teaching in comparison to specific occupations and come to similar conclusions as those of Lortie (1975). Dreeban (2005) noted that historically the educational terrain has been controlled by forces far removed from the day-to-day work of teaching. Federal and state agencies, academe, and even influential individuals have driven education, and therefore the occupation of teaching, in various and seemingly random directions. None of these outside influences has provided conditions for teachers to "define the major categories of their work" and "develop a collegial life that supports

both the analysis of work and its practice" (p. 68). The primary voice for mathematics education in the United States, the National Council of Teachers of Mathematics (NCTM), recognizes and encourages such collegial relations and suggests, but cannot mandate, change. NCTM notes that teachers' best learning occurs while examining their practice with colleagues, yet teachers continue to work in relative isolation. The only suggested remedy from this isolation is a recommendation to restructure the school workday to include time for teachers to plan and analyze lessons (NCTM, 2000), similar to a Japanese model of lesson study (Stigler & Hiebert, 1999). Again, however, such systemic change depends on financial and political decisions that are typically far from the direct influence of classroom teachers who would benefit the most and who best understand the need for such change.

Johnson (2005), examining the prospects for teaching as a profession, proposes that education will necessarily undergo a change as an aging teaching force reaches the age of retirement. In the current culture of serial careers, younger teachers and midcareer entrants may have a more tentative commitment to the classroom and be more likely to leave teaching if working conditions are not amenable. This observation is relevant since, as McLaughlin and Yee (1988) conclude, teachers define their own effectiveness and efficacy in their careers in nonmaterial terms, with one of the principle factors being collegial relationships in sharing the work of planning and teaching.

In an early ethnographic study of teachers' professional relationships, Little (1982) concluded that within successful schools there is an expectation of shared work and a norm of collegiality, along with a sense of teaching as experimentation followed by analysis and evaluation of that experimentation. In further work, Little (1990a; 1990c) observed that exchanges between teachers commonly do more to support and strengthen the isolated work of

teaching than to diminish it. A teacher's most typical interaction with another teacher is in story telling, and these stories of details of the classroom often reinforce the classroom warrant that the classroom is the teacher's exclusive domain. Teachers also expect that other teachers will give help and advice, but that they will honor the boundary between advice and interference. Little noted that even teachers with many years of experience do not offer unsolicited advice, even to beginning teachers. Collegiality is also limited by a belief that teaching knowledge is intuitive and that teachers' like-mindedness limits the need for close examination of shared assumptions. Little's conclusion was that mutual sharing or assistance may account for a degree of teacher satisfaction in the workplace and serve to maintain a minimum level of performance, but these superficial interactions are unlikely to challenge the patterns of private practice that are the norm of teaching.

Lord (1994) uses the term *critical colleagueship* to identify a facet of professional development in which teachers talk publicly about their own teaching practices and the practices of others, building over time a mutual obligation to share knowledge and to create and sustain a productive disequilibrium directed toward improved teaching. He suggests that this critical colleagueship will move teachers to embrace fundamental intellectual virtues, increase empathetic understanding, develop and improve communication and negotiation skills, become comfortable with the high levels of uncertainty generated in teaching for understanding, and achieve a collective generativity that allows the group to move on to new challenges. Lord also notes, however, that such revolutionary engagement with other teachers and with a collective approach to teaching practices is foreign to most teachers and is nearly impossible to mandate from outside a group. These relationships and practices must develop from within. Unfortunately, most teachers do not have the professional preparation, the appropriate

opportunities, or the time to develop the relationships with others necessary to exercise critical colleagueship. Critical colleagueship is driven by difference and conflict, whereas given the demands and time restrictions imposed on teachers, the most common reaction to new challenges is for teachers to turn to reliable and private routines.

Cochran-Smith and Lytle (1999) discuss three types of teacher knowledge: knowledge *for* practice, knowledge *in* practice, and knowledge *of* practice. Each of these involves a particular type of learning and of teacher involvement in that learning. Knowledge *for* practice consists of existing knowledge about the many facets of teaching; therefore, teacher learning involves working toward advanced degrees, attending workshops and professional meetings, and so forth. Knowledge *in* practice assumes that the knowledge needed to teach well has been acquired by some through experience and is therefore available to others by studying with these more experienced others. This view of teacher knowledge gave rise to the construct of master teacher and to structures of mentoring for less experienced teachers.

The third type of teaching knowledge—knowledge *of* practice—consists of local knowledge obtained through studying and theorizing in and from teachers' own experiences and the experiences of those teachers around them. Inherent in this idea of knowledge *of* practice is the notion that teachers make problematic their own practice and the practice of others. Such problematizing is necessarily situated in the theory that knowledge is socially constructed and that teachers openly deprivatize their practice as a site for knowledge construction. Cochran-Smith and Lytle (1999) suggest that this local and generally grass-roots theorizing can expand from classroom practices to curriculum development and eventually to whole-school reform. These researchers conceptualize this deprivatization and the construction of knowledge *of* practice as part of a shift in the work and knowledge acquisition of teachers toward "inquiry as

stance" (p. 288), echoing Dewey (1904), who wrote that learning to teach should focus on becoming a student of education rather than becoming a competent practitioner.

Grossman et al. (2001) designed a professional development project that brought together 22 English and social studies teachers twice monthly over a period of 2½ years. This extensive project was designed to examine the birth and growth of some form of community by a diverse set of participants and to describe successes and failures of this model for professional development. The teachers were from the same school, though the two departments had little interaction with each other on a professional level. The teachers from the two departments knew each other largely through reputation, largely based on comments from various students over a span of years and in some cases decades. Each group meeting lasted for an entire day to read and discuss literary and historical works and to design an interdisciplinary humanities curriculum. The researchers found that the idyllic visions attached to notions of teacher community are just that, and in fact, bringing teachers together can hurt as easily as it can help. "Reducing isolation can unleash workplace conflicts that were, ironically, kept in check by the very isolation in which teachers work" (p. 991). Although many of the meetings were contentious, however, the group moved toward a strategy to adapt this learning model for both students and the rest of the faculty.

Deprivatization and teachers of secondary mathematics.

High school teachers may identify themselves with their respective subject area departments more than with their school as a whole (Little, 1982; Talbert, McLaughlin, & Rowan, 1993). The beliefs, culture, and social norms of secondary mathematics teachers relative to teaching and learning mathematics are often different from those of other subject matter teachers relative to their subjects (Grossman & Stodolsky, 1995). Mathematics teachers tend to

see their subject matter as more sequential and their curriculum as more constrained than teachers of other subjects. Grossman and Stodolsky found that mathematics teachers were more likely to coordinate course content with other members of their department and were more likely to develop common exams than were teachers of language, social studies, or science. McLaughlin and Talbert (2001) found that coordination of course content by mathematics teachers was normative and based on beliefs by teachers that much of mathematics instruction is predetermined by the subject matter. These researchers concluded that "mathematics represents a 'worst case' in terms of teachers' potential openness to rethinking traditional assumptions or developing new practices" (p. 57). Mathematics teachers are constrained by cultural canons of subject matter, including images of mathematicians, and therefore of mathematics and mathematics learning as isolated and individual.

Several researchers have studied deprivatization by and among secondary mathematics teachers, either by selecting teachers from a single mathematics department or by locating research within some formal or informal gathering of mathematics teachers for professional interaction. Little (2003) studied mathematics teachers from a single school who describe themselves as collaborative and innovative. They met weekly to discuss how they taught specific mathematics lessons and how students responded to these lessons. Each teacher presented a comment or a situation relative to recent classroom events and then these statements became the topic of conversation for the meeting. Thus each teacher was automatically a participant and necessarily opened his or her own practice as a focus of discussion. Little notes that although these teachers had discussions that provided an examination of teaching practices in transformative ways, there was also risk and vulnerability when, for example, the group responded to a teacher's situation with a critique of that teacher's instructional choices and

responses to students in the situation. Also, some situations were not taken up for discussion, but rather deflected by a joking response that effectively ended the conversation or that rapidly shifted the topic intended by the initiating teacher. Little concludes that, although these mathematics teachers working toward a common purpose might share a common language and a common set of values, ongoing interactions could both open up and close off potentials for teacher learning and discussion of practice.

Horn (2005) studied groups of mathematics teachers from two secondary schools involved in and committed to whole-school reform. In South High School the reform project was funded from outside sources, and teachers were involved in professional development structured around workshops and meetings conducted outside the school site. At East High school, although dedicated to whole-school reform, reform efforts were motivated and instigated within the individual departments as a more grass-roots movement. While each mathematics department made similar decisions aimed at reducing disparities in student achievement, the collegial interactions differed among department members at the two schools, with different reform results at the two schools. At South, meetings of the mathematics department were largely bureaucratic, and reform efforts did little to change the teaching and learning of mathematics. Although South's teachers were clearly committed to their students as human beings, there was little evidence that teachers changed their views of students as learners of mathematics. Ultimately, the mathematics department was granted a sort of exemption from efforts to reform. In contrast, at East High School, internal professional development focused on constructing an algebra curriculum based on what the teachers called group-worthy problems. The mathematics teachers developed a system of deprivatization that Horn characterizes as either replay or rehearsal. That is ,as teachers shared events from the classroom, they were replaying a situation for comment by

other members of the department. These comments might be supportive, or they might challenge the teacher's categorizations or interpretations of events; however, in either case, the shared norms of operating and the focus on the larger goals of the department allowed the group to push toward a common understanding of the event. By placing classroom events into larger, more general categories of student learning, curricular design, and teacher decisions, the teachers at East used these replayed events as a sort of rehearsal for future, similar events. Through these public sharings of private practice, teachers at East developed an evolving ability "to analyze teaching, reflect on practice, and communicate collective standards of pedagogy" (p. 228).

In a professional development setting separate from the school-day work of teaching, LaChance and Confrey (2003) conducted a 2-week summer workshop that focused on mathematical problem solving. Participants were the members of a mathematics department from a Texas high school. Prior to the course, the teachers did not see the department as cohesive. Six of the 13 department members ate lunch together and naturally discussed students and classroom events. A subgroup had worked on some local mathematics curriculum reform, though seldom on specific mathematics topics or problems. This small group of six thought that some of the other department members were antisocial or were unwilling to cooperate. The other seven members of the department reported that the lunch group was unwelcoming and cliquish. During the summer workshop members of the department were paired on a rotating basis for the purpose of solving a series of mathematics problems. LaChance and Confrey interviewed each participant immediately after the workshop. The teachers reported that this shared work brought them closer together as a department because the interactions afforded each teacher a common and substantive focus, but more importantly allowed each teacher to see what other members of the department thought. The mathematics department at this high school continued to work with

LaChance and Confrey over the subsequent 3 years; however, the growth of this community was constrained by the lack of proximity of its members during the school day, a high turnover rate in membership, strained relationships with administrators, and a lack of time to meet and continue to build collegial relationships.

Gutiérrez (1996) compared secondary schools in which mathematics departments had high numbers of students progressing to more advanced mathematics courses to schools in which students did not take as many advanced courses. She expected to see a high degree of collegiality and collaboration in those schools she identified as OFA, an abbreviation for "organized for advancement" (p. 501). Instead, she found that teachers operated with a high degree of autonomy and displayed a high level of private ownership of their classrooms and teaching practices while maintaining accountability to the goals of the department. That is, the mathematics department was successful in its stated purpose to advance students mathematically without the presence of a deprivatized learning community of teachers. Teachers in these schools described themselves and their colleagues as independent and guided by shared goals and purpose. Teachers in schools identified as not OFA also operated autonomously, though they reported a sense not of independence, but rather of powerlessness and disconnection. Gutiérrez speculates that differences in attitudes between OFA and non-OFA mathematics departments come from practices of assigning courses to teachers. In OFA departments, teachers rotate through a series of courses over time and each year have a range of abilities and ages, whereas in non-OFA schools many teachers come, in effect, to own a particular course over time. Gutiérrez states that exposing mathematics teachers to the entire curriculum "seems to predispose teachers to think about students in a more longitudinal manner" and "seems to be accompanied by teachers exchanging ideas on a more regular basis" (p. 522).

Whatever it is called—deprivatization, community, joint work, critical colleagueship, or collaborative work—researchers for more than 3 decades have continued to believe that teachers working together and publicly examining their own teaching practice and the practice of others is a valuable site for teacher learning and contributes to enhanced student learning and school improvement on a variety of measures. As Wilson and Berne (1999) note in an extensive review of studies of teacher learning, research is inherently messy at sites where teacher discourse is not only the data source but under constant negotiation and layered in existing and emerging teacher cultures. We see this messiness as we read that deprivatization can lead to reduced teacher isolation, yet can also increase it, and can either improve or strain collegial relationships. One thing that does seem to be consistent across research into teacher community and deprivatization is that relationships that develop internally, whether school-wide or intra-departmental, are more productive than those that are imposed or mandated from the outside. As noted earlier, much of the recent literature on community comes from the administrative and leadership side of education, offering principals and other school leaders notions of creating school communities. As Hargreaves (2003) writes, voluntary culture regimes such as collegiality may provide weak assurances of quality and the effects of voluntary regimes may be weak or inconsistent, but when cultural regimes are imposed, "their consequences can be counterproductive and perverse" (p. 166). He calls teacher collaboration that is imposed by principals and district administrators "contrived collegiality" and warns that

> By crowding the collegial agenda with requirements about what is to be done and with whom, contrived collegiality inhibits bottom-up professional initiative. Teachers may actually collaborate less, or they may abandon collaborative ways of working altogether once the urgency of implementation has passed. (p. 166)

The research that I report in the following chapters looked at deprivatization by members of the mathematics department at a single secondary school who hosted student teachers for one semester. These teachers and student teachers met regularly, along with me, to discuss whatever topic came up relative to teaching and learning mathematics. As it turned out, it was often left to me to suggest or introduce a topic, though there was never any comment from the participants that participation was being imposed on them from some outside force. Several of the results described in the current chapter are appropriate to describe the results of the research, though there are significant nuances that make this current research unique.

Chapter 3

Research Method

This research was conducted within a larger research and professional development project in the Department of Mathematics and Science Education at a large southern university. The structures of this larger project provide the setting and part of the motivation for the current study. Therefore, I first give a brief general description of the larger project and then introduce the particular setting, participants, and procedures used in this research. The research questions that guided this study were as follows:

1. How are acts of deprivatization conceived? What do they look like, and how do they develop?

2. What collegial structures are produced by and among teachers who mentor student teachers and meet regularly to discuss the work of teaching mathematics?

Project PRIME

Partnerships in Reform in Mathematics Education (PRIME) was a multi-year project in the Department of Mathematics and Science Education designed to provide professional development for preservice teachers in mathematics education, for mentor teachers teaching in local secondary schools, and for university teachers teaching courses and supervising field experiences for preservice teachers. The structure and activities of PRIME encompassed the final year of professional preparation experiences for secondary preservice mathematics teachers at the university and included two courses during fall semester, field experiences during fall semester, the student-teaching experience during spring semester, and a seminar that

accompanied student teaching. PRIME was designed to provide some coherence and continuity across this set of experiences. PRIME necessarily induced some structure on the mathematics departments of local schools that hosted university students for field experiences and student teaching. It was this induced structure that was important for the design of the present study.

For the fall field experiences and for student teaching, PRIME placed multiple preservice teachers at each participating school, with a desired minimum of three per school. PRIME also assigned one university teacher, either a faculty member or a doctoral student, to each school. This university teacher assumed some of the roles of what might be termed *supervision* in some preservice teacher education programs; however, for PRIME, the principal focus of the university teacher was to consider his or her particular school as a site for the professional development of the mentoring teachers and the student teachers, as well as for himself or herself. Thus, project participants at each PRIME school site consisted of multiple university students, multiple mathematics teachers who volunteered to mentor university students, and one university teacher. The project referred to this set of participants at each school site as a *cluster*. Within each cluster, the particular structure was negotiable. That is, some clusters chose to assign each student teacher to an individual mentor for the duration of the students' time in the school. Some clusters had each university student share two or more mentors. Some clusters placed multiple university students in the same classroom with a single mentor for all or part of the student teaching experience, and so forth.

The only requirement of PRIME was that during the student-teaching experience, each cluster would hold weekly meetings. These weekly cluster meetings were to be a site for practice-based professional development for the student teachers, mentor teachers, and university teachers alike, though the principal focus of PRIME was intended as the professional

development of mentor teachers. Each cluster operated somewhat as an independent unit within PRIME; however, the university teacher in each cluster encouraged work with specific topics. In particular, PRIME worked in two large areas of interest and research, namely, understanding and developing the mathematical knowledge needed for teaching, (Ball & Cohen, 1999), and understanding and developing characteristics of a professional learning community (PLC) as defined by Kruse and Louis (1993a). The present study focused on PLCs, and further details are discussed in Chapter 2.

Grant-Union High School

The setting for this study was the PRIME cluster at Grant-Union High School. I was the university teacher at Grant-Union for both the 2004–2005 and 2005–2006 school years. In this section I give an overview of the physical and demographic characteristics of the school site and introduce the three inservice teachers who were the participants in the study.

The physical setting.

Grant-Union High School was one of two secondary schools in a county school system near a major southern university. The hyphenated name is an artifact of the consolidation of city and county school systems in the middle of the last century. Grant-Union appeared to be a typical construction of the late 1960s—light brown brick, long and low, flat roofed—with a more recent addition defining the primary entrance and breaking the monotony of the facade. Banks of awning windows marked the classrooms that parallel the street, though the majority of these were no longer functional or had been sealed for energy efficiency with the addition of individual air conditioning units to each room. Most rooms had blinds drawn against the morning or afternoon sun, which gave the school a closed feel from both the outside and the inside. There was also a subterranean level with lowered ceilings and smaller classrooms. This entire building

was scheduled for demolition two years later. Displaced teachers and students would meet in portable classrooms during the construction of a new building.

Behind the first building, not visible from the front of the school, was a two-year old modern, almost windowless, but brightly lit two-story building that housed science and vocational classrooms and laboratories. The upper and lower levels of the original building and the newer building seemed to occupy three disjoint worlds and eras. During my visits to Grant-Union I necessarily visited all three of these areas. Each of the mathematics classrooms was in the older of the two buildings; however, the members of the mathematics department used a workroom in the newer building for their shared lunchtime. We used this space and time for our regular cluster meetings.

The mathematics classrooms at Grant-Union were on the top floor of the original building, with one exception. Some beginning algebra classes used the Learning Logic computerized instructional model (National Science Center Foundation, 2005). These students were condemned to toil away in one room of the dungeon-like basement. The other mathematics classrooms were located on the floor above in what were previously science laboratory rooms, now stripped of cabinets and lab stations. These rooms had 12-foot-high ceilings that exposed the structural beams of the flat roof. Two-bulb florescent light fixtures hung from long rods and paralleled columns of student desks facing improvised white boards fastened over the original chalkboards. In each of these mathematics classrooms the primary instructional medium was an overhead projector and a screen suspended from the wall above one end of the whiteboard. Only a small central portion of many of the white board spaces was available for demonstration or student work, with one end blocked by the overhead projector equipment and the other littered by pages of daily announcements, lunch menus, sports schedules, and so forth taped to the board.

In most of mathematics classroom classrooms a portion of the whiteboard was reserved for maintaining a list of names of the top five students by class average in that teacher's courses. This practice of displaying a sort of Who's Who for each course was described by the department chair as a motivational tool for class members.

Demographics.

In 2004, Grant-Union High School had approximately 1250 students in grades 9–12. The student demographics roughly paralleled those of the county, with approximately 78% of the students reported as White and not of Hispanic descent, 13% Black and not of Hispanic descent, 3% Hispanic, and 4% Asian or Pacific Islander. This characterization contrasted with corresponding state statistics for all secondary schools of 52%, 38%, 5%, and 3%, respectively (Georgia Department of Education, 2004). There were 90 teachers at Grant-Union High, and 12 taught mathematics for all or part of the school day. Each mathematics teacher was certified to teach secondary mathematics. One mathematics teacher had certification from the National Board for Professional Teaching Standards, and another was working to resubmit a portion of the portfolio that did not meet eligibility criteria the previous year. Membership in the mathematics department had been relatively stable over the previous several years, with a low turnover rate and with only one new teacher hired for the 2004–2005 school year because of enrollment. This study focused on three of these experienced mathematics teachers, though my investigation was necessarily in the context of several layers of community within the school, including the PRIME cluster, the mathematics department, and the school. The three teachers in my study each mentored a student teacher in mathematics from the university during spring semester of 2005.

The three participants and me.

Beth had taught secondary mathematics for 24 years, 11 of them at Grant-Union. She was co-department chair and, for spring of 2004–2005, taught one class of Learning Logic, also called Algebra I Part B, and two classes of Advanced Algebra/Honors Trigonometry. She had a BEd degree in mathematics education from a local university and an MEd in mathematics education from a second local university. Beth's student teacher was Nina.

Cecilia was the mentor for Brad. She was a National Board certified teacher with 23 years of experience who taught AP Calculus AB and two classes of Honors Euclidean Geometry. Cecilia had a BS degree in mathematics and MEd and EdS degrees in mathematics education, each from the same local university.

The third participant, Sandy, taught Advanced Algebra II and two classes of Algebra I Part B. Unlike Beth's class, Sandy's Algebra I Part B classes did not use the Learning Logic lab. Sandy had 5 years experience, all at Grant-Union High School. She coached a women's junior varsity sports team in the fall and a women's varsity sports team in the spring, in addition to her teaching duties. Sandy had a BEd degree in mathematics education from a local university. Sandy's student teacher was Ruth.

I had BS and MS degrees in mathematics, an EdS degree in mathematics education, and was a doctoral student in mathematics education. These degrees, as well as my doctoral work, were at different universities in the same state. By our education and our work experiences, the participants and I shared many formational positions (Scheurich, 1997) and therefore I expected that each of us would, to some extent, share certain norms, certain common vocabulary, and certain experiences.

There were, of course, many differences in the formations of each of the participants and of me. The gender difference is obvious and one that can have significant effect on teachers and their roles in education, but gender is not a difference that I considered as an influence in this study of deprivatization of practice. This research considered the relations between and among the three participants, who were all female. The participants and I did have different educational backgrounds and experiences. Cecilia and I had undergraduate degrees in mathematics, whereas Beth and Sandy each had degrees in mathematics education. This differing relation to subject matter might or might not have affected the ways in which teachers planed and acted in classrooms and might or might not have influenced their interactions with other teachers of mathematics. Sandy was the only one of us without an advanced degree. Cecilia and I had both masters and education specialist degrees in mathematics education and Beth had a Master's degree in mathematics education. The advanced study represented by these degrees did not necessarily translate into increased effectiveness as a teacher and might or might not have affected relations with other teachers. Similar to our differences in educational background, we were each constituted in significantly differing ways by our roles and functions at Grant-Union High School. Cecilia and Beth had roles almost exclusively as mathematics educators, whereas Sandy was constituted in significant ways by her role as coach of two school sports teams. I was also constituted in significant and sometimes internally conflicting ways as high school teacher, university teacher, researcher, and expected leader of meetings. As I participated in each of the meetings and in my role as interviewer and notetaker I was both explicit and implicit in the production of data. Sandy had the least teaching experience of any of us, having completed 5 years, all at the same school. At the time, Cecilia, Beth, and I each had over 20 years experience, and each had experience at multiple schools. These differing, yet overlapping, formational sets

allowed the participants and me to have common ground and taken-as-shared knowledge, but necessarily created different ways of seeing and knowing.

The mathematics department at Grant-Union High School participated in project PRIME for the first time in the 2004–2005 school year. For fall 2004, seven members of the department either hosted UGA students for classroom observations and participation, or attended a PRIME orientation gathering. The three of these teachers detailed above were the participants in the study. The four additional teachers were available to work with student teachers for spring semester 2005, though they did not have primary responsibility for mentoring. All participants ate lunch together daily, and we agreed that this common lunchtime would be the venue for our weekly cluster meetings.

As I note elsewhere, the desires of PRIME and the expectations of the mentor teachers did not necessarily agree. The mentor teachers expected the student teaching setting and the ways of operating to parallel their own previous experiences as student teachers and as mentors of student teachers. In their experience, the primary role of the university supervisor was to observe and rate the progress of the student teacher. During the student teaching semester, however, I tried to operate in ways consistent with the structure of PRIME, and therefore, I used my role as university teacher to interact with and observe the mentor teachers as if I were a provider of professional development. In that role I also set up situations that I hoped would evoke conversations among the participating teachers and thereby provide data relative to the research questions. Actions of the student teachers often provided some or all of the setting for these situations, and therefore the student teachers were involved and participated in conversations and were necessarily part of the data without themselves being participants relative to the research questions and to deprivatization in general. My role was rather more confounded

than that of the student teachers. The participants each noted at some point that they viewed me as a fellow teacher because of my experience. Given this stated view from the participants, I acted and thought as a colleague even as I acted and thought as a researcher and as a provider of professional development. I necessarily contributed to the raw data, just as I am even more contributed to the transcribed data, the coded and categorical data, and the data as presented in this document.

The student teachers.

Although the three student teachers assigned to Grant-Union High School provided part of the environment for this research, they were not considered participants in the study of deprivatization of practice. Part of the design of Project PRIME was to rethink the university's role in the student-teaching experience. Our desire was to have the semester of student teaching be one of professional development for each of those involved at any given school. The mentor teachers would be providers of professional development for the student teachers; the university teachers, traditionally called supervisors, would instead use each school as a site for local professional development for the mentor teachers; and the school experiences and a university seminar would be a setting for the professional development of university teachers as becoming researchers and as becoming mathematics educators.

Data Sources

Cluster meetings.

Consistent with the structure of project PRIME for 2004–2005, I intended to meet with the mentor teachers and student teachers at Grant-Union High School each week of the 15-week student teaching experience. These so-called cluster meetings were to occur during the common lunch period for the mathematics department. True to the capricious nature of fieldwork in

education, the scheduled cluster meetings did not always occur or evolve as I expected. On some days of scheduled cluster meetings, one or more of the participants had an unplanned responsibility or were called away for some administrative reason or for a parent conference. On other occasions, some school event necessitated that the one available time that all mathematics teachers could convene had to be used for departmental or administrative business. During the latter part of the semester, the student teachers were required to attend a seminar at the university, and these meetings took them away from their respective high schools. Some of those days occurred on days of cluster meetings, and for some of these days I attended the seminar rather than travel to the high school. In all, I recorded audio files for eight cluster meetings as data sources. Since it was a usual practice for much of the department to eat together, there were always other mathematics teachers in attendance at the cluster meetings. At each recorded meeting the attendees included me, the three student teachers, the three mentor teachers, and from three to five other mathematics teachers. These others consented to the audio recording of the cluster meetings; however, I use contributions of these others only as they serve to highlight acts of deprivatization of practice by or from the three participants.

The intent of project PRIME was that cluster meetings could be sites for professional development of mentor teachers through "scheduled, consistent, ongoing, practice based meetings" (PRIME, 2004, Summer). Any consistency of these meetings, however, did not imply that the clusters at all the school sites operated in a similar manner, or that the activities of cluster meetings were consistent across school sites. This structure makes PRIME what Borko (2004) describes as a Phase II professional development research project. In a Phase II project, although goals and general procedures may be established for the project as a whole, the activities of the project were carried out by multiple researchers and professional developers across multiple

sites. This multiplicity within PRIME naturally introduced variability from school site to school site. Such variability does not necessarily imply a weakness in the research design or professional development goals of PRIME since the various clusters operated independently and had no intentional contact with each other. Rather, research and professional development at each of the 10 school sites, as interpreted by a different university teacher at each site, gave multiple and varied approaches to the intended agendas of the larger project.

One advantage of the design of PRIME as a Phase II professional development research project (Borko, 2004) was that I had the opportunity to operate within the Grant-Union cluster as I desired, as long as I attended to the goals of PRIME to understand and develop the PLC and to understand and develop the MKT at this school. Although one goal of the larger project was to understand and develop the five characteristics of a PLC as defined by Kruse and Louis (1993a), namely, engagement in reflective dialogue, collaboration, deprivatization of practice, a collective focus on student learning, and the existence of shared norms and values, I used cluster meetings to explore the single concept of deprivatization of practice. I was also particularly interested in the second goal of PRIME to understand and develop the MKT of secondary mathematics teachers.

I did not have any detailed discussion about deprivatization with the three participants nor did I describe my research interests to the cluster, other than to state on several occasions that I chose to be the university teacher at Grant-Union because of the ways I observed members of the mathematics department interacting with each other at a PRIME orientation meeting in the fall of 2004. That dinner meeting, intended as an introduction to PRIME for mathematics teachers at local secondary schools interested in hosting student teachers, was my first introduction to teachers from Grant-Union High School. Five teachers from Grant-Union

attended the meeting, including two of the three teachers who would become participants in this study. The design of the meeting included having the teachers from each school seated at the same table for dinner, along with a single university teacher. I sat at the table with the Grant-Union teachers. After the meal, the teachers at each table investigated a mathematical situation and produced a group response to share with the larger group.

My reaction to the interactions of these teachers during the mathematical investigation was one of great surprise and some trepidation. These five teachers spoke to each other in ways I do not believe I had experienced in working within mathematics departments at four different secondary schools during my career as a mathematics teacher. My initial thoughts were that these teachers were loud, blunt bordering on rude, and aggressive. They seemed to be operating outside of what some have described as a *norm of politeness* (Lord, 1994; Wilson & Berne, 1999) that has been identified as detrimental to efforts toward effective change within groups of teachers. As an example of the teacher behavior at the dinner meeting, one Grant-Union teacher began an investigation of the mathematical situation with the others looking on as he talked about what he was doing. The others were commenting on the progress and potential of his approach, speaking loudly and simultaneously. When he hesitated, apparently reaching an at least temporary impasse, another teacher simply grabbed the paper from in front of him and started to present another method of investigation. All the while, the cacophony continued. My observation of the behavior of the Grant-Union teachers at the PRIME orientation meeting led me to believe that, at least in this single instance of investigating a mathematical situation, they might be operating in public ways. These teachers seemed to be openly sharing their practice of mathematics with little reservation, hesitancy, or fear of judgment by their peers or by me. These actions were unlike those I remembered from many, many small group meetings I had had with

my own colleagues over the course of a career teaching secondary mathematics. I was both fascinated and a little intimidated by being in such a group, but I also desired to know more about how and in what context such interactions occurred and if these were possible in more routine situations of teachers' daily lives. Grant-Union then, from a practical standpoint, seemed to be a likely place to investigate deprivatization of practice among secondary mathematics teachers in that this subset of Grant-Union mathematics teachers displayed what I considered at the time to be a public, or deprivatized, practice of mathematics.

One of the goals of PRIME, both from a research standpoint and from a professional development standpoint, was to use the context of placing multiple student teachers at a single school to provide structured opportunities, in the form of cluster meetings, for interaction among mentor teachers. In some sense, the hope was that these conversations would be the start of a type of grassroots movement, in that student teachers would come to expect these types of collegial conversations and would carry this expectation with them as they began their careers. The actual focus of PRIME, however, was the mentor teachers who were involved with student teachers. This focus included an investigation of existing ways in which mentor teachers operate as a professional learning community (Kruse & Louis, 1993a), based on any or all of the characteristics of a PLC suggested by Kruse and Louis. These characteristics include engagement in reflective dialogue, collaboration, deprivatization of practice, a collective focus on student learning, and the existence of shared norms and values. As noted in chapter 2, Scheurich (1997) suggests an archaeological approach to research in which any culture may be thought of as an array of historically produced categories that operate, mostly below any sensory horizon, to produce meaning through interdependent linkages connecting various categories. Any concept of reality must be considered as an enactment of a particular archaeology. Thus, realities

may be differently produced by different archaeologies, yet within a particular archaeology there may be considerable agreement on the nature of reality. To be a member of a culture, then, is to be (re)produced by the historical categories of that cultural archaeology. Teachers in the United States are constituted by a set of categories that are produced within the Western archaeology, and teachers of specific subject matter, particularly teachers of mathematics, are further constituted by more detailed sets of categories. The existence of such categories of teaching explains, so to speak, many of the commonalities of teaching that are reproduced in classrooms across the country. Culture is mutable; however, changing a culture involves changes in the categories that produce that culture, many of which have been in operation for decades or centuries. More recent arrangements of categories change and rearrange more easily than those that are older or well established, helping to explain local differences even within a single larger culture such as that of teachers of mathematics. That is to say, although all teachers of mathematics in the United States are constituted within and by similar categories in the dominant archaeology and therefore have many commonalities, some groups or individuals may behave or perform quite differently. However, these differences are likely to be products of recent categories and therefore nearer the surface. It is these surface features that attracted me to Grant-Union High School.

I am an (re)enactment and (re)creation of many categories within the dominant archaeology of the Western world in general, and of the formations of teacher in particular. As a result of these productions of my identity, I seem to operate with relative ease within the cultures of mathematics teachers. I speak the cultural language and have common or similar experiences as other teachers. When a group of mathematics teachers acts in ways that are not resonant with my expectations as a member of the culture, those behaviors, presumably formed near the

surface of the formation of these mathematics teachers, suggest to me that members of this set of teachers are being enacted in some way different than I am.

My intent was that cluster meetings at Grant-Union would be self-organizing and that participants would initiate discussions around recent classroom events, questions or concerns of student teachers, and continuations and extensions of pedagogical and mathematical conversations between and among student teachers and mentors. As I discuss more fully in chapter 4, my intention and the actual operation of the cluster were nowhere near congruent. The expectation among participants other than myself was that these were my meetings and that therefore I should provide the topics and structure each week. The norm became that each Wednesday for the duration of the student teaching experience, I would go to the school for most of the day and visit classrooms. Before the common lunch time for the mathematics teachers, I would set up my audio-recording equipment and whatever artifacts or presentation equipment that we needed and be prepared to introduce an event or a topic for discussion around the lunch table.

Field notes.

I used observations of student teachers and field notes from my discussions with mentors and other department members to design some activity or to initiate some discussion for each cluster meeting. These activities and discussions play a central role in chapter 4 of this report, and therefore I do not discuss them further here. Since cluster meetings lasted for only 30 minutes each and were concurrent with the shared lunchtime for the department, some cluster meetings allowed little time for focused discussion in the interests of PRIME or of my research. Occasionally, some event of the day, whether personal or school-related, precluded pedagogical or mathematical discussion, and the time was spent in celebration—a birthday, for instance—or

in teacher talk about school system policy changes, a particular discipline problem, parent contact, or the like. These times were still valuable in that they were unstructured occurrences of discussion by and among teachers, including the student teachers and me. I kept these records of these non-PRIME cluster meetings in my field notes and included them as shared experiences in later meetings and in interviews with the participating mentor teachers. I augmented these field notes with annotations and commentary as particular topics or events reappeared in conversation. This cyclic approach to field notes was valuable in later analysis of the data.

Evaluation meetings.

One requirement of PRIME was that each of the student teacher, mentor teacher, and university teacher would do an independent evaluation of the student teacher's changes over the course of the semester. Each triad then met to discuss these evaluations and to reach some consensus on the effectiveness of the 15-week experience and on the structure of PRIME as a program for the culminating portion of student teacher education at the university. These evaluation meetings were an informal discussion of our collective observations over the semester.

Interviews.

The UGA student teachers were at Grant-Union High School for 15 weeks during the spring semester of 2005. I was the university teacher assigned to Grant-Union again during the following 2005–2006 school year and conducted interviews with both Sandy and Beth during March 2006. Cecilia had changed school systems in order to lessen her commute time by two-thirds, a move she had tried to make for several years. Her new school was also a site for PRIME and university student teachers and I was also able to interview her in March at her new school. This relocation by Cecilia separated the participants in space and time and gave them an

opportunity to speculate on differences in the ways that interactions occurred during the previous year, depending on the presence or absence of one or more department members.

During the three independent interviews, conducted almost 1 year after the participants had concluded their first experiences within PRIME, each of the participants spontaneously mentioned at least one conversation from a recorded cluster meeting. They each did this to illustrate some aspect of the types of interactions that commonly occurred in the mathematics department at Grant-Union High School.

I recorded each cluster meeting, student teacher evaluation meeting, and interview using a third generation Apple iPod with a Griffin Technologies iTalk microphone adapter. The audio quality of these recordings is excellent; however, for cluster meetings there is a large amount of overtalk, which is not unexpected given that typically a group of some 10 to 12 people sat at a large table and prepared or ate their lunch during the meetings. I transcribed each recording using the free software package *Transcriber* (Barras, Antoine, Galliano, & Manta, 2005). These transcription sessions necessarily required many listenings of each recording in attempts to follow side conversations that developed as a part of the larger discussions at each meeting.

Other data.

The sources listed above are a traditional inventory of qualitative research data. They fit neatly into what Bogdan and Biklin (1982) say about data. "Data refer to the rough materials researchers collect from the world they are studying. Data include materials the people doing the study actively record, such as interview transcripts and participant observation fieldnotes" (p. 73). These implications that the researcher is separated from the world that he or she is studying do not exist in postmodern theories. The researcher, the participants, the setting, and their interactions not only produce the data, but also produce and reproduce each other in highly

intricate interplay in both the present and the past(s). These interactions *are* the data. From a humanist perspective, "data are both the evidence and the clues. They serve as the stubborn facts…. Data ground you to the empirical world and, when systematically and rigorously collected, link qualitative research to other forms of science" (p. 73). But how can such a grounding take place if the world is not empirical, and if we subscribe to the "rhizomatic disintegration of the narrative of knowledge production" (St. Pierre, 1997, p. 184) necessary after the postmodern turn? Artifacts, recordings, transcripts, notes, codes, categories, and this dissertation become texts for the reader, and each reading is a new interaction and a new production of knowledge. In each of these texts, "the absence of the transcendental signified extends the domain and the play of signification infinitely" (Derrida, 1978, p. 280). There is always "more to be known and more to be said," and an "ever-present decentredness" that "eludes totalizing explanation and determinate truth" (Usher & Edwards, 1994, p. 123).

When we are constantly (re)produced in and of the moment and also in and of our past(s), we must consider what St. Pierre (1997) calls transgressive data. When I read my raw fieldnotes written at Grant-Union High School, I read as a teacher, and my sense is that I wrote as a teacher. This shifted perspective must be counted as data, but what is its source? To whom is it attributed? When I created categories for coding transcribed data, that is, when I created new data to contain or to approximate the old data, whom do I cite? What St. Pierre calls sensual data (p. 183) might be thought of as place data. This physicality of theorizing that placed me in the very familiar sites of public education, yet also placed me there and elsewhere in the very unfamiliar role of researcher, creates its own data with no citable source. I acknowledge these transgressive data as a vital part of my interpretation and reporting of results in the following chapter.

Data Analysis

I transcribed the audio recording of each cluster meeting as soon as possible after it occurred. The transcription software that I used allowed for time-stamping the written text relative to the audio file. As I typed, I made comments that seemed relevant to the data and to what I recalled as my response-in-the-moment as I experienced the meeting live. I also inserted items from my field notes as appropriate, either as commentary on the transcribed text or as a planning device for future meetings and for interview topics. Thus, the transcription process also became a tool for collecting and organizing data, analysis, planning, and thereby the production of a different kind of data.

The transcription documents from the cluster meetings also provided a place for coding and further analysis. The transcription software allowed for a tabular format, and I used adjacent columns to list short phrases or words that came to mind as I listened and typed. This initial coding provided the basis for much of the detailed data analysis and as an advance organizer as I compiled and merged data from other sources. I used the same techniques as I later transcribed audio files from participant interviews. Coding data, grouping similar codes, and identifying emerging themes seems to parallel the mathematical operation of rounding. When a numerical value is rounded to some limited number of decimal places and then is used in a calculation, the result of the calculation inherits an uncertainty that may or may not be acceptable to the end user. If the rounded result is used in further calculation, and the new result is again rounded, additional uncertainty is introduced. If the calculate, round, calculate cycle is repeated again and again, or if the rounding process is severe or flawed, the reported result may be so far from accurate as to be useless or even dangerous. Coding of raw or transcribed data, recoding of codes, and recoding of recodings of codes is rounding process that also is dangerous and does not accord with a

postmodern, archaeological approach to research and data analysis. According to my computer dictionary, synonyms for emerge are: *materialize*, *become apparent*, *come to light*, *come into view*, and *surface*. These signifiers each presuppose that within or underneath the data are "totalizing explanations and determinate truths." Archaeological research requires us to get out of "a habit of mind which sees the only point of reading a text to be that of extracting knowledge and truth which is relevant, useful, and efficacious" (Usher & Edwards, 1994, p. 124). Even as I created codes and themes and rounded data, I sought to look askance at any simulacrum of coherence and to develop a new habit of mind that looked for structure and production rather meaning and truth.

One of the most valuable tools for data analysis became driving. Soon after the end of the student-teaching semester, I moved to a location approximately two hours by automobile from the university. Over the next year I continued to be enrolled in courses and arranged my schedule so that I could be at my new home 2 or 3 days each week and also at the university for 4 or 5 contiguous days. During these 4 hours of weekly commutes, I could, if I desired, listen to complete sets of audio recordings of cluster meetings or of participant interviews. I read and I attended classes, and I drove and listened, and the only thing that emerged was sounds from the stereo. Instead of emerging themes and truths I found new ways to hear, (re)lived data through new structures, and had data produce new structures in and around me. These new ways to hear and these new structures followed me as I returned to the classroom as a secondary mathematics teacher. I participated differently in conversations and in other interations, I listened differently for what is said, what is not said, and what cannot be said. I deprivatized my practice in new ways and with different purposes. I counted these new structures and new ways as trangressive

data (St. Pierre, 1997), and they were present during my returns to coding data, were present in the writing of this dissertation, and are present in your reading.

Chapter 4

Results

In this chapter I present the results of my work with three teachers at a single high school who each hosted a student teacher for 15 weeks during the spring semester of 2005. I used Scheurich's (1997) theories of archaeological research in the postmodern as a tool for analysis and presentation. First, I give a brief description of archaeological research and necessary terms and conditions needed. For a more detailed description, see chapter 2. I then present events and interactions from this study, situate them within Scheurich's archaeological concepts, and discuss the implications of these events relative to the research questions. The research questions that guided this study were as follows:

1. How are acts of deprivatization conceived? What do they look like, and how do they develop?

2. What collegial structures are produced by and among teachers who mentor student teachers and meet regularly to discuss the work of teaching mathematics?

Archaeological Research in the Postmodern

Research in the postmodern is not a search for truth or meaning, but rather an examination of structure and relation. Researchers do not dig deep for roots, but spread across the territorial surface and examine traces. Archaeological research (Scheurich, 1997) considers that relations and indeed, reality itself, are enactments of historical rhizomatic structures and not based on some present conscious choice or derived from free will. Rather, individuals or groups are enactments of some formational set of cultural interactions that stretch back through the

history of the culture. Individuals and relations are interactions of these formational sets and therefore the structures of individuals and relations are created using both shared and unshared formational sets.

In the following analysis I consider the three participants in this dissertation study, as well as myself, to be constituted by many near-isomorphic formations; yet we differ in significant ways that allow for discussion and analysis of our actions and interactions. Each of us was educated in Georgia public schools, and each of us has one or more degrees from the same university. Each of us has experience as a secondary teacher of mathematics in Georgia public schools, and in that experience we have necessarily been constituted through formations of instructor, counselor, parent, social worker, evaluator, administrator, and…and…and…. The three teachers in this study were also constituted as members of a departmentalized secondary school, knowers of a specific content discipline, and mathematics educators working with student teachers within the specific requirements of a university professional development project.

Three Situations From Grant-Union

I present data from three situations at Grant-Union High School and use the similarities and differences in the formations that constituted the participants and me to analyze the category of deprivatization of practice by and among these teachers of secondary mathematics. Each of these situations is taken from one of the weekly cluster meetings, and quotations are as they appear in transcripts of audio recordings. In the presentation of each of these situations, I also use data from field notes and from transcriptions of individual interviews with the participants. I conducted interviews with each of the participants almost a year after the semester in which they mentored student teachers. Each participant mentioned one or more of the following three

situations in response to questions about how and when department members discussed teaching, learning, and mathematics. For that reason, I chose these situations as the focus of my analysis and used other data to support these situations as sites of deprivatization of practice by teachers who were constituted by similar, yet different, formational sets. For each of the situations, I first give a brief background, stating how the situation came to be a topic for discussion. I then present the situation as it occurred, using quotations as needed, and I also provide commentary based on other data relevant to the situation. Finally, for each situation I give a brief analysis as an advance organizer for further discussion in chapter 5.

Situation 1: Beliefs about teaching.

Background.

During a classroom visit, I observed Sandy's student teacher Ruth grading tests from a first-year algebra class. One of the mathematical topics on the test was the calculation of money earned in a compound interest scenario. See Figure 4.1 for a question from the test and a reproduction of one student's work.

You invest $1400 at 12% for 10 years, compounded yearly. How much money do you have at the end?

Student work as written on test:

$$T = P(1+r)^t$$
$$= 1400(1.12)^{10}$$
$$= 1400(3.11)$$
$$= \$4354$$

Figure 4.1. A test question and student response showing inappropriate rounding. The student rounded $(1.12)^{10}$ to 2 decimal places and then used the rounded value to complete the calculation. The correct answer for this problem is $4348.19.

Note that the correct answer to this question, rounded to the nearest cent, is \$4348.19. By rounding the value of $(1.12)^{10}$ to two decimal places, the student did not obtain the expected dollar value for the amount of money after 10 years. The student had followed the same procedure and rounding strategy on a series of similar problems and had received half credit for each problem.

Description of the situation: Beliefs about teaching.

To initiate some discussion about mathematics, I decided to use this situation at the next cluster meeting. I presented the problem and the student's work using a paper flip chart and asked, "What does this student know about mathematics?" Beth spoke immediately with, "He knows the formula for compound interest. He knows what the variables stand for in the formula. He knows how to change a percent to a decimal. He must know that his answer is reasonable. He knows the order of operations." Someone added that he knew how to use a calculator, but another teacher asked, "Where did the 3.11 come from?" A teacher said that, "He added (*sic*) 1.12 to the tenth, but then he rounded inappropriately." Cecilia started a sentence, "We saw that last week in geometry with the pi key …," and everyone around the table nodded his or her head. Before Cecilia finished her sentence, Sandy interrupted with, "We probably said that ten times per period, to just put 'times 1400,'" implying that she and her student teacher had instructed students to perform the exponentiation first and then multiply by the value of initial amount of money. Note that at this point there had been no indication that the situation under discussion had occurred in Sandy's classroom.

I commented that one of my pet peeves had always been, in situations similar to this one, that students apparently use a very inefficient strategy by entering a portion of the calculation into a calculator, namely $(1.12)^{10}$, round off the result, write it down as a step in the solution, and

then reenter the remaining calculation left to right using the rounded figure. A better strategy in this case would be to either enter "1400 * 1.12 ^ 10" as a single line in the calculator to obtain the correct result directly, or to commute the order of the multiplication and calculate "1.12 ^ 10," and then simply enter the calculation " * 1400" to obtain the correct result. Referring to the second option, I asked, "Does he not know the commutative property of multiplication? Or perhaps he doesn't trust the commutative property." Beth responded, "He definitely knows the commutative property," and listed various times in the curriculum when the student would have been tested on this property. Sandy suggested, "He may be more comfortable going left to right." Cecilia commented that we constantly ask students to "show their work," and therefore that this student felt a need to show the result of the calculation 1.12 to the tenth. She noted that when studying the topic of order of operations early in the course, first-year algebra students were required to do a single step and show the results of that step before proceeding to the next step. She suggested that perhaps this requirement of showing the work had carried over to the current situation even though, "We let up on that after we study order of operations." A second-year algebra teacher said, "I tell them to write on their paper, 'fourteen hundred times one point one two to the tenth,' and then pick up the calculator. I've shown them how to do that." Brad asked, "So, as part of the lesson you would teach the proper calculator procedure?" Sandy responded I thought defensively, even though there had been no direct indication that the situation we were discussing had occurred in her classroom "We worked through several of those and always said 'multiply by 1400,' and we never put down that third step [referring to the student's line of work showing 1400(3.11)]. We never did that, never. We emphasized so many times each period not to do that and explained why."

The situation involving compound interest occurred during Week 3 of the 15-week student-teaching experience, and I used it as a cluster meeting topic to see how the participants would discuss mathematics, if at all. I deliberately avoided bringing up the way in which Ruth and Sandy graded the students' papers. For the incorrect answer reproduced above, they had given the student half credit. The test included seven similar questions about compound interest, varying only in the quantities involved. Because this student produced each answer following the same rounding strategy, he lost half credit on each problem, for a total of 17.5 points. I thought that this decision was overly harsh, given that, in my interpretation, the student made only one mistake, albeit repeatedly. I hoped for a discussion about mathematics rather than classroom procedure; however, one of the student teachers, Brad, asked directly, "How many points would you take off in a situation like this?"

Amy spoke first, whether in response to Brad's question or not, "Part of it is teaching them to follow instructions, whether it be their teacher or their boss, whether it's mathematical or not. It gets back into character education or whatever you want to call it." Her student teacher responded directly to Brad, "We took off half credit, two and a half out of five." Brad said, "Maybe I'm a nice individual, but I was thinking four out of five" [implying that he would have only taken off one point]. Sandy responded, "I don't think it's about being nice, Brad." Cecilia said with a laugh, "That's an interesting question isn't it? It would be interesting to see the range of responses to how people would have graded that." She mentioned grading procedures from AP Calculus, where for minor mistakes such as sign errors, students may be "given the benefit of the doubt," and receive only a small penalty, whereas if the topic being tested was operations with signed numbers, an error in sign might warrant losing full credit. Sandy again stated that the situation was connected to students "following directions and doing what they were told to do,"

and that "things are different with higher level kids." This latter comment seemed directed toward Cecilia and her statement about grading in AP Calculus.

The remaining discussion centered on descriptions of various examples in which teachers had received unexpected responses to assessment items. These examples came so rapidly that there was no time to discuss any one individually before someone described the next. As Brad mentioned a grading situation in Cecilia's class from the previous week, one teacher said loudly, "You gave them all the credit." There was general laughter, including from Cecilia, but this seemingly humorous comment was the first indication I had seen of tensions between Cecilia and some other members of the department, including Sandy. The department chair emphasized that the teachers were giving the student teachers some things to think about in terms of the way that assessment questions could be constructed to avoid ambiguity in grading. The meeting ended as the bell sounded for the lunch period to end. As the teachers were filing out, Cecilia said quietly to Brad, "I would have taken off for the first time the student rounded, but not for the other times."

Analysis: Beliefs about teaching.

In this situation I hoped to see how the participants used an example of a student mistake on an assessment item to discuss mathematics and the mathematical knowledge of students. I am sure that, at the time, I was thinking as a researcher and as a doctoral student and not as a secondary mathematics teacher. As we see in the presentation of the situation above, the participants did not see the event as the mathematics that the student had done, but rather the student mistake. The mathematics of the student was important to these teachers only in relation to the mistake. The participants located the mistake within the curriculum when they discussed order of operations and the commutative property, and they located the mistake in their

classroom practice as they discussed whether or not students performed the solution of the assessment item as they were told. The event, from the participants' perspective, also included the relative value of the student mistake to the value of the student knowledge as they discussed the teacher practice of grading and evaluating students.

In this situation, the participants deprivatized their practice by relocating the situation of an abstract question about an unknown student in their own actions as teachers in their own classrooms. They deprivatized by relating stories through specific statements made in the classroom and specific instructions for students. This deprivatization carried with it beliefs about teaching and beliefs about classrooms as sites for an enculturation of students as learners in a particular way, namely, as learning to do what they are told. We also see a structure in which, for whatever reason Cecilia chose to not deprivatize by withholding a comment about point values for a mistake from public display and reserving it as a more private comment directly to her student teacher.

Situation 2: Classroom management.

Background.

During classroom visits, I had seen Sandy and her student teacher Ruth engage in very brief, whispered exchanges while students were doing seatwork or while Ruth was lecturing and Sandy walked around the room. During my visits, they seldom spoke aloud to each other with students present during class. My visits to Sandy's classroom contrasted sharply with visits to Cecilia and her student teacher Brad. When Brad was leading the class, Cecilia usually sat in whatever student desk was convenient and participated in class. That is, she would ask follow-up questions of students who responded to Brad, and he would perhaps follow her lead and continue the discussion along lines that she had opened with her questioning. Cecilia would sometimes

simply suggest aloud that Brad move on to create an example or to shift to a related topic that illustrated some mathematical point. Sometimes she would say, "Let me do this part," and they would swap roles for some portion of the class, though Brad remained standing rather than sit among the students. Both Cecilia and Brad regularly asked for my input during class, either by asking my mathematical opinion or by asking me to respond to a student question. I hoped to use these contrasts in operating norms in the two classrooms to stimulate discussion during one of the weekly cluster meetings.

The situation: Classroom management.

During a cluster meeting, I asked Sandy directly what she and Ruth were whispering to each other during class. She responded that she was usually reminding Ruth of some "management type issue," because that was the main thing that Ruth needed to work on. Sandy's examples were, "That person over there is writing a note, and you need to go say something to them," and "Those people back there don't have their books open. They're listening, yeah, but…." Sandy said that she and Ruth whispered because she believed that the classroom needed to be quiet so that students had the opportunity to concentrate and also that if more than one adult in the room was talking, the students would not know whom to listen to and could become confused. Her comments were consistent with a conversation I had with her during my first visit to Grant-Union in which I asked if she had any requirements for where I was to sit or how I was to behave in her classroom. Her only request was that I not speak to the class. I could talk quietly to individual students at their desks, but I was not to offer any direction, because the student might become confused if he or she saw a different way of doing something.

In the cluster meeting, I contrasted Sandy and Ruth's classroom interactions with those of Cecilia and Brad, saying that "both may be talking at the same time, and it seems to work really

well in their classroom." Sandy responded, "They also have upper level kids, and the management is different." Cecilia responded "I can't imagine sitting in there watching Brad and keeping my mouth shut. We've taken the approach that we both speak. If he feels like he needs to stop me and speak, he's welcome to do that. If I want to stop him and speak … ." She was not interrupted, but did not complete the sentence. Ruth said, "Yeah, but your personalities are different. Sandy and I are both cut and dried." Cecilia said, "It's an individual thing—your personality, your classroom environment."

During the same cluster meeting, we discussed the idea of how much time, if at all, a student teacher should be responsible for the entire teaching load, including planning, teaching, assessment, and management. Sandy stated that she expected Ruth to "have it all" for 4 to 5 weeks so that she would "know what it's like." Brad stated that he did not think that he would learn any more by assuming total responsibility over the way in which he and Cecilia were already operating. I shared information that the state department of education had no specific requirements or suggestions on the matter, leaving the details of the student-teaching experience to individual colleges of education.

I then made a comment from my own experience and from my reading of Dewey (1904). Dewey wrote that it is possible for a beginning teacher to leave teacher training and be so skilled in school management that he or she appears to be a superior teacher to one who attends to the psychology of the learner, at least for the first day or month or year, but that future progress may consist only in refining the skill of teaching without becoming a student of teaching. That is, Dewey thought that, for long-term results, the focus of the professional training of beginning teachers should be on "making him a thoughtful and alert student of education, rather than to help him get some immediate proficiency" (p. 320). My statement was not so eloquent but tried

to express the same idea that teachers could learn to make a classroom look and feel a certain way and feel comfortable in their role as manager, yet not be very good at helping students learn mathematics. My statement came from no planned agenda; I was just trying to join in the conversation about student teachers taking on the entire responsibility of a complete teaching load and Dewey was what I had in mind.

In response, Sandy said, "Don't you think that kids can't learn unless it's under control?" She asked me directly, "What is it that you hope they get from student teaching if it's not management? What would be the purpose of them being here?" My response was that the student teachers should be focused on the thing that we had emphasized during the methods class during fall semester: "what kids are thinking about" when they do mathematics. "Why did that kid get that problem wrong," and so forth. "That's all," I said. Sandy said, "Do you think that what they're thinking is going to help the kids get into college? Or do you think that it's about how much they learned in the classroom?" These questions still confuse me. At the time, I offered the bumbling answer that, to me, the two were related. Our time was almost up when Cecilia said over the increasing background conversations, "There's more than one way to measure success, more than one way to achieve." Sandy responded, "But colleges measure success by your test scores, unfortunately." Cecilia said, "There's more than one way to get the test scores," and Sandy said very slowly, "Other than taking the test, how?" Cecilia explained that she meant more than one way to operate a classroom, "More than one modality of operating and more than one way to manage success." Sandy rolled her eyes as she got up to leave. The cluster meeting ended in scraping chairs and overlapping talk as the bell rang for students to return from lunch.

Analysis: Classroom management.

In the situation above, the participants seemed to agree that each teacher has his or her own ways of operating and own teaching style. Public statements about teaching style effectively end the need for discussion of teaching practices and thereby privatize, rather than deprivatize, acts of teaching. There is also an indication that any teaching style needs to be different for differing groups of students. The discussion of the need for student teachers to first be efficient managers of student behavior continued a theme that I mentioned above as part of the first situation. This theme relates to the purpose of schools and schooling as sites for character education and the production of certain types of docile bodies.

Situation 3: Confrontation.

Background.

In many of the cluster meetings during the semester, the student teachers were not highly vocal. They participated in some discussions and not others, mostly responding to direct inquiries or making comments connected to specific events in which they were directly involved. In only one cluster meeting did someone other than me initiate the topic of conversation. When I visited Cecilia's classroom on the day of one planned cluster meeting Brad, Cecilia's student teacher, indicated that he would like to lead the discussion at lunchtime. He stated that he would like to hear other's comments on something that he had observed in his classroom and that he preferred not to discuss it with me before the meeting.

The situation: Confrontation.

As the participants were starting to prepare and eat their lunch, Brad announced that he would like to offer a proposal that, from a teacher's interpretation, students' questions could be

separated into three categories and that he would like comments on his observations. I paraphrase his observations here as I understood them after transcribing his direct statements:

1. A student's question indicates to the teacher that the student has no clue about the topic. He or she is lost.

2. A student's question indicates the he or she has a conceptual understanding of the situation, but is missing some or all of the procedural knowledge needed to produce a solution. Said another way, the student understands the problem situation and can see the meaning and significance of a solution, but cannot complete some component of a solution because of missing background knowledge or technique.

3. A student's question indicates that the student understands a concept and has at least one procedural way to solve a problem or complete a task, but seeks an extension in some way. Brad's examples were, "I understand. Does this connect to …?" and "I've heard of something called trigonometry. Does this situation lead to these concepts?"

There was an immediate and loud response from Sandy:

"Four, what about questions that don't concern the topic?"

"Five, questions from students who've been asleep?"

"Six, students who say, 'I don't get it.'"

After Sandy's comments, there was a brief silence broken by Brad, who stated, "I guess I'm trying to get at analyzing what students know by what they ask." Sandy said, "They only ask good questions when they really understand." I named another category of students who know and can do procedures, but may or may not have a conceptual understanding of a topic. These students may not ask any questions at all. They produce correct answers and therefore feel that there is no need to ask a question. Beth suggested to Brad, "Sometimes you can ask them

questions to tell you what they think." Brad completed her sentence with, "so you can get a *better* understanding of what they know."

Jeanette then described a situation from the previous semester when, in a class of low performing students, a student had asked her a question during a test, and she had asked the student a series of questions "to find out how close the student was to a solution." Cecilia was illustrating for the student teachers Beth's idea of questioning students in order to find out what they think. The reaction from Sandy was immediate and challenging, beginning with, "So you let students ask questions during tests?" Cecilia again described the situation to explain that she was not giving students answers, but that she might probe their understanding about the thinking that they had done about a question and then either suggest a different approach or even suggest that they let the problem go and move on.

Amy responded, "That's why we give notes," and "If they've done what they were supposed to do, they would have already asked that question," and finally, "When I was a student I 'tested' teachers early in the year to see if they would help me during tests." The discussion broke up into many individual conversations and is impossible to follow on the audio recording, but I commented in my field notes that neither Sandy nor Cecilia spoke for the rest of the cluster meeting. When the discussion refocused, the topic had shifted to a discussion of how high stakes testing might change with the coming introduction of new statewide standards and how teacher preparation at the university might or might not change relative to those standards. The meeting ended with individual conversations about the new standards continuing out the door.

Analysis: Confrontation.

In this situation a student teacher had proposed a discussion topic and asked for feedback on his observations. Sandy's first response was perhaps an attempt at humor, though she was not laughing, and I judged the tone of her voice as tense. When she said, "They only ask good questions when they really understand," it is not clear how she might define a good question. She did not connect her statement to either of the student teacher's categories and did not seem to be offering a new category, so her statement is nebulous.

This situation was the most confrontational event that I observed at Grant-Union over the course of the student-teaching semester. I interpreted the facial expressions from Sandy as an indication that she was not merely having a discussion about teaching practices, but was confronting a challenge, either to her beliefs or to her classroom practice. During later interviews each of the participants mentioned this cluster meeting in one way or another, and that alone warrants its inclusion in my analysis of deprivatization of practice. Each of the participants recalled this situation slightly differently. Beth recalled the situation as a good discussion about questioning students to find out what they know. Sandy restated her arguments against allowing questions during tests. Cecilia recalled it as a challenge to her practice and said that Sandy did not listen to the fact that she was not giving students answers, but asking them questions to see how they were thinking about a problem. Cecilia stated that she saw testing as just another site for teaching and learning. Neither of the participants placed the discussion in the context of the student teacher's observations about student questions. However, each participant recalled in some detail what she and others said during the conversation, leading me to conclude that acts of deprivatization of practice that occurred during this situation affected each participant. None of the participants said that the discussion about students asking questions during tests had caused

her to alter her own practices. My analysis of this situation is that it continues a theme of control and of students doing as they are told, even as it is situated in a specific classroom practice of questions by and to students.

The previous descriptions of three situations may read as if the events and conversations were linear and the exchanges were paced and discrete, but this impression is necessarily the result of having to produce a written account of events. These situations, like each of the meetings at Grant-Union, were loud, chaotic, and full of side conversations and comments. A group of friends and colleagues who had known each other for a minimum of five years was having lunch and unwinding during a brief break in the workday. There were near constant side comments from teachers who did not mentor a student teacher, inside jokes, planned birthday celebrations, announcements over the school intercom, and so forth. Each of these situations is necessarily filtered through my own lenses as enacted by my own formational set. On these days and many others I was concerned about the ways that my presence altered events and relations; however, my presence as researcher was a part of the structure and, for one day a week, was the mode of operating for each of us. In the next chapter, I offer a more detailed analysis of each of the three situations presented here and offer my conclusions relative to the overall dissertation research and to the use of the theory and methods of postmodern archaeological research.

Chapter 5

Discussion

In this study, I examined the deprivatization of practice of three members of a secondary mathematics department who each hosted a student teacher for one semester. These three teachers met regularly, along with the student teachers and me, for what we termed a cluster meeting. These meetings occurred on Wednesdays during the common departmental lunchtime and there were necessarily other teachers present who participated in the meetings as they desired. My plan was that these meetings be self-generating in the sense that the research participants and the student teachers would have specific topics that they wanted to discuss each week. For the most part, that self-generation did not occur and those present turned to me to start the meetings. After I offered some initial situation or asked some question each week, the conversations proceeded spontaneously, and I did not attempt to change its course. For the short time that we were together each week, the discussions generally stayed within the topics of teaching and learning mathematics and associated classroom events.

The research questions that guided this study were as follows:

1. How are acts of deprivatization conceived? What do they look like, and how do they develop?

2. What collegial structures are produced by and among teachers who mentor student teachers and meet regularly to discuss the work of teaching mathematics?

In this chapter, I first present a detailed analysis of each of the three situations from chapter 4. I then offer some overall analysis of themes that were present across the situations and discuss

deprivatization as it did and did not occur at Grant-Union High School. As I discuss later in the chapter, the results of this study were both comparable and at variance with other reports related to teacher deprivatization, whether it is known as collegiality, joint work, community, or some other term. Also in this chapter, I explore aspects of each of my research questions that proved to be problematic given constraints inherent in the research setting and design. Finally, I reflect on my exploration of Scheurich's (1997) suggestions of research method in the postmodern and discuss implications of using the idea of archaeological formations for further research.

Analysis of the Situations

      Analysis of Situation 1: Beliefs about teaching.

The current report is written in the first person singular, but the I of this person is not first and certainly not singular. The writing subject is a subjectivity or a subject formation of a particular archaeology and is written by that archaeology. My dominant formation set in a school is that of teacher, and in a classroom I am enacted by that set. I become a part of the classroom and the activities and events and interactions that appear to happen there. The intent of some portion of a doctoral program, however, is to replace that dominant formational set by the formational set of researcher and to be enacted as a researcher. Therefore, the "I" here is multiple and conflicted by instantaneous jumps between two formations. Each of these formations had a different interaction with the participants at Grant-Union High School. My teacher-formation felt accepted and at home. My researcher-formation felt outside and other. The intersection of the two formations felt hesitant and conspiratorial.

The participants in this study were real and individual, but from an archaeological perspective it is most appropriate to think of these participants as a Sandy-formation, a Cecilia-formation, and a Beth-formation. Each was an enactment of a similar, though different, set of

formations, and each, including the I-formation, constructed the world and was constructed by those different formations. As Scheurich (1997) says, "The lens constructs the world according to the nature of the lens, and, in the archeological view, the archaeology constructs the lens (p. 173)." As mathematics teachers in the same school, each of the participants at the cluster meeting in the previous section shared a formational set to a greater or lesser degree. In that case, certain events and certain knowledge were taken as shared (Cobb, 1994). That is, when Sandy or I mentioned Algebra One and when Cecilia referred to the study of order of operations early in the algebra course, each of the people at the table had some, presumably common, interpretation of these combinations of words as they were used at Grant-Union High School. For other combinations of words, this commonality was perhaps less certain. When Cecilia said, "We saw that last week in geometry with the pi key …," and those at the table nodded their heads without her finishing the sentence, it is impossible to know how congruent our images or thoughts might have been. Though the statement was made in the context of rounding off inappropriately, we each may have recalled an array of experiences with different students and in different contexts.

In this cluster meeting, Sandy, Cecilia, and to some extent Beth, both deprivatized and failed to deprivatize their practice of teaching. Beth offered an analysis of what, in her opinion, a student must have known in order to produce the work that I had shared with the group. She also commented that the student would have been assessed on his or her knowledge of the commutative property at particular points in the mathematics curriculum. Beth did not, however, speak about her own classroom practices or her experiences relative to the student mistake. Both Sandy and Cecilia spoke directly about what they did and did not do in their classroom. The situation involving a student inappropriately rounding a mathematical result happened in Sandy's classroom, and one might have expected Sandy and her student teacher to have had the most to

say relative to the situation. Each did offer some detail of what they did and what they said to prepare students for testing on this mathematical topic. Curiously, neither Sandy nor her student teacher acknowledged that the situation had occurred in their classroom until late in the discussion, and then only indirectly. One act of deprivatization of practice did not occur in this situation. Ruth, Sandy's student teacher, indicated that they had deducted half credit for each of the problems in which the student rounded incorrectly, and Ruth and Sandy each connected that penalty to the student not doing as he or she had been instructed—not following directions. Cecilia did not challenge this penalty even though she commented in private to her student teacher that she would have penalized the student only for the initial and not the subsequent mistakes. She did discuss alternate grading procedures as used in grading advanced placement work, but she did not say publicly that she would have done differently than Sandy and Ruth. This act of privatization could be construed as an avoidance of confrontation, or it could be simply that time ran out on the meeting. Either way, an opportunity for deprivatization to be a site of teacher learning might have been lost.

In their seminal work combining sociology studies of professionalism with those of community, Kruse and Louis (1993) identify a set of characteristics of faculty and staff at schools identified as successful. One important aspect of these so-called professional learning communities (PLCs) was a deprivatization of practice. Louis and Kruse (1995) make the following observation about deprivatization:

> Teachers within professional communities practice their craft openly. Peer coaching relationships, based both in the mutual solving of problems through discussion and collegial relationships, have been accepted by many schools as a method to improve both classroom practice and collegial relationships. Moreover, bringing real teaching problems

to the table and engaging in mutual observations provides a richer context for discussions

of practice because it is specific and event focused and thus encourages new forms of

conversation among teachers. It allows teachers to be analytic in their planning and

thinking and to use observations from others about student effort and achievement that

cannot be obtained while in the act of teaching. (p. 42)

Parsing the Louis and Kruse (1995) description of deprivatization of practice, relative to

the cluster meeting described above, I was the one who brought the "real teaching problem to the

table" and asked the teachers for a specific type of response, namely, what the first-year algebra

student knew about mathematics. Only Beth responded to that original question. The

conversation shifted almost immediately to the student error and its origins. That shift made

sense to me as a teacher from the perspective that "the event" in this situation was the student

error. The student knowledge was relevant only in relation to the student error. From an

assessment and grading perspective, the "discussion of practice" was a discussion of the relative

value of the student's error as compared with the student's knowledge, explaining the eventual

shift in the conversation to the topic of grading and point values.

In the meeting, I asked an abstract question about an unknown student: "What does this

student know about mathematics?" Beth answered with a list, and Sandy made an attempt at

humor or perhaps overlaid facets of student behavior on top of the mathematical knowledge of

the student. These statements might or might not have come from individual beliefs about

teaching or learning, but they were not directly about the practice of teaching and learning. The

participants began to deprivatize their practice when the abstract student and the student error

became connected to how similar students were taught in classrooms at Grant-Union High

School. This shift, along with interview data and fieldnotes in which participants almost always

illustrated a discussion of teaching and learning mathematics with a story of a particular student or classroom situation, led me to conclude that deprivatization of practice arises within situations of practice itself. The extension of this idea could be that, in order for a set of teachers such as the ones in this study to deprivatize as a site for their own learning, they should share some set of common practices rather than discuss the differences in their practices.

One possible analytic and planning direction that the conversation could have taken would be a discussion of the different calculator instructions used by Sandy in Algebra One and by the Algebra Two teacher. Sandy said that in Algebra One, she and her student teacher had told students to enter 1.12^{10} and obtain an answer and then to "multiply by 1400." The Algebra Two teacher said, "I tell them to write on their paper, 'fourteen hundred times one point one two to the tenth,' and then pick up the calculator. I've shown them how to do that." At least in the context of this cluster meeting, a "new form of conversation among teachers" could have been a discussion of the relative merits and implications of using one calculator procedure and not the other. Such analysis could produce some agreement about a consistent school-wide approach to calculator instruction and usage rather than each teacher having his or her own preferred policies and procedures. Such a conversation, however, would have been impossible within the setting of this cluster meeting because Sandy, her student teacher, and the Algebra Two teacher appear to be operating from a particular formational set that has long been the dominant archaeological formation of school—training and control. This formational set dates to the early part of the last century as Western schools were called upon to produce workers educated for new jobs in an industrializing society. This physical and curricular structure of schools has perhaps been the most continual and unchanged feature in Western education.

Foucault (1975/1995) describes in detail how Western schools evolved structures and methods from military training techniques and from the penal supervision and control of docile bodies and minds. This purpose of schools and of schooling to train and acculturate continued as a means to produce industrialized factory workers and remains as a major obstacle to change in educational policy and practice today (Sarason, 1996). Sandy's statement during the cluster meeting, "Part of it is teaching them to follow instructions, whether it be their teacher or their boss, whether it's mathematical or not. It gets back into character education or whatever you want to call it," is a statement from an archeological formation that sees the purpose of school as the training of future workers and compliant citizens to follow instructions. Within that formation, there is no need for a discussion of student thinking or for a school-wide consistency in instruction. What is expected is that students follow whatever instruction they are given by the teacher and success should follow. This archeological formation also produced Sandy's statement, "Things are different with higher level kids." Whether Sandy was indicating students in more advanced classes, students who were operating at some different cognitive level, or both, her statement indicates that either those students did not have to follow the teacher's instruction, or that they had learned to play the school game and that there is little doubt that they will follow instructions. In any case, the statement that things are different, from Sandy's archeological formation, is a closed statement, needing no discussion. This cluster meeting was not the only occasion in which higher-level students were mentioned, and I comment on the significance of this mentioning below.

In this cluster meeting, although Sandy deprivatized her practice by sharing her classroom actions and her teacher decisions about grading, these acts did not lead to a discussion among the participants about what might be options for other actions or for other decisions.

Sandy's beliefs about teaching and about the purpose of teaching as training a particular type of student created a closed system in which there was little flexibility and no need for consideration of changing one's practice.

Analysis of Situation 2: Classroom management.

In this situation, in which participants discussed the ways that the mentor-student teacher dyad operated in each of their classrooms, Sandy again represented a position that teaching and learning to teach is primarily about control. In Deleuzean terms, Sandy's classroom and Sandy's teaching world were striated spaces (Deleuze & Guattari, 1980/1987) in which "trajectories are subordinated to points" (p. 478), and teacher and student move from problem to problem or behavior to behavior. Though Sandy comments that management is different for upper level students, my observations were that her classroom operated much the same for sophomores and juniors in advanced algebra as it did for freshmen in algebra one. Cecilia's classroom was a much smoother space where points are subordinated to trajectories. "The stop follows from the trajectory; the interval takes all, the interval is substance" (p. 478). Learning occurs in the journey and the connections rather than in the arrival at a correct or incorrect result. In this situation both Sandy and Cecilia deprivatized their practice of working with student teachers and of their ways of operating in a classroom. Sandy's student teacher Ruth, along with Cecilia, says that these practices are about differing personalities and about individuality. Britzman (2003) argues that this legitimization of personality cum teaching style over pedagogy obscures "the discursive practices that make pedagogy intelligible" (p. 232). Rather than use the contrasting ways and means of mentoring and of classroom norms that were deprivatized in this discussion as tools for a discussion of teaching and learning, the differences are explained away by exaggerating personal autonomy. That is, while classroom practices were shared in the situation

described here, this sharing did not become a site for learning since it was expected that each teacher-student teacher dyad would return to their respective classrooms and continue to operate in their particular style, thereby continuing a privatization of practice even as it was shared. The belief that style is an identifiable and individual characteristic of teachers was either extant or developed between both the participants and the student teachers. At one time or another, each of the participants and each of the student teachers commented that their mentor-student teacher relation was effective, in part, because the members of the dyad had a similar teaching style. Those statements assume that compatibility, or similar styles, was desirable legitimized and effectively insulated each mentor teacher from consideration of changing her practice. If there is no need to change, then there is no need to discuss change.

In the final exchange between Sandy and Cecilia about "getting the test scores" and "managing success," we see a difficulty in the communication between smooth and striated spaces. In an interview with Beth as department chair, almost a year after Cecilia had moved to another school, I asked about conversations between Cecilia and other members of the department, and especially between Cecilia and Sandy. Beth said that throughout her time at Grant-Union, Cecilia had often started conversations that revealed differences between her practice and views and those of others in the department. Beth stated that Cecilia participated in those conversations in a role of mentor to less experienced teachers, wanting to hear other viewpoints, but specifically challenging others to think about hers. Louis and Kruse (1995) identify sharing and trading off roles of mentor and advisor as a part of deprivatization of practice; however, Little (1990b) notes that "many teachers have no sensible grounds on which to grant or deny someone the right to lead them" (p. 305). I suggest that while Sandy and Cecilia are each constituted by similar formational sets (Scheurich, 1997), each is also sufficiently

different that they do not have a shared and common language to use in their discussions. To return to Deleuze and Guattari (1980/1987), Cecilia is constituted by a more smooth, rhizomatic space relative to Sandy's striated, arboreal space. Cecilia operates in the middle of things and in "directions in motion" (p. 21) rather than Sandy's sets of points and positions and binary relations between them. Although Sandy and Cecilia each deprivatized her practice by discussing or implying how they operated or what they believed about teaching and learning, the lack of a negotiated common goal and common language limited the potential of deprivatization to advance their instrumental and technical expertise (Louis & Kruse, 1995).

Analysis of Situation 3: Confrontation.

In this cluster meeting, participants discussed her belief and her practices relative to student testing. Both Sandy and Cecilia gave student teachers and department members a view into what would typically be a private classroom practice, but what could have been a productive collegial discussion of teaching and learning or even of policy, was instead more of a confrontation between diametrical approaches to teaching and learning. A situation in which deprivatization of classroom practice could have become a learning situation for student teachers instead presented them with Sandy's position that implied student learning is connected to social control and that Cecilia's practice was somehow inappropriate. Beginning teachers often have the idea that either the teacher controls the students or the students will control the teacher (Wideen, Mayer-Smith, & Moon, 1998), and Sandy offered some evidence that this was her belief as well, when she says that as a student she "tested" her own high school teachers to see if they would answer her questions during tests. Sandy implied here that part of teaching and learning is about control and manipulation by and between teachers and students, not as a

negotiation of teaching and learning, but as gaining some advantage by students or limiting that advantage by teachers.

In this situation, a deprivatization of Cecilia's practice occurred through an inference rather than from a direct statement from Cecilia about what she does in her classroom. Cecilia attempted to share a practice illustrating for a student teacher how questions from a teacher could probe student knowledge and understanding. When she used an example from her own classroom in which she probed a student's knowledge about a test question, Sandy inferred a practice that was different from the one that Cecilia was actually relating. In this situation, an instance of deprivatization of Cecilia's practice was mutated as it was translated into Sandy's dichotomous view—either you allow questions during tests or you don't. The participants lost this opportunity for mentoring in a particular way since Cecilia's intended point was never discussed. Rather, Sandy deprivatized her own practice as opposition to the inferred practices of Cecilia with an either/or and even right/wrong dichotomy that precluded further discussion. In this situation, unlike the previous situation, there was no mention that each teacher did or could have her own teaching style that allowed for privatized practices needing no legitimization from consensus.

A conversation that did not occur, either in the meeting or during interviews, was a discussion of what types of questions students asked during tests and how teachers might use instruction or might design assessment items to enable students to answer their own questions or to limit the need for questions. Perhaps if teachers deprivatized their practice in the context of designing common assessment items, conversations might arise that allowed for teachers to consider how different practices and beliefs might allow for different results, or allow for results in a different, yet productive way.

During interviews, I asked if my presence at the cluster meetings or the topics that we discussed created tensions between or among those present. Each participant said that discussions like those we had occurred on a regular basis and that several department members had strong opinions about certain issues. The participants each mentioned that department members felt free to voice those opinions and that that freedom was one strength of the department. Cecilia, however, did say that she was often the lone proponent of some viewpoints, that she felt that some department members had gone beyond the ideas of collegial discussions about teaching and learning, and that she sometimes felt that their disagreements with her had become personal. She made that statement in the context of the situation involving student questions during tests.

Deprivatization

Collegial relations between mathematics teachers are complex, and research into such relations is inherently messy (Wilson & Berne, 1999). My desire was to investigate a group of teachers that, prior to the beginning of my research, I had observed interacting in ways that I had never seen during my own 25-year teaching career. I hoped to see how these teachers shared the work of teaching mathematics as they met weekly with their student teachers and myself. I found that they expected me to introduce topics for discussion each week, though they seemed willing to discuss the topic, no matter what it was. Rather than finding that these teachers shared a norm of politeness and shared the work of teaching, I observed that they argued and challenged each other along lines that I inferred had to do with the purpose of schooling. Acts of deprivatization occurred in instances that involved beliefs about teaching and learning, about classroom management, and about specific classroom practices. Each of these is ultimately about how and why students learn mathematics or even about why they are required to be schooled.

I undertook this investigation at this school and with these teachers because I had observed them interact with each other at a meeting for potential mentors of student teachers in mathematics. The meeting opened with a mathematical puzzle to solve. Rather than work on the puzzle as individuals, this group of teachers from Grant-Union High School argued about how to best attack a solution, started down different solution approaches as one or the other of them simply took the puzzle paper from another, and discussed or loudly criticized each step written by whichever member currently had the paper and pencil. Although my interpretation was that this situation seemed to be all in fun, and funny to them, it was also a set of behaviors that I had seldom observed in my own 25-year career in teaching. I chose this group as participants in my dissertation research because I wished to see how what I interpreted as deprivatization of practice looked during the more routine setting of the school workplace. I restate this description of my initial meeting with these teachers to point out a sort of congruence with other research related to deprivatization.

Had I taken a different approach to this dissertation research and, with Gutiérrez (1996), first identified a successful mathematics department and then investigated deprivatization within that department, expecting to see certain types of collegial behaviors, I could have done little better than to choose Grant-Union as the site for my research. For the 2 years prior to my research, Grant-Union was among the top ten high schools in the state when compared using Georgia's End-of-Course-Test for Algebra One. This test was mandated by the state Department of Education as fifteen percent of each student's final average for the course. Not only did Grant-Union have an extremely high passing rate for this statewide, high-stakes test, but two thirds of the students at Grant-Union scored at the highest proficiency level possible. Given this success, one might expect to find a cohesive and collectively shared work directed toward the success of

students. I found instead, as did Gutiérrez in her work, a group of individuals who were independent and had disjoint ideas about classroom practices and about the work of teaching. Unlike the schools that Gutiérrez studied, the mathematics department at Grant-Union did not have a stated goal or common vision that each teacher worked independently to achieve. Rather, each of the participants in my study worked independently and autonomously within the structure of the state-mandated curriculum, using her own beliefs and judgments as a guide. In this respect, while these teachers openly discussed and even argued about classroom practices and student learning and thereby deprivatized their own practice, they did not particularly share the work of teaching in any visibly constructive way during the times that I interacted with them.

My research also affirms findings of Little (1990a; 1990c). Little found that one way that teachers deprivatize their practice is by telling stories from the classroom. Rather than being a starting point for investigation of teaching and learning, when other teachers comment on the events and teacher actions from the stories it is often in the context of telling a similar story from their own classroom. These stories may serve to reinforce the warrant that a teacher's classroom is his or her private domain, and when two teachers take different or even contradictory stances in similar situations, the explanation that each teacher has a different teaching style or belief is simply accepted without discussion. The participants in the study voiced the same idea on several occasions—that teachers have different styles and that there are different ways to reach the same goal of student learning. This pronouncement effectively shuts down further discussion of teacher actions. Little also found, as did I, that discussion can be deflected by an initial humorous comment or by rapid responses that change the subject. These structures of conversation might be the norm among friends and colleagues, but limit the potential

productivity in situations where careful consideration and discussion of individual statements is needed.

I observed that the participants in this study had relations driven by disagreement and conflict, yet in interviews they each described the mathematics department as family and as supportive to its members. Each reported that discussions about mathematics and about teaching and learning mathematics were common. Lord (1994) suggests that repeated perturbations of one's actions and beliefs by other teachers may lead to a critical colleagueship that becomes a generative approach to facing new challenges. Lord also notes, however, that when conflict arises the most common reaction from teachers is not to engage in conflict but rather to continue to operate in private ways. My transcripts, fieldnotes, and initial analyses imply that the participants were often surprised at the opinions and statements of their colleagues, as if it had not occurred to them that others held differing views. This initial analysis on my part became hard to sustain given that these teachers had worked together for at least five years and had spent many hours together in departmental meetings and in the less formal setting of a shared lunchtime. I eventually concluded that some of this surprise had to be feigned or for dramatic effect, given the differing view of the participants. Each of the participants stated in interviews that Cecilia often had differing opinions and views from other members of the department and each participant also said that she brought up topics that she knew would be contested, but only because she was curious about how others thought or what others would do. For that reason, I suspect that many topics of disagreement were known by and among the participants. During the semester that I conducted this research, they disagreed openly and often, but there was no indication that they had begun to use these conflicts as a site to improve the teaching and learning of mathematics. Similarly, the participants had not begun to collectively explore the

deprivatization of their differences as a way to develop an inquiry as stance (Cochran-Smith & Lytle, 1999) approach to knowledge construction.

The two participants in this dissertation research that most often presented differing views of teaching and learning and most often disagreed, namely Sandy and Cecilia, are separated along lines suggested by McLaughlin and Talbert (2001) and Grossman and Stoldolsky (1995), who compared secondary mathematics teachers and mathematics departments to other secondary academic departments. These researchers concluded that many secondary teachers of mathematics, such as Sandy, may see their curriculum as strictly predetermined by the subject matter and also see mathematics as an individual and isolated activity. Cecilia, however, operated her classroom in ways that suggested that mathematics, or certainly mathematical knowledge, could be created in the moment as a group construct, making mathematics and therefore mathematics teaching more fluid and uncertain. These different and incompatible views of mathematics teaching and learning preclude the possibility that deprivatization of practice by Sandy and Cecilia could produce any structure other than continued disagreement over ways and means of operating in the classroom for both teachers and students.

My first research question asked how acts of deprivatization were conceived and how they looked and developed. In individual interviews, each of the participants stated that within the department, and especially during their common lunchtime, discussions about mathematics and about teaching and learning were relatively common; however, during the scheduled cluster meetings it feel on me to introduce topics for discussion. Once a topic was introduced, the discussion sometimes stayed relative close to that topic and sometimes ranged across a variety of other topics. Based on participant responses, I can only assume that any lunchtime discussions that happened in my absence were similar in content and in structure to those that occurred in my

presence. In discussions during the cluster meetings teachers deprivatized their practice mainly by relating stories from their classroom or from their own experience as students. Even when I or someone else sought some generalization or summary of some situation, the discussion returned almost immediately to some teacher's specific classroom incident or to some experience from the teacher's own actions as a student. Through these shared stories and through comments about others' stories, the participants either implicitly or explicitly deprivatized both their practice and their beliefs relative to mathematics, to the teaching and learning of mathematics, and to the purposes of schooling in general.

In the first research question, the word *conceived* was deliberately chosen because of its dual interpretation. Conceived may be used to indicate an initiation—to produce something from the mind—or it can be used to indicate a perception of or an understanding of something. My analysis suggests that deprivatization of practice was initiated as teachers shared specific events from the classroom. This sharing was not initially spontaneous during the casual setting of a common lunchtime when teachers had a short break in the workday. However, once the sharing of stories began, it continued as a story by one teacher acted as a prompt for a story by another teacher. Teachers also understood the phrase deprivatization of practice as this sharing of stories of classroom events. Teachers did not interpret deprivatization as requiring joint work to improve the teaching and learning of mathematics, nor did they interpret deprivatization as having a necessary component of teacher-to-teacher observation.

My second research question concerned structures produced by acts of deprivatization. I find any simple response to this question intractable. The participants already had a long and complex history as students, teachers, and as colleagues before the beginning of my research. These histories necessarily produced complex relations that sometimes intersected with my own

experiences as student, teacher, and colleague, and new experiences as researcher. At other times statements from a participant were simply incompatible with any way that I could interpret them and I continue to ponder those incidents. I have tried in both chapters 4 and 5 of this report to give some sense of structures that seemed to be operating and how the participants used these structures as they deprivatized their practice of teaching mathematics. From a postmodern view, these structures are "flows meeting other flows" (Deleuze & Guattari, 1991/1994, p. 9) and are necessarily contingent and highly mutable. My presence at the weekly meetings necessarily influenced the interactions of the participants, though each stated that my presence at these meetings did not change the behaviors and conversations that were typical when the department members met. My own sense was that I was accepted more or less as another teacher in the room, though that sense itself is of course suspect. One participant expressed appreciation that the university had sent a teacher to work with student teachers rather than "just a graduate student."

The existing structure of deprivatization in place among the participants allowed for open and even blunt discussion of classroom events and of teacher actions. Each participant acknowledged that department members spoke their mind and that what I called a norm of politeness was not the norm at Grant-Union. However, there was not evidence that teachers changed or adapted their practice through participation in these discussions. Based on my own experience as a member of several departments of secondary mathematics teachers, this structure of blunt discussion is not typical. For deprivatization to occur and for this deprivatization to be productive, some other structure would need to become the norm and I argue that this structure would be developed by and among those involved rather than being imposed from outside the group. Structures are negotiated in the interaction of archaeological formations and any

transformation of individual formations happens more easily near the surface of the archaeology (Scheurich, 1997). To affect any change such as the creation of a structure of deprivatization requires an interaction between those formations involved in that structure. Changes in the archeology are necessarily produced by the archaeology.

Beyond the two research questions, or rather through the research questions, I also used this research to explore my own practices as a career mathematics teacher. I found myself reluctant to deprivatize my own practice in the setting of cluster meetings at Grant-Union. As a becoming researcher I felt it necessary to be outside and other, even as I tried to record and understand the inside and the sameness of participant acts of deprivatization and to understand the structures existent, or created by, acts of deprivatization. I also knew that I had spent a teaching career operating with a norm of politeness that seemed to differ from that of many of the teachers at this school. As participants told classroom stories, I told my own classroom stories in my head, and as I observed and analyzed teacher interactions at cluster meetings, I recalled meetings from my own career. Previous reflections on my own practices and my own career had originally motivated this study of deprivatization and these continued reflections influenced both my analysis and conclusions.

Applying an Archaeological Approach to Research

From a theoretical perspective, this dissertation research explored the use of postmodern archaeological methods of data production and analysis. The theory and methodology used in this dissertation research are based on *Research Method in the Postmodern* (Scheurich, 1997), in which Scheurich postulates a view of archaeological research related to the ideas of French historian and philosopher Michel Foucault. In his investigations, Foucault attempted to identify the mechanisms by which certain social structures and ideas became possible. Scheurich

connects the ideas of Foucault to a postmodern world-view often described as rhizomatic

(Deleuze & Guattari, 1980/1987) in which events, ideas, knowledge, relations, and so forth do

not arise due to some process of bifurcation from other events, ideas, knowledge, or relations.

The Deleuzean view is that there is not a root structure to which other structures must conform,

but that all is interconnected. Nothing is traceable to any central or basic form. Scheurich brings

the ideas of Foucault and Deleuze together to say that each person and each event does not arise

through free will but is an enactment of all prior events and influences, individual as well as

cultural. Thus, to study individuals and their relations, as I hoped to do in this dissertation study,

is to research entire histories and cultures of rhizomatic connections and disjunctions, including

my own. Foucault made use of vast numbers of historical documents as a means to study the

social knowledge and accepted social truths of an era that allowed certain concepts and structures

to form and not others. Identifying collegial structures produced by and among this group of

teachers using ideas suggested by Scheurich, through Foucault, would require much greater

access to these individual's histories and relations and cultural identities than I could expect

through weekly half-hour visits and other encounters over the course of one semester. This is

especially true given that when I arrived the participants in this study had a minimum of 5 years

of interactions with each other as colleagues and had existing relations that were complex and

necessarily subliminal to my available data sources and interpretations. In lieu of the

impossible—a complete knowledge of other individuals and their interactions—I necessarily

used what I perceived as my own enacted similarities as a career teacher with a similar

formational set. That is, I assumed that I was being enacted by a sufficiently similar formational

set as to make my observations, to a greater or lesser degree, similar to those of the participants.

This insertion of my subjectivity into the research and the data would be a criticism of an

archaeological method by some who approach research from a realist or humanist perspective. However, realism merely "assumes that it is able to achieve a purchase above or outside its historicized context, while archaeology assumes it is an enactment wholly within and of the archaeology" (Scheurich, 1997, p. 174) and admits as much as a part of any research report. My own formation as an experienced secondary mathematics teacher allowed for a particular interaction with the participants—one that produced this data analysis and report and not another.

There is little if any precedent for using Scheurich's (1997) theories of archaeological research. Scheurich presents these ideas as a final chapter in a book describing his own journey toward postmodernism. The chapter is a systematic challenge to humanist research and a speculation on a possible structure of reality and the implications that that view of reality has for relations and therefore for sociological research. As far as I can tell, no other researcher has used these ideas as either theory or methodology. I tried in this research to use my interpretations of formations as enactments of an archaeology to study the archaeology itself and to explore how the construct of deprivatization of practice is enacted by particular formations and what structures are produced or exist as a result of these enactments. I cannot find that even Scheurich continued to explore his ideas further or that he applied his theories toward developing a methodology and specific methods for research. Whether that is a limitation or an opportunity remains to be seen. I found Scheurich's theories to be useful as I thought myself as an enacted researcher, operating within a strange, for me, archaeology of academe, and being so within a more familiar enactment as classroom teacher. I hope that my research contributes to further exploration and application of postmodern theories to the daily activities and relations of teachers and that others consider Scheurich's challenges to realist research as a starting point for thinking in new ways.

I am fascinated by Scheurich's speculation on the nature of reality and on the implications for human interaction. These ideas seem located somewhere between Eastern religious theories and science fiction, both life-long interests for me. Ways to put these theories into practice as method or methodology on a small scale are no clearer now than when I began my research. I find that I can live this theory comfortably much of the time, and at other times I realize that I struggle to comprehend it in use. I will continue to try.

Implications for Further Work and Research

This research happened at a site and with participants of convenience. I had a choice of sites based only on where the university placed student teachers. From this pool of some 15 schools, I selected the school and the mentor teachers where I had seen teachers talk and disagree openly about approaches to solving a mathematics problem. What I had not seen and what I was hoping to investigate, was how these teachers deprivatized their practice of teaching mathematics. The teachers who participated in this study met regularly to discuss whatever topic I introduced; however, the topics changed weekly based on observations I made in the classrooms of student teachers and as I read research and had discussions with other graduate students in mathematics education. There was no continuing theme or task that connected the meetings or the work of these teachers other than the fact that they each had a student teacher and whatever common work they normally had in planning and teaching. That is, while I did observe teachers deprivatize their practice, I had little opportunity to observe the participants cooperate to directly produce a product. Through my reading and my experiences with this study, I believe that deprivatization of practice might take a different form and might produce structures of collegiality and change if deprivatization occurred in the context of producing a product that directly affected those involved. While the participants in this dissertation research were at the

same school and each mentored a student teacher, each participant was also able to deprivatize some facet of classroom practice and then immediately return to the privacy of her own classroom with no necessary consequences of the deprivatization. I am now curious to see if, in order for deprivatization to lead to a collegial structure directed toward improving teaching and learning, teachers should be working to accomplish some common task that has implications for the future actions of each teacher, whether it be curriculum design, creating a common assessment, or analyzing data and implementing practices based on data analysis. Only through some common task that directly affects the actions of each teacher will it behoove teachers to resolve, or at least negotiate, differing views of teaching and learning. A more task oriented stance toward deprivatization and thereby toward some form of teacher community suggests a possible direction for future research. If I were to repeat this research, or if I were to continue research into deprivatization and structures of deprivatization, I would locate that research in a setting in which teachers were jointly creating some product. Georgia has adopted a new framework and a new set of standards for its mathematics curriculum and within each district and often within each school, teachers are left to interpret how implementation of those standards might look. These sites of course creation carry the components of interaction and negotiation that might give a different view of deprivatization than that from Grant-Union.

A search of databases for recent reports related to teacher community or deprivatization seems to show that the term *deprivatization* did not become the favored identifier for the concept of teachers sharing the work of teaching. The literature is dominated by the terms *collaboration* and *collegiality*. After my research and after the production of this dissertation, I still prefer the term deprivatization. The terms *collaboration* and *collegiality* carry, I believe, a taken-as-shared quality that lessens the perceived need for detailed discussion of what it might mean to

collaborate or to be collegial. On the other hand, deprivatization has a strangeness that may warrant and even necessitate unpacking and analyzing both what it means to deprivatize and what it looks and feels like to do so. Database searches also indicate that educational fields related to supervision and administration have appropriated concepts of teacher community, and very few recent articles report on active research outside these fields. To me, the literature from the supervision and administration fields use community in a simplistic and contrary way. Recent essays from this literature seem to be based on the idea that when groups of teachers operate in collaborative ways, good things happen, typically improved student achievement. I can agree with this viewpoint. However, coming from a top-down view of education as supervision, the translation seems to become one of thinking of ways to make teachers collaborate and expecting improved student achievement. This idea is in direct opposition to much of the research on teacher collaboration and teacher community that concludes that successful communities are largely a grass roots phenomenon. My experience as a teacher of some 30 years aligns with that of Hargreaves (2003), who writes that the contrived collegiality that comes from imposed collaboration actually inhibits professional initiative and thereby lessens what teachers do best, which is creatively solve local problems in education. The concept of community and of deprivatization of practice has moved into the arena of administration, but has not as yet generated a body of research within that arena. Much of the literature consists of essays pointing out the positive reports of community and collaboration published in the field of teacher professional development. Situating community and collaboration in the field of administration opens research possibilities into the affect and effectiveness of this direction of thought and action as teachers take on or reject mandated structures of interaction.

Comments and Discussion

This research investigated teacher interactions from a particular perspective, namely, a postmodern look at mathematics teachers' deprivatization of practice. My interest in the topic of deprivatization of practice grew from a career of some 30 years as a public school mathematics teacher. Over this time, there were very few instances in which my colleagues and I observed each other in classrooms with students or even spent significant time in productive discussion of the teaching and learning of mathematics. At each of the schools in which I worked, I have found colleagues that would discuss specific aspects of teaching and learning, but these situations were never extensive nor were they organized or documented. I have found colleagues that I could go to for discussions of mathematics and other colleagues who I could count on for discussions of curriculum or pedagogy, but these were typically short interactions that addressed some immediate issue. Continued joint work directed to the solution of larger-scale issues of teaching and learning has been rare indeed. I did spend two school years teaching in a collaborative setting with a special education teacher and those times of jointly designing and implementing lessons and assessments are the most memorable times of my career.

As a doctoral student, I read literature defining and describing professional learning communities and exploring how teachers share, or typically do not share, the practice of teaching. Literature specific to community and to deprivatization, or collaboration, by secondary mathematics teachers is sparse and inconclusive. Much research into the interactions of members of a secondary mathematics department has relied on self-reported data to investigate these interactions and has gathered this data immediately after some intervention or professional development activity designed to promote teacher interaction over some short period of time. Research that has used observational data suggests that secondary mathematics teachers are the

least likely among all secondary academic teachers to operate in cooperative, communal ways. In this study I had the opportunity investigate a set of teacher interactions and, for better or worse, filter observations and data analysis through my own experience as a mathematics teacher. I hope that my research has contributed to the base-line data about deprivatization by and among secondary mathematics teachers and has contributed to research method in the postmodern.

I found that teachers deprivatized their practice through the sharing of stories from their experiences as students and as classroom teachers. There was no data to support the idea that this deprivatization altered the actions of the participants or caused them to think differently about their practice. I concluded that certain deprivatization is possible, but that deprivatization does not lead to change and sometimes is not possible, based on participants' relation to mathematics as a subject and based on participants' ideas about the purpose of schools and of schooling.

Mathematics and structure of discourse.

McLaughlin and Talbert (2001) are among researchers who note the effect of content disciplines on the identities of secondary school teachers. They report that secondary school mathematics teachers, more than other secondary school teachers, see the content of their discipline as historically fixed and see mathematics curricula as sequenced by the discipline itself. Therefore, secondary mathematics teachers may be more resistant to reform movements than their colleagues in other secondary disciplines. Grossman and Stoldolsky (1995) found significant differences between secondary mathematics and English teachers. They found mathematics teachers to hold a more "consensual view" of their subject, meaning that "if another teacher took over their course it would remain pretty much the same" (p. 203). They suggest that mathematics teachers are more likely to view their subject as "unchanging and relatively 'cut and

dried'"(p. 203) and that these views may result from a disciplinary socialization during both precollege and college coursework in mathematics.

My research did not allow a comparison between mathematics teachers and those in other disciplines. However, my research did allow for a discussion of mathematical differences among the three participants and within the mathematics department itself. These differences relate to the nature of mathematics and therefore what it means to learn mathematics and how one learns it, to expressed beliefs about participants' own knowledge of mathematics and how that knowledge is acquired, and to how teachers use their own mathematical knowledge in the classroom. These differences helped to shape a collegial structure by and among the participants and to influence ways in which they deprivatized both their knowledge of mathematics and their practices of teaching.

The purpose of schools and of schooling.

One recurring formation in the data production of this study, and therefore relevant to how and why participants' deprivatize their practice, was the purpose of schools and of schooling. Teachers live and work within multiple theories, one of which involves the simple notion of why they come to work each day. What is the purpose that guides decisions that they make and what are they trying to accomplish?

Foucault (1975/1995) traces the European, and hence largely American school tradition as a model derived from military and prison origins—a tool for training, correction, classification, normalization, exclusion, and so forth. In this tradition, the role of schools is the production a certain type of citizen who can operate as a docile body, capable of work in an imposed temporal and structural system. In this original context, there is no connect between the methods of instruction and the content to be learned, nor is there a need for such a connection.

Traditional American public schools maintain at least the physicality of their military origins, with students straying no more than a few inches from some known location at any specified time of day. However, within these continuing modal lines, various ideas about what and how education should occur exist and may be enacted by teachers. These large ideas and theories range from the child centered educational thoughts of Piaget (1970), to the socio-cultural theories of learning from Vygotsky (1978), to more recent and more practical, that is, already interpreted from theory, ideas specific to the teaching and learning of mathematics from those in the field of mathematics education (NCTM, 2000; National Research Council, 2001), to ideas generated by political views, religious beliefs, media reports, and the like. Mathematics teachers operate with some or all of these ideas about education and this exposure necessarily influences teachers' ideas about the purposes of school and schooling. The participants in this research held differing ideas about these purposes and these differing ideas both allowed for sites of deprivatization, but also limited the productivity of that deprivatization.

Conclusion

In this study I sought to identify structures of deprivatization involving experienced secondary mathematics teachers at the intersection of multiple discourses. These teachers, like all teachers, took on roles of instructor, counselor, parent, social worker, evaluator, administrator, and…and…and…. The three teachers in this study also had roles as members of a departmentalized secondary school, roles as knowers of a specific content discipline, and roles as mathematics educators, working with student teachers within the specific requirements of a university professional development project.

As a part of my research and as a part of the project Partnerships in Reform in Mathematics Education, the three participants met regularly for the duration of the student

teaching experience, together with the three student teachers assigned to that school. I was present at each meeting, as were several other members of the mathematics department at the school. This additional group of teachers seldom consisted of the same individuals, and those present were less vocal than the participants and student teachers. My intent during each of these meetings was to investigate how the participants deprivatized their practice of teaching mathematics and to examine collegial structures that were produced by and among the three participants as they discussed the work of teaching and as they mentored preservice teachers.

During the investigation, the analysis, and the writing, I attempted to consider the implications of my presence in the discourses at work in the production of data. I also attempted to consider the archeological structures that produced each participant's involvement and to be aware that data were not a product of the moment, but of the many "processes by which history 'deposits its traces'" (Britzman, 1994, p. 60).

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