DISCURSIVE NEGOTIATION AND (RE)CONSTRUCTION OF PROFESSIONAL

IDENTITIES FOR MATHEMATICS

by

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In Homer's *The Odyssey,* Mentor was an advisor to Telemachus and friend to Odysseus. Not only does mentor mean advisor and friend, through its etymology it carries many more associations: mind, intent, purpose, spirit, and passion. Dr. Michele Carney and Dr. David Gabbard have been my mentors. I thank them for their advice, support, and friendship as I have tried to find my voice as a teacher, student, researcher, and writer.

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ABSTRACT

This qualitative study explores how discourse communicates professional identities for mathematics in a context of pedagogical reform. The central research question is: In a case of mandatory mathematics professional development, what professional identities for mathematics are expressed, (re)constructed, and negotiated through discourse? This study takes a poststructuralist approach to discourse analysis. The purpose is to describe ways discourse communicates professional identities, or understandings about what it means to be a good mathematics teacher, in a context that may ask teachers to change their pedagogical practice. Data were collected by recording a mandatory, full-day professional development meeting for mathematics teachers of grades 6-8. Transcriptions of the meeting were analyzed using Gee's (2005, 2014) method of discourse analysis. The analysis revealed that discourse communicated a range of positions relative to the pedagogical philosophy presented in the professional development. Through these positions, negotiations of issues of responsibility to students and to the system were taking place. These positions reveal professional identities based on different epistemological beliefs and moral purposes. Emotions, obligations, and values worked as discursive resources for communicating one's position. Recommendations for professional development include providing opportunities for teachers to discuss and negotiate issues of responsibility both to the students and to a larger system.

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LIST OF ABBREVIATIONS

CCSS-M   Common Core State Standards—Mathematics

NCTM   National Council of Teachers of Mathematics

SDE   State Department of Education

CHAPTER ONE: INTRODUCTION TO THE STUDY

Introduction

Teachers' professional identities, or their knowledge about the work of teaching

mathematics and beliefs about what it means to be a good teacher, affect both

instructional practice and interpersonal relationships with students and colleagues

(Bjüland, Cestari, & Borgersen, 2012; Kelchtermans, 2005; Nias, 1996). Teachers'

professional identities include characteristics such as content knowledge, epistemological

beliefs, past experiences, moral purposes and goals (Beijaard, Meijer, & Verloop, 2004;

Kelchtermans, 2005). Importantly, professional identities are also constructed in light of

contextual factors such as the normative pressures and power relations that are part of

education reform (Day, Kington, Stobart, & Sammons, 2006; Flores & Day, 2006; Lasky,

2005).

This dissertation is a study of ways discourse reveals these professional identities

and negotiations over the characteristics that enable recognition as a good mathematics

teacher in a context of pedagogical reform. I refer to an individual teacher's professional

identity as a personal professional identity and the negotiated understandings about a

good mathematics teacher as normative professional identities. Unlike earlier research

that explores identity in the context of voluntary professional development, here the focus

is on discourse that takes place during a mandatory professional development program

for grades 6-8 teachers that was aimed at changing mathematics pedagogy. In response to

efforts to reform mathematics pedagogy, teachers may respond by taking up various

positions (Davies & Harré, 1990) such as identification, compliance, or resistance (Day, 2011; Day et al., 2006; Gresalfi & Cobb, 2011). Working with transcriptions of the discussions, I used a three-phased discourse analysis to: first, explore teachers' figured worlds (Gee, 2014; Holland, Lachicotte, Skinner, & Cain, 1998); second, employ a form and function analysis (Halliday & Mathiessen, 2014; Thompson, 2004) to uncover ways language was used; and third, explore ways identities are constructed and negotiated using Gee's (2005, 2014) building tasks. As a result of these analyses, I describe how discourse communicated stable and changing personal professional identities and worked to negotiate normative professional identities, or socially constructed understandings of the characteristics of a good mathematics teacher.

This research aims to contribute understanding to an issue that is critical to the field of mathematics education and teacher professional development. That is, how do teachers respond to normative pressures and power relations associated with efforts to reform pedagogy, particularly reform that may challenge philosophies of teaching and conceptions of what constitutes high quality mathematics instruction? This research is based on a poststructuralist theoretical framework and uses the theory of figured worlds (Holland et al., 1998) and method of discourse analysis developed by Gee (2005).

In this introductory chapter, I provide background for the topic, my interest in it, and the problem this research seeks to address. Next I describe the rationale and significance of the research. This is followed by my research questions with a brief outline of the analytical framework I used to investigate them. The chapter concludes with definitions of key terms and an overview of the organization of the dissertation.

Background and Problem

Figured worlds are recognizable cultural spaces that shape identities and social interactions (Holland et al., 1998). We recognize when we are in a professional setting, such as a staff meeting, or a casual setting, such as dinner with friends, and we interact accordingly. The figured world of mathematics education includes classroom interactions, professional development, and normative discourses (e.g., standards, policy documents, research, textbooks) that shape conceptions of quality instruction and professional identities. For several decades, mathematics professional organizations and mathematics education researchers have sought to shift these discourses toward practices that develop deep conceptual understanding of mathematics through problem solving tasks with the goal of improving students' achievement, problem solving abilities, and dispositions toward mathematics (Hiebert et al., 1997; National Council of Teachers of Mathematics [NCTM], 2000). The recent adoption of the Common Core State Standards—Mathematics (CCSS-M) (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) in many states places much more emphasis on conceptual understanding. Many professional development programs have aimed to provide training for teachers to change their instructional practices, but these programs have had limited success (Bray, 2011; Desimone, Porter, Garet, Yoon & Birman, 2002; Elmore, 2007; Goldsmith, Doerr, & Lewis, 2014). The majority of mathematics classrooms are dominated by an instructional model that procedural-based teacher demonstration (Darling-Hammond, 2010; Polly & Hannafin, 2011; Stodolsky, Salk, & Glaessner, 1991). Thus, the figured world of mathematics education today is facing both pressure to change (external pressure in the form of accountability and

internal in the form of pedagogical reform), and resistance as the majority of classroom practices remain unchanged.

By studying past reform, researchers have provided recommendations to those seeking to "re-figure" the world of mathematics education and create large-scale change in pedagogical practices (Coburn, 2003; Darling-Hammond, 2010; Elmore, 2007; Fullan, 2000). Three are relevant to the exploration of professional identity that is the focus of this research. First, they argue that for reform to work people need to identify with the goals (Coburn, 2003; Fullan, 2000). Second, pressure for change should be integrated with adequate support for change (Darling-Hammond, 2010; Elmore, 2007; Fullan, 2000). Third, rather than trying to control a system, efforts should focus on working with the people involved in the system, building upon their creativity and experience (Coburn, 2003; Fullan, 2000). By providing teachers with support (whether cognitive, motivational, or affective), and connecting with teachers' goals and personal experiences, these recommendations imply that teachers' professional identities should be considered when designing professional development programs. Yet, they also imply a tension between reaffirming identities that maintain the figured world as is and promoting deep change in pedagogy and understandings of quality mathematics instruction.

My interest in this topic developed out of many years teaching elementary and middle school mathematics and many days being on the receiving end of professional development that aimed to reform pedagogy. I have seen that this normative pressure can be a challenging and, at times, an emotional experience for the teachers involved. It seems that many teachers find that their personal professional identities and new expectations of them are at odds. Often they receive inadequate support for negotiating

these differences. In such situations some teachers experience heightened senses of vulnerability (Kelchtermans, 2005; Lasky, 2005), decreased job satisfaction (Day, 2002), diminished self-worth, exhaustion, or demoralization (Hargreaves, 2005; Nias, 1989; Santoro, 2011). Teachers may perceive threats to their confidence, agency, and conceptions of what is valued in a mathematics teacher (Hodgen & Askew, 2007; Lasky, 2005; Nias, 1989, 1996).

As worlds are re-figured, there are shifts in networks of power. Changing worlds means new ways in which people are both objects (power acting on them) and subjects (power acting through them). A change in professional norms creates situations in which teachers must negotiate meaning and (re)position themselves. Positioning oneself involves "an emotional commitment" and "a moral system" that develops around that position (Davies & Harré, 1990, p. 6). Though I, as a former-teacher and graduate student/researcher, necessarily take up a position (or positions) in this world, my intention is to take a bird's eye view of the normative pressures and power relations. This research seeks to shed light on the complex relations between normative pressure and professional identity in the context of pedagogical reform.

Rationale

Most research on professional development has focused on identifying features that are effective in creating change, measured in terms of impact on teacher learning or student achievement (Goldsmith et al., 2014; Hill, Beisiegle, & Jacob, 2013). Results of these studies have been contradictory or inconclusive (Hill et al., 2013) and have shown that impact varies across individuals and contexts (Goldsmith et al., 2014). Some researchers suggest that to better understand the effects of professional development

research should also consider mediating influences such as teachers' knowledge, beliefs, and experiences (Desimone, 2009; Sumsion et al., 2015). Such a shift suggests attention to figured worlds—the understandings teachers hold about their roles in the social spaces of mathematics classrooms and the normative pressure placed on those roles by professional development. Also, Goldsmith and colleagues (2014) suggest research can expand from simply focusing on effectiveness to considering *how* programs work in certain contexts and considering the processes of teacher learning—cognition, motivation, and emotion. These learning processes are embedded in discursive practices; they are situated at the intersection of "all the ways in which people actively produce social and psychological realities" (Davies & Harré, 1990, p. 4).

Current research has studied professional identities in a context in which institutional norms were at odds with the philosophy of the professional development (Gresalfi & Cobb, 2011). In this study, I analyze a context where institutional norms (i.e., district-level expectations) align with the philosophy of the professional development to create pressure to re-figure classroom instructional practice. However, this philosophy may be at odds with school-level norms and personal professional identities. Rather than voluntarily enrolling in a professional development program, this was a district sponsored event, and teachers were expected to attend. Also, current research uses interviews and surveys as the units of analysis. This study extends research on normative influences of professional development by using discourse as the focus of analysis.

Significance

The case is significant because it describes how discourse reflects and shapes the processes that teachers go through as they negotiate normative identity pressures that

come with reforming instructional practice. The theoretical contribution of this work is to use a poststructural theoretical framework and discourse analysis to analyze the negotiation of identities in the context of changing normative pressures. The pragmatic contribution is a better understanding of how discourse reveals factors that influence positions of identification, compliance, or resistance as a result of those pressures, as well as a better understanding the personal tensions inherent in educational reform.

Research Questions

As described above, this research analyzed discourse with attention to the role of professional identities in a figured world undergoing reform—how discourse communicates positions relative to professional development pressures and negotiates normative understandings of what it means to be a good mathematics teacher. I pay particular attention to the expression of beliefs, emotions, and moral purposes in these processes. On this basis, the central research question is:

In a case of mandatory mathematics professional development, in what ways are professional identities for mathematics expressed, (re)constructed, and negotiated through discourse?

In order to explore answers to this question, I asked three sub-questions:

- In what ways does discourse reveal positions of identification, compliance, or resistance to changing pedagogical practices, and on what bases are these positions taken up?

- What understandings about the characteristics of a good mathematics teacher are expressed, constructed, or contested through discourse?

- What beliefs and emotions are communicated in response to pressures to change pedagogical practices?

These questions served as guides as I conducted a three-phased analysis. First, I used Gee's (2014) theoretical tool of figured worlds. Then, I turned to a form and function analysis based in functional grammar (Halliday & Mathiessen, 2014; Thompson, 2004). Last, I returned to Gee's work and used his concept of building tasks (Gee 2005, 2014).

Definitions of Key Terminology

Building tasks: a discourse analysis term used by Gee (2005, 2014) that describes a type of work done in the process of building and rebuilding our reality through language. This is the work that is accomplished by discursive practices (see below).

discourse: written or spoken language.

Discourse: language, belief, and cultural thought that shapes our understanding of reality. Discourse involves deep understandings of the nature of truth, power, and authority (S.J. Ball, 2013; Foucault, 1980).

Discursive practices: "all the ways in which people actively produce social and psychological realities" (Davies & Harré, 1990, p. 4).

Emotion: socially constructed, affective interpretations of experience. Emotions can act as resources within discursive practices.

Figured worlds: jointly constructed, hierarchical social spaces that structure patterns of interaction, communication, and construction of identity. These are collective understandings about cultural realms that include roles, styles of interactions, genres of discourse, coproduction of activities. These understandings shape thought, behavior, and emotion (Holland et al., 1998).

Moral purposes: purposes that drive a teacher's actions and decision making and that are based on beliefs about what is good or right.

Normative professional identity: a collective, negotiated understanding about what it means to be a good teacher.

Personal epistemology: an individual's beliefs about the nature and sources of knowledge and how knowledge is obtained and justified.

Personal professional identity for mathematics: a combination of personal epistemology, moral purposes, and self-understandings about the work of teaching mathematics and what it means to be a good mathematics teacher.

Self-understandings: personal appraisals of oneself in relation to one's context, such as self-esteem, motivation, goals, and agency.

Organization of Subsequent Chapters

In this chapter I have described the background and problem, provided the rationale and significance of the research, listed the research questions, and provided definitions for key terms used throughout the dissertation.

The remaining chapters are organized as follows. In chapter 2, I provide a review of research on relevant topics, while chapter 3 describes the theoretical and conceptual frameworks that organize my thinking and analysis. Chapter 4 contains an account of the research methodology and method. Chapter 5 presents the findings related to the research sub-questions. Chapter 6 provides a discussion of the central research question in light of the findings. In chapter 7, the final chapter, I discuss the findings in light of the conceptual framework. In this chapter, I also discuss implications and suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

This chapter provides a review of research relevant to the topic of professional identities for mathematics. This chapter begins with a description of research on mathematics pedagogy and, in particular, the pedagogy endorsed by the professional development program that is at the center of this research. This chapter continues with a description of research on the effectiveness of professional development, followed by research on teachers' responses to reform. Then I summarize research on professional identities. Finally, I discuss research on teachers' emotions.

Mathematics Pedagogy

Mathematics Reform Movement

Through normative pressures and power relations, the mathematics reform movement aims to re-figure the world of mathematics education in favor of a pedagogical approach that is based on developing students' conceptual understanding and mathematical reasoning. The National Council of Teachers of Mathematics (NCTM), an influential professional organization, states that the fundamental purpose of the mathematics reform movement is to ensure that all students are learning mathematical concepts and skills with understanding (NCTM, 2000). Additionally, the CCSS-M require that this understanding must be used for problem solving in real world contexts, while developing reasoning, justification, and communication abilities (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

The call for reform stems from concerns about mathematics achievement, commonly measured by the results of large-scale testing (Darling-Hammond, 2010; Kilpatrick, Swafford, & Findell, 2001; W. H. Schmidt, 2012). Based on these measures, fewer than a third of U.S. students are proficient in mathematics at the end of the eighth grade (National Mathematics Advisory Panel, 2008), and some people express concerns about the rate of improved performance compared to other industrialized nations (Hanushek, Peterson, & Woessmann, 2012; W. H. Schmidt, 2012).

In an effort to develop students' mathematical proficiency, educators often focus on approaches that rely on developing computational fluency through teacher demonstration of solution strategies and student practice of those strategies. These demonstration-based models of instruction have been and remain most common in the United States (Banilower et al., 2013; Darling-Hammond, 2010; Polly & Hannafin, 2011; Stigler & Hiebert, 1999; Stodolsky et al., 1991), resulting in this type of instruction being referred to as "traditional." This is evident across a wide range of research studies—from large scale studies of instruction (Banilower et al., 2013; T. J. Kane & Staiger, 2012; Stigler & Hiebert, 1999) to smaller-scale studies of groups of students in various contexts (Fuchs, Fuchs, Bentz, Phillips, & Hamlett, 1994; Stodolsky et al., 1991).

In contrast, in the "refigured world" of mathematics education that is the aim of reform, instructional approaches commonly involve developing conceptual understanding through problem solving (e.g., Hiebert et al., 1997; Boaler, 2002) and building on student thinking (e.g., Carpenter, Fennema, & Franke, 1996; Treffers, 1987). A concern is that traditional mathematics instruction focuses on modeling and practice of procedures and algorithms, and it commonly omits key understandings about the structure of

mathematics (Confrey, Maloney, Nguyen, Mojica, & Myers, 2009; Mulligan &
Mitchelmore, 1997; Russell, 2000). Calls for reform also express concerns that an
incomplete understanding of these mathematics concepts will have consequences for
students and schools in the context of the CCSS-M and the demands of the new
accountability tests. A lack of key understandings may affect students' abilities to reason,
justify, and problem solve—the skills that are emphasized in the content standards and
assessments (Burkhardt, Schoenfeld, Abedi, Hess, & Thurlow, 2012; National Governors
Association Center for Best Practices, Council of Chief State School Officers, 2010).

Therefore, the power relations involved in the accountability movement reinforce
the normative pressures of professional organizations and mathematics education
research (described in more detail next) to refigure the world of mathematics education.
These pressures aim to move pedagogy away from traditional demonstration-based
approaches and toward socio-cognitive practices.

Socio-Cognitive Mathematics Pedagogy

The professional development program that provides the context for this research
is based in a socio-cognitive approach to instruction. In this approach, students construct
knowledge by building on their own informal understandings as they participate in
problem solving activities and discussion. The teacher supports the development of
proficiency by gradually formalizing students' understandings (Bruner, 1964; Treffers,
1987). Progressive formalization encourages students to use and make sense of multiple
models and strategies. Discussion of these models and strategies generally follows a
concrete-iconic-abstract progression to develop conceptual understanding (Bruner, 1964).

Many empirical studies contribute to the argument for effectiveness of a socio-

cognitive approach in developing rich understanding across mathematics domains: number and operations (Carpenter et al., 1996; Fuson, 1990; Hiebert et al., 1997; Russell, 2000; Young-Loveridge & Mills, 2009); proportional reasoning (Behr, Harel, Post, & Lesh, 1992; Confrey et al., 2009; Lamon, 1993); algebraic thinking (Ellis, 2011); geometry (Battista, 2007; Jacobson & Lehrer, 2000); data and statistics (Shaughnessy, 2007). Rich understanding is described as combining the intuitive knowledge that is expressed in different problem solving contexts, the concrete knowledge of modeling those contexts, and principled knowledge of mathematics to make sense of the context and invent a strategy for solving (Treffers, 1987). It is argued that when these types of knowledge are connected to computational knowledge, such as the traditional algorithm, students will be better able to apply mathematical procedures to new situations (Bruner, 1964; Hiebert et al., 1997; Treffers, 1987).

Those in favor of this pedagogical approach describe many additional benefits: improved flexibility, fewer errors, better mental computation and estimation skills, less reteaching, and stronger development of number sense (Fuson, 2003; Treffers, 1987; Van de Walle, Karp, Bay-Williams, & Wray, 2007). Additionally, they argue that it supports students' metacognitive monitoring (Fuson, 2003), builds self-confidence (Hiebert et al., 1997; Van de Walle et al., 2007), and allows teachers to differentiate lessons to meet students' needs (Treffers, 1987; Van de Walle et al., 2007).

Even though this pedagogical approach has wide support in the world of mathematics education research, it is not familiar to most people. We generally received mathematics instruction based on a traditional model. It is often difficult for teachers to conceptualize how to implement instruction that is based in socio-cognitive pedagogy,

the refigured vision of mathematics education. Therefore, mathematics professional development programs at the center of this research aims to support teachers' reconceptualization of mathematics instruction.

Professional Development

Professional development may take place in a variety of contexts that encompass both institutional power relations (e.g., mandatory training) and social networks of power (e.g., conversations among colleagues). As an instrument of power, it places normative pressures on teachers, though perhaps with what may be considered positive intentions to increase certain kinds of knowledge, develop particular skills, improve practice, or contribute to personal, social, and emotional growth as teachers (Desimone, 2009).

With such a broad purpose across many settings, any study of the effectiveness of a professional development program to achieve its intentions must address a complex range of issues (Desimone, 2009; Goldsmith et al., 2014; Hill et al., 2013; Maddox & Marvin, 2012). The complexity of this research agenda is evident in a debate over whether there is even consensus on the features of professional development that enable it to achieve its aims (Desimone, 2009; Hill et al., 2013). Researchers who argue there is consensus point to features such as coherence, collaboration, and active and in-depth learning (Cobb & Jackson, 2011; Desimone, 2009; Desimone et al., 2002; Garet, Porter, Desimone, Birman, & Yoon, 2001; Polly & Ausband, 2009). Researchers challenging the consensus point to conflicting empirical evidence (Guskey, 2003; Hill et al., 2013) and the difficulty of isolating variables (Hill et al., 2013; Maddox & Marvin, 2012). To address these obstacles to identifying effective features, there have been repeated calls for improved frameworks for evaluation (Borko, 2004; Clarke & Hollingsworth, 2002;

Desimone, 2009; Guskey, 2000), improved research studies that can disentangle complex variables (Guskey, 2003; Hill et al., 2013; Sumsion et al., 2015), and improved standards for reporting research (Sztajn, 2011). I assert that research should also consider the normative pressures and power relations inherent in the drive to influence practice through professional development.

Even though processes involved in teacher learning have been a feature of multiple conceptual frameworks (Clarke & Hollingsworth, 2002; Desimone, 2009; Guskey, 2000), the research agenda has remained centered on the investigating effects, or outcomes, of different models (Desimone, 2009; Goldsmith et al., 2014; Hill et al., 2013). Presenting a new synthesis of research, Goldsmith et al. (2014) noted that the impact of professional development varies across individuals and contexts and that learning is an incremental and iterative process. An implication, the authors suggest, is that research should also study how programs work in different contexts and with different people. This shifts the focus from whether or not features are effective to the dynamics of teacher learning, opening the door to investigating normative pressures and power relations in different contexts and with different people. It points to the importance of studying negotiations and (re)constructions of professional identities.

Several research studies investigating models for professional development have reported an impact on teachers' learning about content and student thinking (Bell, Wilson, Higgins, & McCoach, 2010; Bray, 2011; Carney, Brendefur, Thiede, Hughes, & Sutton, 2014; Faulkner & Cain, 2013). Also, research studies have shown that professional development can result in shifts in teachers' beliefs about teaching and learning (Carney et al., 2014; Polly, Neale, & Pugalee, 2014; Saunders, 2013). Further,

professional development can have effects on teachers' self-efficacy and confidence (D.
L. Ball, 1990; Hodgen & Askew, 2007; Hudson, Henderson, & Hudson, 2015; Stevens,
Aguirre-Munoz, Harris, Higgins, & Liu, 2013). Because these studies were focused on
effects of the design of a professional development program, reported outcomes do not
present a deep qualitative discussion of how teachers experience these learning processes.

Even though these studies have reported changes in teachers, research has shown
mixed effects on instructional practice, again pointing to the complexity of issues
(Desimone, 2009; Elmore, 2007; Fullan, 2000; Hill et al., 2013). There are likely many
reasons why instructional practice may or may not change in the ways that professional
developers aim for, despite other successes in teacher learning. These possibilities
include: difficulty reconceptualizing practice in the ways professional development may
espouse (Cobb & Jackson, 2011); teachers' interpretations of the content of the
professional development are likely to vary (Penuel, Fishman, Yamaguchi, & Gallagher,
2007); and how teachers perceive implementation may be different than the how
professional developers perceive it (Bray, 2011; Polly & Ausband, 2009; Polly &
Hannafin, 2011). Also, researchers have pointed out that past experiences in professional
development may have an impact on how new professional development affects practice
(D. L. Ball, 1990; de Freitas & Zolkower, 2009; Desimone et al., 2002; Olsen, 2008).
Each of the possibilities listed here implicate teachers' knowledge, experience, and
beliefs about teaching mathematics—in other words, their professional identities.

Qualitative research studies have described how some features of professional
development can support changes in teachers' knowledge, beliefs, self-efficacy, and
practice. In addition to developing content knowledge (Hill, Rowan, & Ball, 2005;

Hodgen & Askew, 2007), many of these features provide what we might call affective or

human support (Bray, 2011; Gresalfi & Cobb, 2011). These studies suggest teachers

need: a supportive school culture that includes trust and accountability (Cobb & Jackson,

2011; McGee, Wang, & Polly, 2013); space for multiple pathways to learning (Carney et

al., 2014; MacLure, 1993); the opportunity to express emotions and concerns (Hodgen &

Askew, 2007; McGee et al., 2013); and the ability to take an evaluative stance toward the

professional development and challenge the ideas (Hodgen & Askew, 2007).

In all of the empirical research, of course, learning and beliefs varied across

teachers. A question that remains is how can we account for differences in outcomes?

Studying the processes people go through in the context of reform and factors that impact

how people experience change gives us means for considering these differences.

Research on Adoption or Resistance to Reform

Research on the effects of reform reveals that the positions a teacher may take up

run a continuum from enthusiastic adoption to vehement rejection (Bitan-Friedlander,

Dreyfus, & Milgrom, 2004; Christesen & Turner, 2014; Datnow & Castellano, 2000;

Gresalfi & Cobb, 2011). Researchers have used different frameworks for describing this

continuum. Bitan-Friedlander et al. (2004) found teachers fell into five categories when

working with mentors on curriculum reform: a.) improvers, who not only adopted but

also engage in constructive cooperation with mentors; b.) cooperators, who were willing

to implement changes but felt unable to proceed without help from mentors; c.) docile

performers who implement but without active involvement; d) worried participants who

felt external factors would prevent their success; and e.) opponents who felt confidence in

their own methods, and while appreciating the mentors knowledge, rejected the mentors

help. Datnow and Castellano (2000) found four levels of adoption: strong, general, acceptance, and resistance. Other studies describe three levels—enthusiastic, concerned, or uninterested (Christesen & Turner, 2014) and identify with, comply, or resist (Gresalfi & Cobb, 2011). Elaborating on compliance, Flores and Day (2006) describe a position of strategic compliance in which a teacher selects to adopt particular aspects of the reform. This may occur when a teacher who is new to the profession or school and feels he or she needs to "fit-in" or when the teacher believes the reform does not address the difference between the ideal and the real of teaching (Flores & Day, 2006).

Factors that impact where a teacher will fall on the continuum include past experience, personal beliefs, and perceived autonomy and agency. If past experience includes too many and too frequent reform efforts, this can lead to a hesitancy to commit or a sense of exhaustion (Brooks, Hughes, & Brooks, 2008; Hargreaves, 2005). With an acceleration of reform efforts as part of the accountability movement (Brooks et al., 2008), and the public evaluations and performativity agenda that goes with them (Day, 2002), teachers may have accumulated tensions and stress that drain energy and inhibit acceptance of more changes (Hargreaves, 2005; Kelchtermans, 2005; Lasky, 2005).

Research on responses to reform point to complex relationships with autonomy and agency. Normative expectations for reform may place limits on perceived autonomy, and teachers may feel a limited sense of agency when expected to implement an unfamiliar model of instruction (Brooks et al., 2008; Datnow & Castellano, 2000; Day, 2002; Leithwood, Menzies, & Jantzi, 1994). However, these are not the only relations identified in research studies. For example, Leithwood et al. (1994) found that alignment with personal goals, and possession of the autonomy and agency to achieve them, were

factors in commitment to change. Brooks et al. (2008) found varied responses when school-wide reforms were focused on creating a normative vision and mission. Some teachers were appreciative of the collaboration involved in the process of creating this normative culture and experienced an enhanced sense of agency. Others felt their classrooms were the only place that they still possessed any agency and autonomy and tried to isolate themselves from their colleagues as a result. Therefore, claims about agency and autonomy must consider these nuances.

Resistance to reforms can represent ideological struggle or philosophical differences (Datnow & Castellano, 2000; Day, 2002; Lasky, 2005; MacLure, 1993; Sachs, 2001). Given the difficulty of facing yet another reform, teachers need to believe that change is worthwhile (Gresalfi & Cobb, 2011). Yet, under normative pressures for a unified vision and mission, there can be little discussion and acceptance of individual philosophies and beliefs (Brooks et al., 2008; MacLure, 1993). If the ideological or philosophical basis for the reform does not align with teachers' beliefs about what is good for students, teachers may express reservations or reject the reform (Darby, 2008; Datnow & Castellano, 2000).

In terms of acceptance or adoption of reforms, Leithwood et al. (1994) describe two bases for the commitment to change. One was "moral identification" with the changes. In this case, the new practices were in better alignment with the teachers' beliefs about teaching and learning. The other base for adoption was "pragmatic", based on what investment in the process of change can provide for the teacher. Regardless of the base on which the commitment rests, teachers need to believe in the capacity of the systems they work in to achieve the goals of the reform (Day, 2002; Leithwood et al., 1994). Without

that belief in capacity, a teacher may be hesitant to commit the effort to change (Gresalfi & Cobb, 2011; Leithwood et al., 1994).

Finally, teachers' responses may change over time. Darby (2008) found that teachers' initial responses of fear later turned to excitement. Initially teachers reported decreased self-esteem and resisted implementation of the new curriculum. Some cited concerns about creating a better future for their students. Others felt an assault on their personal selves; they reported feeling "scared, overwhelmed, traumatized, or devalued" when they felt asked to "throw out everything you've ever done" (p. 1165). However, over time and with instructional support these feelings of vulnerability changed to excitement about student progress, improved self-image from recognition for their work, and pride in student success.

Professional Identities

Through a review of research, Beijaard, Meijer, and Verloop (2004) found that professional identity involves: a.) a complex collection of sub-identities; b.) continual development; c.) negotiation between person and context; and d.) a need for a sense of agency. Kelchtermans (2005) describes professional identity as a sense of being a "proper" teacher. He expands on this sense calling it a "personal interpretative framework" comprised of "the set of beliefs and representations that teachers develop over time and that operates as the lens through which they perceive their job situation, make sense of it and act in it" (p. 1000).

Studies also suggest that professional identities are combinations of sub-identities linking personal and professional aspects of self that may or may not be in harmony with one another (Beauchamp & Thomas, 2009; Cross & Hong, 2012; Day, 2002; Day et al.,

2006; Lasky, 2005; Nias, 1996; Olsen, 2008). Important aspects of self that have been identified are teachers' senses of self-efficacy, confidence, and professionalism (Kelchtermans, 2005; Saunders, 2013). Self also involved professional knowledge and beliefs (Bjüland et al., 2012; Clarke & Hollingsworth, 2002; Day et al., 2006; Kelchtermans, 2011; Lasky, 2005; Nias, 1989; Saunders, 2013). This included knowledge of content and pedagogy as well as beliefs about students, such as fixed or growth beliefs in relation to mathematics (Cross & Hong, 2012; Dweck, 2006; Saunders, 2013). Additionally, research showed teachers have strong moral purposes that are integral to their professional identities (Bullough, 2011; Cross & Hong, 2012; Hudson et al., 2015; Lasky, 2005; MacLure, 1993; Olsen, 2008). These were described as doing what is right, doing what is best for students, or furthering social justice.

Professional identities appear to go through a continual process of development. In some studies, learning through experience or professional development lead to changes in some of the components of identities just described (Carney et al., 2014; Day et al., 2006; Flores & Day, 2006; McGee et al., 2013). In some cases, when a teacher's epistemological beliefs were domain specific, the teacher enacted different professional identities depending on the teaching assignment (Olafson & Schraw, 2006). In times of change or adversity, different aspects of identity were foregrounded, particularly moral purposes, to maintain a positive disposition (Cross & Hong, 2012). Also, professional identities may change over the course of teachers' careers (Hargreaves, 2005).

Because they are continually developing, professional identities are in constant negotiation. Researchers describe ways identities shifted depending on the context in which the teacher was working, for example as a new teacher was enculturated in the

school community (Flores & Day, 2006; Olsen, 2008). When normative pressures change in a context of reform, some teachers identified with, or repositioned themselves to identify with, the evolving normative professional identity (Hodgen & Askew, 2007; Van Veen & Sleegers, 2006). Alternatively, other teachers met some of the normative expectations, or espoused some the normative beliefs (Flores & Day, 2006; Hargreaves, 2000; Polly & Hannafin, 2011; Warfield, Wood, & Lehman, 2005). Still other teachers found the normative pressures on professional identity conflicted too much with their knowledge, beliefs, or moral purposes. As a result, they resisted those pressures (Achinstein & Ogawa, 2006; Darby, 2008; James, 2011; MacLure, 1993).

Agency appears to be an important component of a professional identity (Beauchamp & Thomas, 2009). When educational changes are perceived as limits on agency, there were damaging effects on professional identity (Hargreaves, 1998; Kelchtermans, 2005; Lasky, 2005; Nias, 1989). Teachers reported experiencing diminishing agency "as responsibilities multiply without the power to choose or decide" (MacLure, 1993, p. 319). Lasky's (2005) research found several features of a reform environment that limited a teacher's sense of agency: pressure, lack of resources, unclear aims, deprofessionalization, job overload, and disjunction between teacher's sense of purpose and reform goals. However, as already noted in the discussion of autonomy and agency in reform contexts, some teachers may experience a heightened sense of agency when working as a group toward change (Brooks et al., 2008).

An important feature of professional identities is the interconnectedness of all these features—the sub-identities, on-going development, negotiation in context, and

agency (Day & Lee, 2011; Lasky, 2005; Saunders, 2013). Also interwoven in professional identities are emotional experiences.

Teachers' Emotions

Emotion is important in teaching (Hargreaves, 1998). Emotions are an integral part of how teachers view their circumstances and the conditions of their work (Cross & Hong, 2012; Kelchtermans, 2011; Nias, 1996; Saunders, 2013). Emotions play a role in micro-level interactions with students and colleagues and in responses to macro-level interactions such as responses to policy changes and reform mandates (Cross & Hong, 2012; Zembylas, 2011). Emotions affect relationships with students, parents, and colleagues (Saunders, 2013). They affect and reflect efficacy and self-efficacy (Day, 2002; Nias, 1989; Van Veen & Sleegers, 2006). Emotions influence decision-making (Nias, 1996). The process a teacher goes through under internal or external pressure to change practice is an emotional one (Hargreaves, 1998; Meyer & Turner, 2006; Saunders, 2013; Sutton & Wheatley, 2003).

Hargreaves (1998) states, "Good teaching is charged with positive emotion" (p. 316). Research has indicated some of these positive emotions are love, caring, happiness, hope, and pride (Bullough, 2011; Darby, 2008; Hargreaves, 1998; Sutton & Wheatley, 2003). Teachers reported experiencing emotions such as joy, excitement, and fun from their relationships with students (Cross & Hong, 2012; Hargreaves, 1998). Teachers also reported experiencing happiness when they are able to meet persistent challenges (Bullough, 2011; Hodgen & Askew, 2007). Recognition brought about feelings of happiness and pride (Cross & Hong, 2012; M. Schmidt & Datnow, 2005). Teachers reported joy, excitement, or happiness when they felt alignment of ideological beliefs

with colleagues (Brooks et al., 2008; M. Schmidt & Datnow, 2005).

Negative emotions stem from teachers' past experiences, external pressures, relationships with others, and a sense of loss. Negative emotions reported by teachers are typically frustration and anger, but also included disappointment, shame and guilt (Cross & Hong, 2012; Kelchtermans, 2005; Nias, 1989; Sutton & Wheatley, 2003). Hudson et al. (2015) found that negative emotions that stem from teachers' own experience as students had deep and lasting influences on how they perceived mathematics and mathematics teaching.

Perceived obstacles to progress, such as limited time and resources, also triggered frustration or anger (Day & Lee, 2011; Saunders, 2013). When teachers felt the values and practices of the institutions they work for were in conflict with their own, they reported feeling unvalued, exhausted, alienated, frustrated, and bewildered (Lasky, 2005; MacLure, 1993). The perception that policy makers were not empathetic to the needs of students was also a source of frustration (Cross & Hong, 2012). Teachers also reported experiencing anxiety and insecurity when trying new models of instruction (Hodgen & Askew, 2007; Reio, 2011; Saunders, 2013).

In relationships with students, teachers experienced anger, disappointment, frustration, or shame when students were struggling or behaving in what they consider to be inappropriate ways or appeared to show a lack of effort (Cross & Hong, 2012; Day & Lee, 2011; Sutton, 2004). In relationships with parents, teachers reported feeling stress and frustration when they felt professional boundaries were not respected or parents were not actively supporting students' learning (Cross & Hong, 2012). In relationships with colleagues, teachers reported sadness or disgust when they felt others did not invest in

students as they should (Cross & Hong, 2012).

A lost sense of control or of loss of something of value can lead to emotional response (Pekrun, 2006). Teachers experienced negative emotions in response to loss of status, confidence, ideals, agency, self-worth, and privacy (Achinstein & Ogawa, 2006; Bullough, 2011; Day, 2002; Lasky, 2005; Nias, 1996; Santoro, 2011).

It was often found that negative emotions were experienced early in a process of change. These became positive over time as teachers developed more knowledge, experience, and confidence (Hodgen & Askew, 2007; Scott & Sutton, 2009). These changes in emotions, though, did not progress along a continuum from negative to positive, but changed in a cyclical or iterative manner (Saunders, 2013; Scott & Sutton, 2009). Also, in the contexts of reform and professional development, teachers reported mixed emotions, experiencing emotions such as excitement and frustration at the same time (Cross & Hong, 2012; M. Schmidt & Datnow, 2005; Scott & Sutton, 2009). One consistent finding is that negative emotions were overcome or managed through the presence of supportive relationships from colleagues, administrators, or family members (Cross & Hong, 2012; Day, 2002; Day & Lee, 2011; Flores & Day, 2006; Hodgen & Askew, 2007; Saunders, 2013; M. Schmidt & Datnow, 2005).

Summary

In summary, this literature review describes the mathematics reform movement and the mathematics pedagogy that is the focus of the professional development described in this research. Then, the review summarizes research on professional development and presents evidence that there are many factors that influence the degree

to which a teacher will engage with new instructional practices. Among these are professional identities and emotions—mediating factors in educational change.

The interactions among professional development, reform, professional identities and emotions are complex areas that warrant further study. One area that has not been studied are the power relations and interactions that take place when teachers negotiate different understandings about what it means to be a good mathematics teacher. This research looks at a particular context—teachers faced with normative pressure from the district to change their instructional practice. It explores discourse that communicates professional understandings that include mathematical knowledge, beliefs about teaching, learning and self, and moral purposes for teaching—what I call professional identities for mathematics.

CHAPTER THREE: THEORETICAL AND CONCEPTUAL FRAMEWORK

This chapter first presents the theoretical basis upon which the research rests. It continues with three premises on which I develop my theoretical and conceptual framework.

Theoretical Paradigm

Because it aligns with my ontological and epistemological beliefs and purposes for research, I have adopted a poststructuralist approach to analyze teachers' normative and personal professional identities (Guba & Lincoln, 1994; Paul & Marfo, 2001; Stinson, 2009). Ontologically, this approach rejects the idea of an essential reality that can be objectively known or "discovered." Rather, poststructuralism asserts the centrality of Discourse in constructing our understandings of reality and our understandings of ourselves—our subjectivities—in relation to that reality (Gannon & Davies, 2007; Stinson, 2009). Here, Discourse (upper case "D") refers to all aspects of social interaction (e.g., language, beliefs, culture, historical meaning) that both shape and constrain what we think, say, and do (S. J. Ball, 2013; Foucault, 1980), whereas discourse (lower case "d") points, more narrowly, to any spoken or written language. However, poststructuralist ideas assert that all reality is discursive. This means that discourse, as spoken or written language, transmits Discourse and therefore constitutes worlds rather than merely describing them (Gannon & Davies, 2007).

Epistemologically, this approach views knowledge as transactional, subjective, and value-mediated (Guba & Lincoln, 1994; Stinson, 2009). As we question claims to

truth, we must also question our understanding of knowledge and how it is gained. Poststructuralism asserts that it is through Discourse that knowledge is created, negotiated, held, withheld, and wielded.

Truth, reality and identity are discursive formations and claims about these concepts need to be understood as historically and culturally mediated. However, and this is an important point for this project, even though this perspective describes a historically contingent reality, for all practical purposes this reality is taken as real by individuals (Guba & Lincoln, 1994). Discursive experiences inscribe and construct our subjectivities (Zembylas, 2003; Leask, 2012). Because we experience our *lives* and our *selves* in these Discourses, they are our *lived* reality.

Research derived from a poststructural paradigm can challenge power relations and disrupt limits on agency in our lived reality. Power is not simply wielded from above; it is relational and exercised, constantly and everywhere, through Discourse (Leask, 2012). Because we participate in Discourse in our lived realities, our identities are not only solely determined. Our participation and our resistance creates the conditions of possibility for our identities, a process of "self-fabrication" (Leask, 2012). Disruptions or rearticulations of Discourses work to "reconfigure agency so that we still might claim it as a possibility, albeit contingent and situated, that will assist us to conceptualize and bring about change" (Gannon & Davies, 2007, p. 73).

This way of conceptualizing agency, the subjective nature of knowledge, and the contingent nature of reality are key to the way I understand professional identities. I view a professional identity as a discursive formation that is embedded in relations of power.

As such, a discourse analysis is an appropriate means for analyzing the negotiation and (re)construction of professional identities.

Theoretical and Conceptual Framework

Three interrelated premises provide the scaffolding for my theoretical and conceptual framework for analyzing professional identities for mathematics. These three premises are:

1. The figured world of mathematics education is constructed by Discourses that define relationships of knowledge and authority.

2. This figured world shapes mathematics educators *qua* subjects and thus constitutes, though not deterministically, their professional identities, including their personal epistemologies, moral purposes, and self-understandings about the work of teaching mathematics.

3. Pressure to re-figure the world of mathematics education will lead teachers to negotiate professional identities and (re)position themselves.

<u>Premise One</u>

The figured world of mathematics education is constructed by Discourses that define relationships of knowledge and authority.

The theoretical concepts that support this exploration of professional identities and the relations between those concepts are illustrated in Figure 1. These are Discourse, figured worlds, power/knowledge, and identities. Next, I discuss each of these concepts and elaborate on the relations between them next.
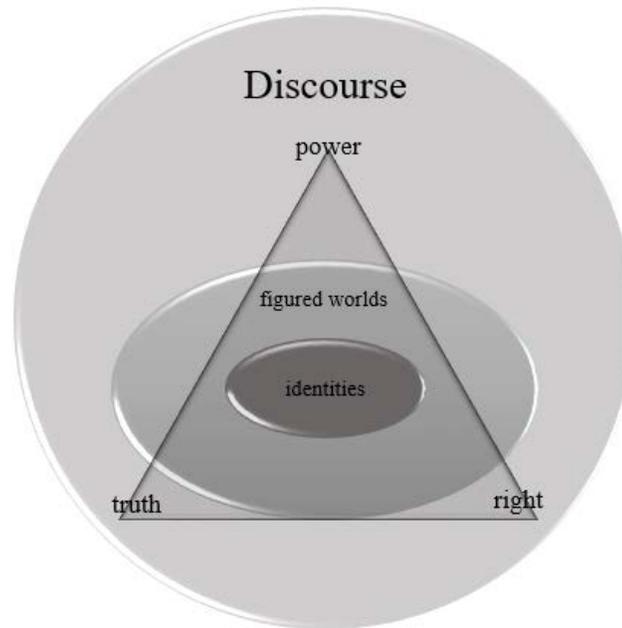
Figure 1.   Relations between theoretical concepts that support this exploration of professional identity.

D/discourse. Discourse with a lower-case "d" refers to language in real use,

including the vocabulary, grammar, semantics and broad ideas and meaning

communicated through texts in writing, visually, or orally (Gee, 2005; Machin & Mayr,

2012). In addition to written and oral text, Discourse with a capital "D" includes the way

language shapes our understandings of the world (S. J. Ball, 2013; Foucault, 1980).

Discourse with a capital "D" is the medium through which we construct "reality." For

example, Discourse related to education includes written and spoken language, non-

verbal communication (especially actions, expressions, or positionings that indicate

approval or disapproval), cultural myths about teaching, unspoken expectations,

epistemological beliefs, etc.

Figured worlds. The theory of figured worlds provides a way of describing the

construction of identities in light of Discourses. Figured worlds are the social spaces in

which we live, act, and interact (Holland et al., 1998). They are created and recreated as we interact through discourse and activity. They mediate behavior, attitudes, beliefs, and understandings about the world and how one acts in it. Figured worlds create expectations about how social situations normally unfold.

Figured worlds are recognizable to us by the presence of typical characters, discourses, activities, performances, and artifacts. These features help us to recognize that we are in a particular world, such as mathematics education, "a socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (Holland et al., 1998, p. 52).

Figured worlds encompass power at macro and micro levels (Holland et al., 1998). From a macro point-of-view, figured worlds recruit, or interpellate, us; they define the positions that are available to us. They are hierarchical productions in which we learn social relations and come to recognize ourselves and others as social types (Gee, 2001; Urietta, 2007). Figured worlds contribute to professional identities by establishing social expectations for recognition as a good mathematics teacher. These expectations are shaped by Discourse, including cultural beliefs about the purposes of education and hierarchies that position teachers relative to administrators, researchers, parents, and students (Kelchtermans, 2005; Lasky, 2005).

However, our identities are not entirely determined by macro-level expectations and social expectations. Figured worlds are created and recreated through participation and positioning (Davies & Harré, 1990). New worlds and new identities are constructed as people push against what might be externally defined as the margins. Professional

identities may change as participation in discourses influences beliefs and knowledge. Teachers may express resistance to the expectations of figured worlds through their instructional practice or by engaging in micro-political action (activity that aims at re-gaining social recognition for a particular professional understanding or practice) (Hargreaves, 2000; Kelchtermans, 2011; Lasky, 2005). They may express resistance by disrupting, changing, or using specific discursive patterns or strategies (Leask, 2012; Zembylas, 2003).

Thus, the concept of figured worlds allows for both determination and agency. While acknowledging interpellation, discursive pressure to be a certain type of person, we are not simply "sutured" to our roles (Holland et al., 1998, p. 33). Deterministic influences can be balanced by improvised action, and appraisals of outcomes of the improvised action may then influence future practices. As such, power acts not only on us, but through us as well.

Foucault and power/knowledge. The concept of power/knowledge helps draw connections between Discourses, figured worlds, and power. It describes how we can view power relations as both constraining and generative. It provides a framework for understanding power relations in mathematics education as they are enacted consciously and unconsciously.

Foucault's concept of power/knowledge explicates how power works consciously and unconsciously. Not only is power relational, as described above, there are two additional points of reference: "the rules of right that provide a formal delimitation of power" and "the effects of truth that this power produces and transmits, and which in their turn reproduce this power" (Foucault, 1980, p. 93). As shown in Figure 2,

power/knowledge is imagined as a triangle. This triangle is important for understanding

how networks of power operate in mathematics education and through professional

identities.

Power

Truth   Right
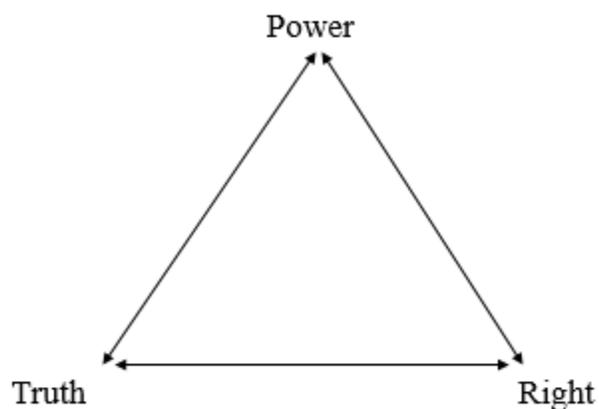
Figure 2.   Representation of relations between power, truth, and right in Foucault's
(1980) concept of power/knowledge.

Right refers to "legitimate" authority. Authority determines what counts as truth,

and this determination is an expression of power. Through these relations, power can be

both constraining and generative. One example of the work of power/knowledge can be

found in teacher professional development. The professional development facilitator's

authority may come from compulsory attendance of the teachers (right). As an authority,

the facilitator determines what instructional practices are important (truth) and, with

varying degrees of pressure to conform, what practices should occur in the classroom

(power). By making those determinations, the facilitator's authority is reinforced.

Alternatively, the professional development facilitator may engage teachers' knowledge,

experience or beliefs as new ideas are discussed and options for implementation are constructed, in a sense sharing the authority for determining truth.

With the concept of power/knowledge, Foucault describes ways power acts on, is inscribed in, and acts through people. Power is not understood as something one does or does not possess. Instead, it is a network of relations that are internalized through micropractices such as social pressure to conform to professional norms. These relations of power "permeate, characterise and constitute the social body, and these relations of power cannot themselves be established, consolidated nor implemented without the production, accumulation, circulation, and functioning of a discourse" (Foucault, 1980, p. 93). Through discourse we establish and maintain power relations. It also is the means by which power relations can shift and change. While "[p]ower in its vertical, oppressive, formation remains firmly in place, and we remain—to a huge extent—subject to it" (Leask, 2012, p. 68), power relations are also a horizontal, unceasing multiplicity. Seen this way, our attention is drawn to micropower, openings for teachers to express agency and influence how power/knowledge is enacted.

To summarize this premise so far, Discourse shapes our understanding of reality; it structures belief, thought, power/knowledge, and expectations in social interactions. These collective relations and expectations constitute figured worlds and enable the construction and recognition of identities, such as a good mathematics teacher. These relations are represented in Figure 1. In later sections I will elaborate on ideas about identities and the effect that changing Discourses may have on them. Next, I will describe the figured world of mathematics education in more detail by focusing on contrasting epistemological orientations and their implications for power/knowledge.

Epistemological orientations in mathematics education. In figured worlds of mathematics education, there are two views of mathematics and mathematical understanding: instrumental and relational (Skemp, 1976). In an instrumental orientation mathematics is primarily a set of procedures while a relational orientation is focused on mathematics as patterns and structure. Even though research literature discusses the need for both relational and instrumental understandings of mathematics, there is a strong tendency toward either/or thinking. These orientations toward mathematics instruction, as well as the discourses and practices around these orientations, can be characterized with Kuhn's (2012) concept of disciplinary matrices.

Disciplinary matrices have several components: symbolic generalizations, commitment to models, values, and exemplars (Kuhn, 2012). Instrumental and relational orientations share symbolic generalizations. These would include content of mathematics such as formulas (a= l x w) and properties (distributive, commutative, etc.). Also, the two orientations have some agreement in the commitment to models. Mathematics education is largely about modeling numerical and spatial abstractions. Models determine permissible representations and explanations. However, some reform-oriented pedagogies with a relational orientation encourage the development of understanding through a progression that begins with informal, student-generated models before the introduction of the formal, shared models (Treffers, 1987).

Further differences in the orientations are reflected in what is valued in the discipline. (These divergences are based on the *relative* value placed on various practices and knowledge.) Values include judgments about accuracy and plausibility, as well as about purposes for the endeavor. Accuracy judgments are shared by both orientations--in

mathematics there is a right answer. Judgments about plausibility are generally agreed upon, but there are differences based upon determinations of what is "reasonable" in terms of strategy or procedure. Instrumental orientations tend to value a single efficient procedure for solving a problem, rather than the idea that different strategies or procedures are appropriate in different contexts. In regard to purposes of the endeavor, there are even bigger differences. Is the primary purpose of mathematics education to promote skills or is it to promote conceptual understanding? All of these values drive choices about mathematics pedagogy, choices that are expressed as exemplars.

Exemplars are the concrete expressions of the discipline that are encountered in classrooms, textbooks, and assessments (Kuhn, 2012). This is where the greatest divergence between instrumental and relational orientations occur. Instrumental exemplars are the most common in mathematics education--teacher models a procedure, students practice the procedure, students are assessed by the number of correct answers (Darling-Hammond, 2010; Kilpatrick et al., 2001; Polly & Hannafin, 2011; Stodolsky et al., 1991). From instruction under this exemplar, mathematics comes to be seen as a static, exact discipline that puts primacy on accuracy and precision (Bruner, 2009; Lindquist, 1989; Skemp, 1976). Instrumental orientations tend to lead to instruction in bare facts and superficial problem solving (Douglass & Spitzer, 1946)—precisely the type of instruction many researchers believe will lead to lack of retention (Brownell, 1945; Bruner, 2009; Hiebert et al., 1997). Math is seen as law (Sierpinska, 1994), something that is passed down by an external authority, rather than as knowledge that is constructed as people interact with mathematics in real contexts (Lindquist, 1989).

In contrast, a relational orientation holds mathematics as a dynamic field of study centered on relationships and patterns. Mathematics understanding extends beyond accuracy in computation to an understanding of structure (Bruner, 2009). A relational understanding of mathematics, it is argued, will be more adaptable across contexts and tasks, promote better retention of learning through the development of connections and schema, and is intrinsically more motivating for students (Brownell, 1945; Hiebert et al., 1997; Skemp, 1976).

Several factors contribute to the prevalence of instrumental over relational exemplars: the nature of textbooks and accountability measures, perceptions about time demands and difficulty of relational instruction, and discomfort with shifting authority away from textbooks or teachers to the logic of mathematics itself and students' ways of understanding (Hiebert et al., 1997).

These orientations reinforce different networks of power/knowledge. Figure 3 elaborates on power/knowledge in relation to mathematics. An instrumental orientation focuses on teaching and learning a body of knowledge that is externally constructed and validated. A relational orientation values developing understanding through experience and interaction, making mathematics more of a dynamic endeavor. This orientation shifts the relations of power/knowledge toward the person interacting with the mathematics.

Power:
whose
knowledge or
ways of thinking
are valued

Truth:
what
knowledge
is valued

Right
(authority):
who validates
knowledge
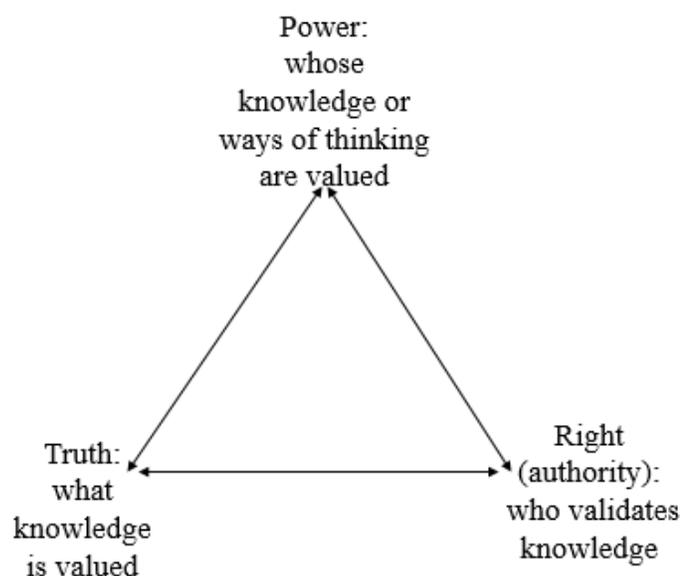
Figure 3.   Foucault's (1980) concept of power/knowledge with an elaboration on knowledge.

Changes in the context of mathematics professional development. The

professional development program at the center of this research proposes a relationally-

oriented model of mathematics instruction designed to develop both conceptual and

procedural knowledge of mathematics. Both are developed through a pedagogy that

places primacy on students' thinking and enactment of practices in the hands of the

teacher, not a textbook.

This professional development, then, may present teachers with challenges to

their understandings of mathematics instruction if those align with an instrumental

orientation, the model of instruction most common in the United States (Banilower et al.,

2013; Stigler & Hiebert, 1999). Shifting one's beliefs to relationally-oriented

epistemology upsets a traditional Discourse of external knowledge and external authority.

It replaces it with another Discourse that makes claims for valuing and building upon students' thinking and ways of reasoning about mathematics and teachers' places in enacting the practice. Thus, knowledge is viewed not as a single procedure; knowledge involves many ways of thinking and solving. This Discourse makes claims to position students and teachers together as authorities whose power to construct knowledge stems from the logic of mathematics and their ways of thinking about it and modeling it.

To summarize premise one, mathematics education is a figured world filled with characters (e.g., teachers, students, researchers), activities (e. g., classes, professional development), and competing epistemological orientations (e.g., instrumental or relational). Participation in this figured world is embedded in Discourse that includes relations of knowledge and authority. Within this figured world a teacher articulates and recognizes a professional identity—defining what it means to be a good mathematics teacher.

Premise Two

This figured world shapes mathematics educators *qua* subjects and thus constitutes, though not deterministically, their professional identities, including their personal epistemologies, moral purposes, and self-understandings about the work of teaching mathematics.

Identity. Identity is a useful analytic tool for understanding educational change. It allows a contextual and dynamic approach (Gee, 2001) that assists in analyzing tensions that arise in reform environments (Lasky, 2005; Olsen, 2008). It is a broad concept that encompasses constructs such as self, emotion, beliefs, reflection, and action in social contexts.

Because it is such a complex construct, identity has defined in many ways (Beijaard et al., 2004; Bjüland et al., 2012; Zembylas, 2003). It is generally considered to be adaptable and dynamic, rather than stable and static (Beauchamp & Thomas, 2009; Bjüland et al., 2012). As people interact in different communities with different norms (Boaler, 2002; Wenger, 1999), perform different roles (Gee, 2005; Gutiérrez, 2007; Sfard & Prusak, 2005), or position themselves in different relations (Davies & Harré, 1990; Hodgen & Askew, 2007; Sachs, 2001), they are enacting different identities. Gee (2001) describes identities as bids for recognition as a kind of person.

Through the interaction of enactment and recognition, identities are jointly constructed by the individual and the social context by Discourse and within historical frameworks of meaning (Foucault, 2013; Holland et al., 1998). Thus, we can recognize the strength that dominant Discourses have over the construction of identity. While resistance to social pressure to be a certain kind of person is possible, identities may also be "quick to compromise, interested, or sacrificial" (Foucault as cited in Leask, 2012, p. 66). Thus, a poststructuralist lens "draws attention to the importance of studying identity in cultural and political contexts where forming identities are constantly at stake" and "individuals develop a sense of agency…and construct strategies of power and resistance" (Zembylas, 2003, p. 223).

Also, by blurring the boundaries of the "personal" and the "social", a poststructural lens can accommodate identity construction as both an internal and an external experience embedded in power relations (Holland et al., 1998; Zembylas, 2003). "Theorizing identity formation from a poststructuralist perspective names simultaneously

cultural and discursive dimensions of experience, but does not neglect that these experiences are felt and embodied" (Zembylas, 2003, p. 223).

     Professional identities. Building upon the idea that identities are bids to be recognized as a certain kind of person (Gee, 2001), I describe professional identities are bids to be seen as a proper or a particular kind of teacher (Beijaard et al., 2004; Gresalfi & Cobb, 2011; Kelchtermans, 2005, 2011; Lasky, 2005; MacLure, 1993). Professional identity includes professional knowledge and beliefs (Bjüland et al., 2012; Clarke & Hollingsworth, 2002; Day et al., 2006; Kelchtermans, 2011; Lasky, 2005; Nias, 1989). It is frequently described as linking personal and professional aspects of self (Day, 2002; Day et al., 2006; Lasky, 2005; Nias, 1996; Olsen, 2008).

     Personal professional identities for mathematics. To synthesize these ideas within the figured world of mathematics education, I define personal professional identities for mathematics as combinations of personal epistemologies, moral purposes, and self-understandings about the work of teaching mathematics (see Figure 4).
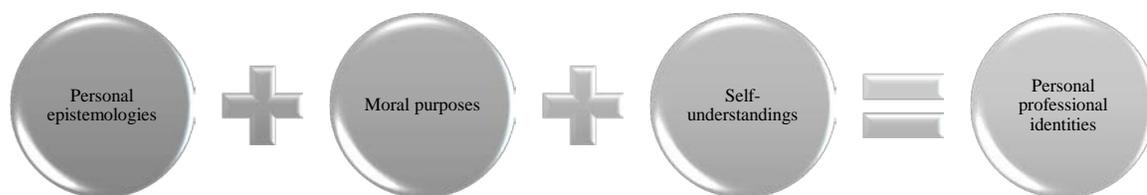
Figure 4.   Components of personal professional identities.

Personal epistemologies. A personal epistemology refers to an individual's beliefs about the nature and sources of knowledge, and how knowledge is obtained and justified. Instrumental and relational orientations toward mathematics are part of personal epistemologies. Also, fixed and growth mindsets (Dweck, 2006) and ability beliefs are part of one's epistemology.

Instrumentally- and relationally-oriented epistemologies involve different conceptions of knowledge and authority. In an instrumentally-oriented epistemology authority exists externally. Knowledge is something transmitted to the student, and the external authority holds the power to determine whether the student has knowledge. In contrast, a relationally-oriented epistemology sees authority stemming from the logic of the mathematics, knowledge is something that is constructed through building connections, and the do-er of mathematics has the power to determine reasonableness.

A review of research on students' beliefs about mathematics shows that students overwhelmingly see mathematics as a collection of discrete, unconnected facts that are transmitted from external authority (teacher, text, or "math gods") and that need to be memorized (Muis, 2004). Further, students believe that one's knowledge of mathematics is justified by the ability to quickly find one right answer. Teachers' personal epistemologies are understudied (Kang, 2008; Muis, 2004). However, one can argue that due to evidence from studies of practice (Banilower et al., 2013; Polly & Hannafin, 2011; Stigler & Hiebert, 1999), the fact that teachers were once students, and that teachers' beliefs are greatly influenced by their experiences as students (Olsen, 2008), many teachers' personal epistemologies are likely similar to those of students.

Professional identities in teaching include these epistemological beliefs about mathematics, teaching and learning (Bjüland et al., 2012; Muis, 2004). Important aspects of epistemology for this research are a teacher's beliefs about what is valuable in mathematics, who can learn mathematics, and how one learns mathematics. A teacher's epistemological beliefs mediate how he or she enacts moral purposes to do what is best for students in the classroom. The same moral justification can support very different practice.

Moral purposes. A person's moral purposes for teaching stem from their moral beliefs. Moral beliefs can be separated into two types: descriptive and normative (Sanger & Osguthorpe, 2011). Descriptive beliefs describe the nature of morality, while normative beliefs relate to what is good or right. Normative moral beliefs contribute to teachers' mathematics professional identities. These beliefs about what is good or right inform decisions about what actions should be taken as teachers interact with students individually and collectively. Normative moral beliefs also involve how teachers present material to different students based on what the teacher believes the student is capable of understanding (Bray, 2011; Warfield et al., 2005). Therefore, I define moral purposes as the purposes a teacher has for making certain decisions or taking certain actions based on beliefs about what is best for students.

MacLure (1993) found that identities were profoundly moral, "bound up with justifications of conduct and belief" (p. 312). Many researchers have shown the importance to teachers of their moral purposes (Achinstein & Ogawa, 2006; Bullough, 2011; Kelchtermans, 2011; Lasky, 2005; Nias, 1989; Olsen, 2008; Santoro, 2011). Teachers have moral reasons for entering the profession (Olsen, 2008; Santoro, 2011),

and meeting moral obligations contributes to teachers' happiness, commitment, motivation, and feelings of efficacy (Bullough, 2011; Day, 2011; Hargreaves, 1998; Kelchtermans, 2011; Santoro, 2011; M. Schmidt & Datnow, 2005).

Self-understandings. In addition to epistemology and moral purposes, many researchers emphasize the importance of personal components, such as self-esteem, self-efficacy beliefs, self-worth and/or emotion, in personal professional identity (Day et al., 2006; Lasky, 2005; Nias, 1996; Rodgers & Scott, 2008; Zembylas, 2003). Kelchtermans (2009) describes five components of self-understandings that are important to teachers' professional identities: self-image (a descriptive appraisal), self-esteem (an evaluative appraisal), motivation, perception of the task, and future perspective. Kelchtermans' case studies show how, in addition to knowledge and beliefs about teaching, all of these components go into how a teacher recognizes himself or herself or others as a "proper" teacher.

Self-understandings contribute to confidence. Research on beliefs has shown that confidence has a complex, but important influence, on teacher learning and on the implementation of new pedagogy (Goldsmith et al., 2014; Hodgen & Askew, 2007). A lack of confidence can hinder willingness to try new pedagogical approaches. Yet, while confidence is needed to try new instructional strategies, too much confidence in one's current approach can undermine willingness to try something new.

Self-understandings also are related to agency. As I use agency here, it is a self-understanding about one's relationship to context, in terms of appraisals about ability to achieve goals and act within one's value system given external conditions (Bandura, 1989; Lasky, 2005; Pekrun, 2006).

For teachers, then, personal professional identities for mathematics are evolving understandings of the work of teaching and being a teacher. These identities are shaped by epistemological beliefs about knowledge, teaching, and learning mathematics. They are also shaped by the moral purposes to do what is best for students and feelings of self-confidence and efficacy. Thus, there are strong, deeply held beliefs on which a personal professional identity is constructed.

<u>Premise Three</u>

Pressure to re-figure the world of mathematics education will lead teachers to negotiate professional identities and (re)position themselves.

When understandings about what makes a proper teacher were contested, Kelchtermans' (2011) participants engaged in a politics of identity. This politics involved actions "aimed at (re)gaining the social recognition of one's professional self-understanding" (p. 78). The management of others' perceptions can be communicated by one's positioning relative to normative pressures and power relations. Following the work of Gresalfi and Cobb (2011), I organize these positions into three types: identification, compliance, and resistance.

When normative pressures change in a context of reform, a teacher may identify with, or reposition himself or herself to identify with, the evolving normative professional identity (Hodgen & Askew, 2007; Van Veen & Sleegers, 2006). Alternatively, the teacher may attempt to comply by meeting some of the normative expectations, or espousing the normative beliefs, without fully changing his or her epistemological beliefs (Flores & Day, 2006; Hargreaves, 2000; Polly & Hannafin, 2011; Warfield et al., 2005). Also, a teacher may find the evolving normative professional identity conflicts too much

with his or her personal professional identity and, as a result, resist the normative pressures (Achinstein & Ogawa, 2006; James, 2011). Gresalfi and Cobb (2011) argue identification, compliance, or resistance to normative pressures are all forms of agency that "provide evidence of the kinds of personal identities" that are developing (p. 274).

These stances do not come only from challenges to personal professional identity; they can come from prior experiences with or the cumulative effects of reform (Desimone et al., 2002; Hargreaves, 2005; Olsen, 2008). Education reform and accountability movements have increased the pressure on teachers (Day, 2002; Lasky, 2005; Van Veen & Sleegers, 2006). Such environments can intensify feelings of vulnerability or damage motivation, job satisfaction, or self-efficacy (Day, 2002; Hargreaves, 1998; Kelchtermans, 2005). Teachers may support the direction of reform, but they may feel concern about changes they are ill-prepared to make. Teachers may feel that lack of resources or increased workload hinders their ability to enact new practices (Day, 2002; Lasky, 2005).

Summary

In this chapter I have presented theoretical and empirical support for three assumptions. First, the figured world of mathematics education is constructed by Discourses that define relations of knowledge and authority. Second, professional identities for mathematics are constituted by a combination of personal epistemologies, moral purposes, and self-understandings about the work of teaching mathematics. Third, pressure to re-figure the world of mathematics education will lead teachers to negotiate professional identities and (re)position themselves.

In the following chapter I will provide a rationale for using discourse analysis in this research project. I demonstrate how this methodology supports an exploration of these premises in the context of a professional development session. Then, I describe my own personal professional identity. This is followed with a description of the context for the study and methodological procedures of discourse analysis that used to conduct this research.

CHAPTER FOUR: METHODOLOGY

The purpose of this research is to examine discourse that takes place during a mandatory professional development program aimed at changing mathematics pedagogy. This involves an exploration of how professional identities for mathematics are expressed, reconstructed, and negotiated as the figured world of mathematics undergoes change. In this chapter, I provide a rationale for using discourse analysis (Gee, 2005) as a methodology for exploring discourses around professional identities for mathematics, linking the methodology to the theoretical and conceptual frameworks described in the previous chapter. Also, I describe my personal professional identity in order to consider how it is at play throughout my research. This is followed by a description of: the context, setting, and participants in the research project, how the data were collected, and the data analysis methods used. After that, I will discuss issues of validity in relation to discourse analysis. The chapter then concludes with the limitations of the research.

Selection of Methodological Procedure

Language is a system of communication. We have learned it so well that most of the time we do not "think" about what we are saying, we just say it. However, everything we say contributes to the construction of meaning and the construction of reality. In ordinary conversation we do not usually notice this process of construction. It becomes apparent when we feel misunderstood, when we cannot find just the right word, when we take offense to something someone has said, etc.

This discourse analysis is based on the assumption that we use language to construct and reconstruct the figured worlds we live in. For instance, when teachers interact in a professional development session, they (re)create a figured world of mathematics education drawing upon multiple sources—the conversations and activities they are engaged in during the professional development, the conversations and their experiences in the past, and the conversations about education in the larger contexts of school cultures, education reform, and society.

Discourse analysis is a method of studying discursive practices, the ways in which we produce reality (Davies & Harré, 1990). It allows us to see language in action, as people make bids for identities (Gee, 2001) or take up certain sorts of positions (Davies & Harré, 1990). Therefore, discourse analysis is an appropriate methodology for investigating the negotiation of normative identities in the figured world of mathematics education.

Discourse analysis is a recursive process of analysis of linguistic structure and language in context. There are many different approaches to discourse analysis, each approach providing tools that facilitate exploring different questions. Gee's (2005) method of discourse analysis provides useful tools for exploring professional identities in contexts of reform and professional development.

Gee's (2005, 2014) method of discourse analysis is made up of tools and strategies that are applied to spoken or written text. Gee states that the tools and strategies should be "continually and flexibly adapted to specific issues, problems, and contexts of the study" (2005, p. 6). They guide inquiry into issues and questions. Some tools focus attention more directly on linguistic structure, others more directly on context. They can

be used flexibly and transformed to align with the study. However, if the transformations move too far from the underlying theory, the tools become less productive. This give-and-take provides flexibility to follow the data where it leads while constraining interpretations in such a way that they remain theoretically sound.

Role of the Researcher

Here, I describe my personal professional identity in order to consider how it is at play throughout my research. From a poststructuralist perspective, relations to our research are not limitations. As Zembylas (2011) writes, "we cannot fully grasp what people are at, without having experienced something similar; emotional connection with what is studied is deemed essential" (p. 38).

Poststructural theory also maintains the importance of remembering that theory, methodology, and writing are inseparable (Gannon & Davies, 2007; Stinson, 2009; Zembylas, 2011). Theories are ways of talking about the world, and as such, they construct models of reality. These theories, or models of reality, then influence methodological choices, interpretations, and writing. Each of these practices, in turn, construct and re-construct those models of reality. Theory does not "emerge" from the data; theory is applied to the data (Stinson, 2009). At every point in the research process are people—the theoreticians, the participants in research studies, and the researchers. Our personal professional identities, our beliefs and emotional experiences, and the power relations we are embedded in play a role in how models of reality are (re)constructed. Therefore, my analysis of the data is a description of how I see things through a poststructuralist lens.

Here I describe my beliefs about mathematics and learning. The characteristics of a professional identity I identified in the conceptual framework—personal epistemology, moral purposes, and self-understanding—are embedded in these beliefs. These beliefs center on the idea of identities—professional identities in the case of teachers and mathematics identities in the case of students.

I am a graduate student who worked as a graduate assistant with the facilitators of the professional development for two years. Also, I hold a graduate certificate in the socio-cognitive model of instruction that is being presented in the professional development program. At the time of this research, I was working at the same university for another project unrelated to the professional development.

As a researcher, I want to know how refiguring the world of mathematics education impacts teachers—how reform pressures teachers to position themselves and possibly reconstruct their professional identities for mathematics. Questions about mathematics-related identity are important to me because I believe it is difficult to deny the value that being good at math has in our society. Students' mathematical identities are influenced by their teachers' pedagogical practices and implicit beliefs. Many elementary teachers say, "I'm just not a math person." Their instruction may communicate a variety of negative assessments about mathematics to their students in implicit ways. Many secondary math teachers have often chosen this career because they were successful in learning procedures in the traditional way from an instrumental paradigm and, therefore, reproduce that model. I believe a result is that mathematics classrooms often discourage students, lack relevance, and hinder students' ability to understand and apply concepts (Hiebert et al., 1997).

As a teacher, student, and researcher, I have met too many people who believe they are not capable of success in mathematics and are even afraid or anxious about mathematics. Unfortunately, reform efforts still have not significantly affected people's attitudes toward math or encouraged people to see themselves as capable in math. If mathematics curriculum and classroom cultures are not engaging or do not have relevance to students' lives, they will alienate those students. If the instructional practices do not develop students' understanding, there will be little reason for students to feel they are capable of doing mathematics. And, yet, that is precisely our aim as mathematics educators. In describing a vision for mathematics, the NCTM makes the point that developing one's mathematical abilities is important in life (e.g., finances, quantitative reasoning, understanding statistics), for the workplace, for scientific and technical knowledge, and as a part of cultural heritage (e.g., aesthetics and recreation) (NCTM, 2000).

In addition to my concerns about mathematics instruction, I have concerns about the well-being of teachers. I left teaching after 16 years, eight in elementary classrooms and eight in middle school classrooms. After many years of accountability pressure, stagnant test scores, decreased funding, increased workloads and feeling devalued as a professional, I decided to quit teaching. It was an incredibly difficult decision to make. My early years as a teacher were filled with nervousness, excitement, and joy. My last years as a teacher were filled with exhaustion, frustration, and anger. As a result of this experience, I feel sympathy for the struggles teachers experience—struggles that come with the job and struggles that come with reform.

Perhaps my most fundamental reason for pursuing questions of identity is that they grow directly from an existential slant to my poststructural outlook; the responsibility we have as educators is to recognize and value the individual. I believe everyone sees and understands the world in different ways. While I recognize that constraints are placed on us by Discourses, I believe that everyone should have the opportunity to develop his or her unique self. An important component in accomplishing this is an ability to be reflexive about the impact of one's own actions, thoughts, and beliefs on others. It is important that I recognize my beliefs about mathematics instruction are not shared by all, may not be appropriate for or accepted by all, that my beliefs are part of a Discourse (with all of its restrictions and possibilities). We are choosing, free, and responsible individuals who are bound to honor those features in others as well (Morris, 1966). I believe epistemology and moral action are intertwined. I feel this research topic, aiming to document teachers' experiences, honors those beliefs.

Additionally, I have to acknowledge that my subjectivity as a white woman in our society has developed in ways that may be problematic in light of this research. Racist, classist, and gender stereotypes are deeply embedded in our culture, and I have certainly internalized those stereotypes in ways of which I am not aware. I wish to acknowledge those stereotypes and to continue to practice and to develop ways of thinking that dispel them. Throughout the research process and into the future, it is critical that I maintain awareness that I have asked teachers to allow me to share my interpretations of their discourse and to make claims about normative or personal professional identities. As female, white, and now a doctoral student, I may represent many things to the teachers, including authority and oppression. I may be "out of touch" with their lived realities.

Therefore, I have a responsibility to communicate that we have entered into a relationship in which I will aim to continually honor their identities. I must show that I value these identities and aim to support teachers' senses of well-being, agency, and efficacy.

Context: Mathematics Education Reform

National Context

Normative pressure to change instructional practice and refigure the world of mathematics education comes from institutions that have a nation-wide reach. The NCTM has called for curriculum and pedagogy reform since the publication of Curriculum and Evaluation Standards for School Mathematics in 1989 (NCTM, 1989) and the Principles and Standards for School Mathematics in 2000 (NCTM, 2000). These documents reflect a relationally-oriented epistemology that emphasizes problem solving, communication, reasoning, and justification. Until recently, most state standards emphasized simple facts and computational fluency (Schmidt, 2012). Now, however, the CCSS-M (National Governors Association Center for Best Practices Council of Chief State School Officers, 2010) shifts curricular discourse toward relationally-oriented practices in many states across the country.

State Context

In the state in which this research takes place, normative pressures to change mathematics pedagogy have intensified in recent years. The state legislature formally adopted the CCSS-M in January of 2011, pushing the teachers, schools, and districts to place a stronger emphasis on relationally-oriented curriculum, pedagogy, and assessment. In an effort to improve mathematics education in the state, the State Department of Education (SDE) instituted a math initiative in 2008. The SDE stated that this initiative

would give teachers access to research-based professional development and resources they need to participate in "innovative and comprehensive change in math education" (source: SDE website).

As part of this initiative, the SDE had the following aims: every elementary and math teacher in the state would complete a three-credit course focused on math content pedagogy; regional training workshops would be provided for math educators; and, mathematics specialists would be available in every region of the state to help continue professional development. The professional development program at the center of this research is part of this initiative and therefore participates in part of the power relations associated with the SDE. The school district's request to participate in the professional development is an outgrowth of the initiative.

District Context

This professional development program took place in a district located in a suburban/rural community in a northwestern state. In 2014, the district served approximately 15,000 students in 25 schools ranging from pre-K to 12th grade. The population was 63% White, 30% Hispanic, and 7% Other. Sixty-six percent of these students qualified for free or reduced lunch. Approximately 6% of the students were identified as English Language Learners, approximately 9% qualified for Special Education services, and approximately 6% of students qualified as homeless (Source: school district website). The state and district websites do not provide demographic on the teachers.

The state uses a five-star rating system to evaluate school performance. This system includes measures of academic growth, academic proficiency, and participation in

testing. In the 2012-2013 school year, of the elementary and middle schools in the district, 40% received a 4-star rating, eight schools40% received a 3-star rating, and 20% schools received a 2-star rating. Also in the 2012-2013 school year, an average of approximately 22% of students in grades 3-8 scored basic or below basic in mathematics on the high-stakes accountability measure (Source: school district website). The approximate percentage by grade level is given in Table 1.

Table 1

Percentage of Students Scoring Basic or Below on 2012-2013 Achievement Tests

Grade level	Approximate percent of students scoring basic or below basic
3rd grade	11%
4th grade	15%
5th grade	24%
6th grade	30%
7th grade	27%
8th grade	24%

Note. Source: school district website.

In 2014, the district published a strategic plan for increasing achievement that focuses on curriculum implementation and support systems for student success. In 2014, the district adopted standards-based report cards for grades K-5. The district requested the professional development program to provide support for teachers in implementing the CCSS-M (Source: district website).

Mathematics Professional Development Program

This professional development program was chosen because it represents a case that has not been studied in the research literature. This is a case of mandatory professional development in which the institutional (district and state) normative pressures for pedagogical reform align with the aims of the professional development

program. These normative pressures may or may not align with the personal professional identities for mathematics held by the participating teachers and their colleagues.

The professional development program is based in socio-cognitive learning theories. The principle tenets are that students construct knowledge through active learning and discussion. The teacher facilitates this process by selecting tasks that build upon and progressively formalize student thinking (Treffers, 1987).

The program's goal is to effect a transformation in instruction by demonstrating how teachers might connect models (representations) of thinking and structural components of mathematics to the CCSS-M. Further, the program aims to develop teachers' knowledge of progressions of representations and how to design instruction around students' thinking using these progressions. The design of the program includes: a.) focusing tasks that provide launching points for discussion of models and structural components, b.) study of model progressions; c.) analysis of generic student work; and d.) analysis of the teachers' own students' work.

I conducted this research on discourse from a grades 6-8 professional development meeting that took place in mid-November. This meeting was the second of four meetings held throughout the year. The second meeting was selected as appropriate based on several assumptions. The initial professional development meeting, which I attended and at which I took field notes, took place at the beginning of the school year as teachers were just returning to work and situating themselves in their classroom contexts. During the first professional development meeting, teachers may be more reticent to voice any concerns or questions. Waiting for the second meeting provided time for teachers to have established a routine in their working day, begun instruction, gotten to

know their students. It also likely allowed time for initial reflections on the mathematics

pedagogy presented in the first meeting. The facilitators have found that, in the past,

teachers voice more concerns and ask more questions after there has been time to

consider the ideas in the context of their classrooms and develop relationships within the

professional development meetings.

Participants in the Professional Development Meeting

The participants in the professional development meeting were a group of grades

6-8 mathematics teachers. I do not have demographic data for the teachers (addressed

further in the limitations). National averages of teacher demographics indicate that 76%

of teachers are women, 44% are under the age of 40, and approximately 85—90% of

suburban and rural teachers are white (Source: National Center for Education Statistics

[NCES], 2015, "Demographic characteristics"). Thirty-six teachers attended the meeting,

twenty women and sixteen men, indicating a higher proportion of men than the national

average.

<u>Consent</u>

First, I sought and received approval for the project from the district

administration. Then, at the first professional development meeting, I was introduced to

the professional development participants by the district's middle school coordinator,

Lynda[1], and the professional development facilitator, Gladys. I explained the purpose of

the project, how the data would be collected at the next meeting, and how confidentiality

would be ensured. I also explained that only those who agreed would have their discourse

included in analysis. I would ensure this was the case by manually editing the recording.

This would involve a mapping of room that identified participants, recording in notebook

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[1] All names are pseudonyms.

when a participant is speaking, and transcribing only those portions of the discussion. Then I stated that teachers were welcome to ask any questions either that day or by contacting me through email. If deep concerns were expressed by participants, I was prepared to remove myself from the location and propose my research with another group of teachers. At the second meeting, I again explained the purpose, data collection, and data analysis. I offered the opportunity to ask questions at any time throughout the day. All teachers agreed to allow me to record and transcribe the discussion.

<u>Protecting Participants.</u>

All video and audio recordings were uploaded to the secure Google drive through Boise State University immediately following the meeting. All video and audio data were deleted from recording equipment after being stored digitally. Also, all electronic data files are in a password-protected folder. To ensure confidentiality, I use pseudonyms for all participants in the meeting, schools, the district, and any other identifying programs in all transcriptions. All participants are encouraged to review the data and analyses.

Data Collection

<u>Observation</u>

Observation of the professional development workshop was important because the discourse affects and is affected by the context in which it occurs. I observed the first professional development meeting in September as well as the meeting in November to take note of any important contextual factors that would affect the analysis. I recorded two-column notes consisting of descriptive information and reflective thoughts. These notes included: time; description of the setting; organization of the room; goal and nature of activities; and description of the topics discussed.

Field notes at the second meeting were more detailed. However, the room was very crowded and the organization of the space prevented me from being able to record detailed information about non-verbal communication—it was simply impossible to see everyone. In addition to features included in the first set of notes, my reflective notes included initial impressions and thoughts about feeling and tone of the professional development and the events to which I attributed the feeling or tone.

Audio Recording of Discussion

At the first meeting, I studied the layout of the room and determined that several recording devices would be needed, as well as someone to help me run them. Therefore, I brought two video recorders, two tablets, three audio recording devices, a Swivl robot and microphone (worn by the professional development facilitator), and extra power packs and batteries. With participants' agreement, the three audio recorders were placed on tables throughout the room. With these devices I was able to capture some of the small group discussions.

Also, a fellow graduate student volunteered to help run this equipment. I was very grateful to have her help, because devices needed to be turned on and off frequently to limit the size of a particular file for easier upload and use. Also, some devices needed to be charged directly through an outlet, so we had to rotate device use.

Data Storage

I kept results of each phase of analysis in separate digital files and individual sections of a binder. During each phase of data analysis, I recorded notes with thoughts, questions, and reflections about the data and reflexive thoughts about my role as an analyst. To organize this process and provide an audit trail, I have a master list of the data

gathered, including field notes and the number and type of recording instruments and the times at which they were in operation. I also have a master list of all analysis-related documents and electronic files.

Upon completion of the project, all electronic data will be stored on the private servers provided by OIT at Boise State University for three years. All paper copies of data that are part of this study will be kept the dissertation advisor's office on campus for 3 years. Only the principal investigators will have access to the data.

Data Analysis

I divide the analysis process into five phases. Next I provide a description of the strategies, tools, and terminology involved in each phase. It is important to note that discourse analysis is an iterative process. However, for the sake of clarity, I present the analysis in a linear manner.

Transcription

The first phase of data analysis is transcription of the data. I transcribed the video and audio recordings recursively, listening to and fully transcribing one recording at a time. This allowed me to return multiple times to each section of the transcript and verify, refine, or adjust the transcription according to the data on each recording.

Decisions an analyst makes about transcription are interpretations of data and the presentation of the transcription in turn affects interpretation (Ochs, 1979). The transcription conventions I selected are found in Appendix A. As the analysis continued, it was important to consider whether the demarcations of text were reasonable or if an alternative transcription would better fit the data and context. On many occasions, it was

necessary that I go back to the audio and video files and consider whether the transcripts needed to be adjusted.

I used two levels of detail in the transcripts during different phases of analysis. A more detailed transcript is referred to as narrow, a less detailed transcript is broad. One means of verifying interpretations is to consider them in light of different levels of detail. Interpretations can be thought of as more trustworthy as increasingly narrow or increasingly broad transcriptions fail to reveal disconfirming evidence. After analysis at one level, I returned to the other level reconsider my interpretations.

In the broad transcription, I identified each speaker with a unique code and a pseudonym. I recorded the speech as complete sentences, and the entire transcript reads like a script for a play. The aim of this transcript is to tell the "story" of the full day of professional development. This transcript helps put the details of the narrow transcription in context and aids with making judgments about an aspect of validity called "coverage" (described later in this chapter). Once the broad transcript was complete, I used it to identify portions of the day with which to begin a more detailed transcription and analysis (see also the discussion of "theoretical tools").

In the narrow transcript, I organized the speech into lines and macro-lines (Gee, 2005). A line is a small unit of speech made up of phrases or phrase-like units that have an intonational contour and often provide one piece of salient, new information (Gee, 2005; Gumperz & Berenz, 2014). These are usually following by a slight pause or hesitation. I used stress, intonation, and knowledge of the context of the discourse to break the text into these segments. Macro-lines are two or more lines that are linked together in some way to form a sentence or a sentence-like structure. Macro-lines will be

numbered. Lines within macro-lines will be given letters. The macro-lines and lines within a piece of text might be numbered 1a, 1b, 2a, 2b, 2c, and so on.

The transcription conventions I used can be found in Appendix A. Here I will give a brief description of these conventions. Within each line, words or phrases that receive the most stress are underlined. In some cases a double underline (here) indicates stronger stress than may be expected or is typical of the surrounding speech. Symbols are also used to indicate truncated words (-), falling tone (\), rising tone (/), laughter (@), etc. Pauses are indicated in three ways. Short pauses are marked with two dots (..). Longer than expected pauses are indicated with three dots (…). Pauses over one second are indicated with three dots followed by the number of seconds in parentheses (… (3)). It is common for discourse analysts to indicate the length of a pause to the nearest tenth of a second (Du Bois, Schuetze-Coburn, Cumming, & Paolino, 2014). However, this analysis is interested in the effect that pauses, as well as stress and intonation contours, have on the situated interpretations of the discourse. Therefore, I use an interpretative evaluation length, such as longer than expected for this speech pattern, rather than absolute duration (or absolute degree of tone, pitch, etc.) (Gumperz & Berenz, 2014). When the number of seconds are recorded for pauses, these are given in whole seconds rather than tenths, again to emphasize the comparative duration rather than absolute duration.

<u>Theoretical Tools</u>

In the second phase of data analysis, I first read the broad transcript coding inductively but with attention to issues of identity, power/knowledge, and emotion. With this reading I identified recurring themes across the day and entry points for deeper analysis. Based on the purpose of the research, the structure and interactions in the

professional development session, and this initial reading (Wood & Kroger, 2000), I selected teachers' mid-day and end-of-day reflections for further analysis.

I analyzed the reflections using the Gee's (2005, 2014) six theoretical tools: social languages, Discourses, intertextuality, and Conversations, situated meanings, and figured worlds. These tools are described in Table 2. While I used all six tools in the first reading, I found that the figured worlds tool was most productive. Therefore, I drew on this tool more often in later phases of analysis. I describe this tool in more detail next.

Table 2

Theoretical Tools for Data Analysis

Tool	Description	Focus of Analysis
Social languages	Ways of speaking associated with different social purposes	What social language(s) are involved? What sorts of grammar patterns indicate this?
Discourses	Ways of acting, being that indicate understandings about reality	What Discourse(s) is/are involved? How is "stuff" other than language relevant in indicating socially situated identities and activities? How are different Discourses aligned or in contention?
Intertextuality	Use of other texts directly or indirectly	How does intertextuality work in the text? What function does intertextuality serve?
Conversations	Public discussions or debates about long-standing issues	What Conversations are relevant to understanding this language and to what Conversations does it contribute (institutionally, in society, or historically), if any?
Situated meanings	Meanings and implications of key words or phrases in this particular context	What situated meaning(s) for a given word or phrase is it reasonable to attribute to their speaker and listener considering the point of view of the Discourse (or other Discourses) in which words were used?
Figured worlds	Theories about the world that people use to create meaning from language	What participants, activities, ways of interacting, forms of language, people, objects, environments, and institutions, as well as values, are in these figured worlds?

Note. Adapted from Gee (2005, 2014).

Figured worlds. A figured world helps people make sense of the world. It is comprised of understandings of typical settings and interactions. Figured worlds are normative, and as such, are important tools that mediate between micro and macro levels of interaction. This discourse analysis tool involves considering what typical settings or interactions "the words and phrases of the communication are assuming and inviting listeners to assume" (Gee, 2014, p. 183). When using this tool, I made note of the significant characters, activities, settings, and artifacts that were present in the discourse. Also, because figured worlds encompass our understandings of what is typical in a social situation, I made note of discourse related to typicality and change. Finally, several teachers used spatial or temporal references, so I added these to my analysis.

At first the analysis of mid-day and end-of-day reflections were organized in Excel in the form of matrices (Miles, Huberman, & Saldaña, 2014). The rows are headed by line numbers. Columns are headed with the theoretical tools. Inside the cells, I recorded key words and phrases from the transcriptions. I used each matrix to organize the information and then write interpretive descriptions that were closely tied to the language used in the lines. These descriptions which were recorded below the matrix. At the end of this process, I wrote analytic and reflective memos that were used in later stages of the research.

As a result of this process, I selected the end-of-day reflections for deeper analysis. When I returned to the end-of-day reflections and the figured world tool, I reconstructed the matrix with the pseudonyms in rows and aspects of figured worlds as column headers. In the cells, I recorded quotes from the text and my reflections.

<u>Linguistic Detail—Form and Function Analysis</u>

Gee (2005, 2014) also includes linguistic analysis as an important part of discourse analysis. My third phase of analysis turned to linguistic details in a form and function analysis based on functional grammar (Halliday & Mathiessen, 2014; Thompson, 2004). The premise of this analysis is that we use language to simultaneously talk about and accomplish things. Form refers to the structural elements of phrases and clauses such noun phrase, verb, or adverb. Function refers to the meaning, work, or purposes of the forms, such as Subject, Predicator, or Complement. (In functional linguistics, lower-case terms refer to a structural element. Upper-case terms refer to functional roles played by the elements.). For example, a form such as a clause may have the function, or purpose, of asserting or making a claim. However, if a dependent conjunction is added to the clause, it may change the work of the clause from assertion to assumption. Form and function relationships determine the *meaning potential* of the form. This form and function analysis looked closely at three metafunctions of language: interpersonal, experiential, and textual (Halliday & Mathiessen, 2014; Thompson, 2004).

<u>Interpersonal metafunction.</u> The interpersonal metafunction involves the how forms are used to respond to and interact with others. We communicate with a purpose, whether that be to gain or give information, influence opinions, elicit a behavior, etc. The interpersonal metafunction helps us achieve this goal.

This metafunction focuses on Mood and modal Adjuncts. The Mood is made up of a Subject and a Finite (usually an auxiliary verb) which are the basis for validity claims. The Subject functions as "the entity…that the speaker wants to make responsible for the validity of the proposition being advanced by the clause" (Thompson, 2004, p.

53). The validity itself is addressed in the Finite in three ways: temporality, or whether the proposition is valid in the past, present, or future; polarity, or whether it has positive or negative validity; and modality, or the extent of its validity. Fused Finites refer to the present tense when the auxiliary verb is understood. For example, "I write" has a fused Finite, the verb "do" is unstated. In past and future tenses, the "do" would reappear.

The presence or absence of modal structures (e.g., helping verbs and adverbs) indicates the degree or type of validity claim the speaker making about the statement. Take the sentence, "You haven't been helping with the housework very much lately." The Subject, or responsible entity, is "you," and the Finite is "haven't". The modal Adjuncts in this sentence are "very much" and "lately." Together these elements create a validity claim that places responsibility on the listener for not engaging in an expected behavior. The claim communicated by that sentence is different from this claim: "You have done nothing to help." The modal structures combine to create a different type of meaning.

An additional aspect to consider in the degree of commitment to a claim is the intonation pattern of the clause. Halliday and Mathiessen (2014) identify intonation patterns that are typically associated with types of validity claims for declarative clauses: a.) falling intonation is associated with an unmarked, factual, taken-as-given statement; b.) falling followed by rising intonation is associated with a reserved statement; c.) rising followed by falling intonation is associated with an insistent statement; d.) flat intonation is associated with tentativeness; and e.) rising intonation is often associated with protest.

Experiential metafunction. The experiential metafunction involves the structures that communicate the content of the message rather than the purpose. This metafunction communicates our experience of the world and the events or relationships in it.

One aspect of the experiential metafunction is the way clauses are constructed and coordinated. For the purpose of this discourse analysis, clauses are considered units of meaning associated with verbs or verb phrases. Relations between clauses signal the way pieces of information are connected. One clause may be subordinated to another. This "downgrading" makes the information less salient, treats it as background information, or as something assumed by the speaker. Coordinated clauses equally foreground two pieces of information. Alternatively, a speaker can create separation by placing related ideas in different clauses. These relations show ways ideas are connected or disconnected, and ways that speakers can give differential importance to ideas.

The experiential metafunction also deals with participants involved in processes in certain circumstances. Processes describe the event or the state of being in a clause. There are six process types: material, mental, relational, behavioral, verbal, and existential (Halliday & Mathiessen, 2014). Normally, clauses have at least one participant that is the "do-er" of the process, usually in the Subject role. In this role the participant is given a different functional label, depending on the type of process (eg., an Actor corresponds with a material Process and a Senser corresponds with a mental Process.) Other participants are found in the Circumstances—these might be what we think of as direct and indirect objects or objects of a preposition. To simplify the reporting of findings, I use the term Participant to indicate the "do-er" of the process; other participants are described as part of the Circumstance.

To return to our example, "You haven't been helping with the housework very much lately," the word "helping" functions as a material Process. "You" and "housework" are participants. "You" functions as the Participant. The Circumstance includes both "with the housework" and "very much lately." (Note that "you" and "very much lately" had different functional labels in the interpersonal metafunction.) Selection of Participants, Processes, and Circumstances can be important. If we change these, we communicate a new experience, "I feel like you aren't helping me around the house."

Textual metafunction. The textual metafunction creates cohesion across speech or writing and contributes to how information is taken as given or salient. This includes ways previous statements are taken up in new statements in an affirmative or disconfirming manner and how the speaker can structure the sentence to then foreground certain aspects of the content.

The textual metafunction operates in three ways: repetition, conjunction, and thematization (Thompson, 2004). Repetition includes using the same word, a synonym, or repetition of meaning, such as when the word "that" in a Subject position carries meaning from the previous sentence. Conjunction refers to the use of coordinating and subordinating conjunctions. Thematization is more complex. The Theme is the first constituent of the clause which "serves as the point of departure of the message" (Halliday & Mathiessen, 2014, p. 89). It contextualizes the message the speaker wants to communicate. Everything that comes after the Theme is called the Rheme.

In our example, the Theme is simply the word "you." If we modify the sentence to say, "When I started my new job, I realized you haven't been helping with the

housework very much lately," we have a new Theme that recontextualizes the sentence: "when I started my new job."

Using the metafunctions. Together these three metafunctions describe the way a message is communicated. I used these metafunctions to conduct a detailed analysis of the end-of-day reflections. I selected fourteen teachers' contributions that I felt, based on the figured worlds analysis, represented a range of possible positions. For each of these, I conducted an interpersonal, experiential, and textual metafunction analysis. As I did so, it was important to consider alternative ways of reading the text in order to test the emerging themes or hypotheses from the earlier analysis. To consider alternative explanations, I asked why the text was spoken in the way it was and what effect a different, but similar, arrangement of words would have had (Gee, 2014). Also, I reconsidered the text from the broader context of the day. These contrasts helped reveal confirming or disconfirming evidence for the emerging themes.

Building Tasks

The fourth phase of analysis centered on using Gee's building tasks. Gee (2005) states, "[w]henever we speak or write, we always and simultaneously construct or build seven things or seven areas of 'reality'" (p. 11). The building tasks are summarized in Table 3 and described next.

Significance. The function of this task is to ascribe significance or importance to something. As an example of significance, contrast the following statements: "Guess what? My class FINALLY seems to be able to add fractions!" and "We were adding fractions today in class. It seemed to go well." The first statement makes the event more significant.

Activities. This task analyzes how language is used to enact and be recognized for engaging in a type of activity, such as opening a committee meeting or greeting a friend. Language is used differently when teaching a math lesson to students than it is when learning through professional development.

Identities. This task analyzes how language is used to enact or be recognized as particular identity, such as a teacher, an administrator, or a researcher. This task is important for this research because the issue for exploration is how language is used to enact and be recognized as a good mathematics teacher.

Table 3

Building Tasks

Building Task	Function	Focus for Analysis
Significance	To ascribe importance to something (or not)	How is this piece of language being used to make certain things meaningful (or not) or valuable (or not)?
Activities	To engage in or be recognized as engaging in an activity	What activity is this piece of language enacting (i.e., agreement, disagreement)?
Identities	To enact or recognize an identity	What identity is this piece of language enacting or seeking to have recognized?
Relationships	To build social relationships (or not)	What sort of relationship is this piece of language seeking to enact with others in the room or elsewhere?
Politics	To claim or ascribe social goods (or not)	What perspective on social goods is this piece of language communicating (i.e., what is 'normal,' 'appropriate,' 'valuable,' 'the way things are or ought to be,' 'like me or not like me,')? What role does the idea of responsibility or credit play?
Connections	To connect things or create relevance (or not)	How does this piece of language make one thing relevant or irrelevant to another?
Sign systems and knowledge	To privilege certain sign systems over others	What ways of knowing and learning are privileged or disprivileged? Whose knowledge is valued?

Note: Adapted from Gee (2005, 2014).

Relationships. The function of this task is to build social relationships. Language is used to establish formality or informality, to communicate deference or authority. Some of the relationships of relevance in this research context are the relationships between participants and facilitators, relationships among participants, and relationships between participants and their students.

Politics (the distribution of social goods). Language can be used to claim social goods or ascribe social goods (or not). Social goods include status, wisdom, "street cred", etc. Social goods in this context include experience, knowledge, authority, and reputation.

Connections. With language, speakers and writers can connect things (or not), creating relevance (or not). An example of connections is the way CCSS-M is connected to high-stakes testing, so that concerns about the tests themselves are conflated with the standards.

Sign systems and knowledge. The function of this task is to analyze ways that certain languages and sign systems are privileged over others. This building task is relevant to discourses that contrast instrumental and relational orientations toward mathematics.

26 Building Task Questions. Gee (2005) states that an ideal discourse analysis provides answers to 26 questions, listed in Appendix B. Actual discourse analyses however, usually develop only smaller sections in detail. As I will describe more in the section on validity, the more questions that can be answered, the greater the trustworthiness of the analysis.

Because thinking deeply about all 26 questions across all fourteen passages was not feasible, I simplified the process. I first analyzed each of the fourteen passages with

simplified versions of the building found in Table 4. After completing this process, I

again reflected on the results and wrote analytic and reflective notes. These notes paid

particular attention to convergence and divergence.

Table 4

Simplified Building Tasks Questions

Building Task	Questions
Significance	How does this text make things meaningful or not? How does this text give them value or not?
Activities	What activity is being enacted by speaking these words?
Identities	This text is enacting what identities? (This is a teacher who…)
Relationships	What relationships are being built with the listeners or with other people and institutions?
Politics (social goods)	How does this text give responsibility or credit for what is good, correct, normal, valuable, the way things are or the way things ought to be?
Connections	How does this text construct relevance and irrelevance?
Knowledge	What knowledge is privileged? Whose ways of knowing matter? What beliefs matter?

Note: Adapted from Gee (2005, 2014).

To further explore the issues of convergence or divergence, I returned to the

earlier phases of analysis and reread these passages in both narrow and broad transcripts.

As I did so, I used additional questions from the 26 suggested by Gee to explore areas

that both supported and challenged my emerging themes. Locating areas of divergence, I

engaged in a negative case analysis (Wood & Kroger, 2000) in which I considered how

the patterns I had identified might be faulty or may need to be reframed to better reflect

the data.

As a final step in this phase of the research, I addressed the issues of coverage, as

component of validity (described in more detail below.) In particular, I returned to

portions of the transcripts that had not received detailed analysis to determine whether my themes were consistently supported by all the data.

Organizing and Presenting Analysis

The final phase of analysis involved organizing and presenting in writing the patterns and themes I had identified. Because writing is part of the analytic process, it is important that I describe this final phase.

I started organizing my findings by summarizing the analyses and themes that had emerged in regard to my research sub-questions:

- In what ways does discourse reveal positions of identification, compliance, or resistance to changing pedagogical practices, and on what bases are these positions taken up?

- What understandings about the characteristics of a good mathematics teacher are expressed, constructed, or contested through discourse?

- What beliefs and emotions does discourse communicate in response to pressures to change pedagogical practices?

Then, I used these summaries to make claims about each of the sub-questions. Because the findings are all related to identity and were intertwined in complex ways, the claim I make about the positions taken up (the first sub-question) provided the structure for the presentation of the findings for the other two questions. This claim rests on dividing the discourse into groups. However, I do not make the claim that the particular individuals associated with a group hold these beliefs. These groups are based on interpretation of the work performed by discourse through my particular theoretical and analytical lens. Also I do not claim that the groups represent a fully homogenous set of characteristics, nor am I

unaware that placing individuals in categories is an act of power. As I will describe in the next chapter, the teachers' discourse is complex and represents a range of positions. Gee (2005) states,

> discourse analysts often look at two contrasting groups not to set up a binary contrast, but in order to get ideas about what the poles of the continuum may look like. We can get ideas that can then inform the collection of new data out of which emerges a much more nuanced and complex picture. (p. 138)

Even though there is individual variation, there are discursive features that the various texts within a particular group share.

I then selected texts that appear to be typical, "fringe," and negative cases to further illustrate my claims, clarify the unifying themes, and represent the range of positions on the continuum (Wood & Kroger, 2000). As a final organizing step, I integrated the answers I found to my research sub-questions to inform my discussion of the central research question:

In a case of mandatory mathematics professional development, in what ways are professional identities for mathematics expressed, (re)constructed, and negotiated through discourse?

Because presenting research is just as much a part of discursive power relations as that which is being studied, selecting a structure for my writing was as important as other aspects of the analysis. As described previously, the entire analytical process was recursive, each phase building on, clarifying, or reframing previous phases. Also, this process was applied to discursive contributions from several participants. The themes that I identified as a result of this recursive process across many excerpts do not tell just one story; they tell multiple stories. Each phase of the analysis contributed to how I read those discursive contributions and how I tell those stories. My writing about the findings is

organized to both answer my research questions and reveal the evidence that lead me to those answers. The presentation of answers to the sub-questions in chapter five includes much of the analyses and, therefore, is rather technical. The discussion of the central research question in chapter six is much less technical, but as a result is less directly tied the analyses and textual evidence.

<div align="center">**Validity**</div>

There are a few important points to make about the validity of discourse analysis before I describe techniques that used to address questions of validity. Validity applies to the rationale used to support inferences made from the data (M. T. Kane, 1990; Messick, 1989). In discourse analyses this rationale is based on details of discourse "that are deemed *relevant* in the situation *and* that are relevant to the arguments the analysis is attempting to make" (Gee, 2005, p. 106). These judgments are based on the theoretical framework for the research and the theory of language that guides the discourse analysis.

Data analysis involves decisions about transcription. Transcription can be completed in varying levels of detail, and different transcriptions reveal different relationships. Thus, transcription is part of the data analysis process. Gee (2005) argues that the level of detail in transcription should not be confused with the level of validity. Validity stems from how the transcriptions work with other aspects of the discourse analysis to create trustworthiness.

Another important point about validity of a discourse analysis is to acknowledge that, like the discourse being studied, the analysis is also a language acting reflexively with the data. Any language simultaneously reflects and constructs reality. The analysis has to reflect the data at the same time that it constructs the data.

Finally, in an analysis, like other forms of research or measurement design, validity is a matter of degree. The analysis will be more or less valid depending upon the evidence provided. The process of determining validity is never complete (Gee, 2005; M. T. Kane, 1990).

Gee (2005) outlines four ways to contribute to the trustworthiness of the data in support of validity: convergence, agreement, coverage, and linguistic detail. Next, I describe ways have sought to demonstrate these aspects of validity. Further in support of the trustworthiness of my interpretations, I have collected all the data, notes, and analyses from all phases. This material has been organized and stored as an audit trail.

Convergence

Convergence refers to the degree to which answers to the 26 questions about language converge. As more of the answers to the 26 questions are compatible and provide support for the analysis, more trustworthiness is achieved. However, answering all questions for even a small amount of discourse is a daunting task. To address the issue of coverage, I chose to ask fewer questions but address all of the building tasks. As a result, it was apparent that some building tasks, such as identities, politics, and sign systems and knowledge, were more relevant to my analysis. For these three building tasks, I paid greater attention and revisited the transcripts several times with those questions in mind.

Also, I used these building task questions to purposefully address the issue of divergence. I extended this approach to also seeking out data that represented a "negative case," considering its implications for the themes I had identified. By doing so, I was able

to reframe and revise those themes and make claims that I believe account for all of the data.

<u>Agreement</u>

Agreement refers to whether the analysis and interpretations reflect how language actually works in the types of context being studied. Agreement develops as "native speakers" of the social languages and Discourses support the interpretations the analyst has made (Gee, 2005, p.113). This is similar to the idea of member checks. To address agreement, I asked a faculty member at another university who has worked with this professional development team extensively to review my analysis and claims.

<u>Coverage</u>

Coverage addresses the degree to which the analysis and interpretations apply to all related data, including discourse that comes before and after the situation that is studied. This also includes predicting related situations. I took several steps to address coverage. First I carefully considered convergence and divergence and conducted a negative case analysis. Second, I returned to the text to consider the analysis in light of two other aspects of the data: other discourse throughout the day from these fourteen teachers and discourse from teachers who I had not analyzed in depth. Third, I consulted my various notes—field notes from both the earlier professional development meeting and this meeting, and analytic and reflective notes from earlier phases of my analysis.

<u>Linguistic Detail</u>

Finally, linguistic detail plays an important role in developing trustworthiness. Analysis and interpretations need to be tightly tied to the linguistic structure of the discourse:

> Part of what makes a discourse analysis valid, then, is that the analyst is able to argue that the communicative functions being uncovered in the analysis are linked to grammatical devices that manifestly can and do serve these functions according to the judgments of 'native speakers' of the social languages involved and the analyses of linguists. (Gee, 2005, p. 114)

Therefore, I attempt to explain these connections fully in writing with the supporting textual evidence while making the text as readable as possible for with less background in linguistics.

Limitations

There are some limitations to the study. First, the teachers involved in this project work in grades 6-8 in a suburban/rural community. Their discourse does not necessarily reflect discourse that may take place in professional development for elementary or high school teachers or teachers who work in urban areas. Also, length of time I spent in the field as a researcher is a limitation. Discourse analysis is a very in-depth analytical process. This one study cannot encompass more than the transcription of one day of professional development. Additionally, the organization of the room prevented capturing aspects of non-verbal communication. The room was very crowded with teachers seated on opposite sides of tables. Wherever I or a video recording device was position, only some of the teachers' expressions and body language were clearly visible.

An important delimitation is my decision not to collect demographic data about the teachers. I made this decision after careful thought, recognizing that it presents real limitations to my interpretations and their generalizability. However, this sort of "personalizing" of the data does not align with the focus on discourse, and I do not wish to imply any claims about individuals. At the risk of perpetuating a harmful "blindness" to social categories, I chose to collect data without tying it to individual teachers' demographic information. This would require that I try to maintain a perspective of

seeing the data as discourse in action rather than representing discourse from different categorizations of people. It has been a tricky balance in a poststructuralist sense—acknowledging that social categories (as part of Discourses) fundamentally shape experience in the world but studying normative identity negotiations through discourse alone.

Other delimitations are related to the research design. Because I did not conduct interviews, it was not possible to ask teachers what they meant by a statement or what they were thinking in response to others' statements. Related to the depth of analysis, it is not feasible to analyze more than a relatively small portion of the transcript with this much detail. I chose to analyze fourteen of the reflections at the end of the day for the most in-depth analysis. This portion of the transcript involved more interaction between teachers and offered the best opportunity to analyze the process of negotiation. However, by limiting the analysis to fourteen contributions, there may be features of the negotiation that remain unexplored.

CHAPTER FIVE: FINDINGS FROM THE DISCOURSE ANALYSIS

Introduction

This study explores ways professional identities for mathematics are expressed, (re)constructed, and negotiated through discourse in the context of normative pressures and power relations associated with education reform. In particular, this exploration focuses on discourse in the context of mandatory professional development for grades 6-8 teachers of mathematics.

The findings I present here are based on analysis of discursive contributions made by fourteen teachers at the end of the day. As the final activity of the day, Gladys, the facilitator of the professional development, asked teachers to share their "takeaways." Gladys asked that everyone take a minute to think about what he or she felt or thought about the ideas presented during the day. Then she stated that she would ask everyone to share these thoughts. Some teachers shared right away. After these initial comments, Gladys asked who had not yet had a chance to share and waited for other teachers to participate. Several times, she communicated that she would like to have everyone say something and waited several seconds for the next teacher to speak. However, she ended the meeting when it seemed clear that no more teachers were interested in sharing.

This portion of the transcript provides an opportunity to analyze many different perspectives. I selected these fourteen contributions because they are representative of the range of topics and perspectives. The contributions by these fourteen teachers are found

in Appendix C. The complete theoretical tools, form and function, and building tasks
analyses are found in Appendices D–H.

In this chapter, I present excerpts from the transcript that demonstrate how my
discourse analysis answers the research sub-questions:

- In what ways does discourse reveal positions of identification, compliance, or
  resistance to changing pedagogical practices, and on what bases are these
  positions taken up?

- What understandings about the characteristics of a good mathematics teacher are
  expressed, constructed, or contested through discourse?

- What beliefs and emotions are communicated in response to pressures to change
  pedagogical practices?

The answers to these questions are intertwined. This presentation is organized around my
findings that address the first sub-question: In what ways does discourse reveal positions
of identification, compliance, or resistance to changing pedagogical practices, and on
what bases are these positions taken up? The positions described here are oriented around
the discourse of the professional development reflecting the idea that positioning is "the
discursive process whereby selves are located in conversations as observably and
subjectively coherent participants in jointly produced storylines" (Davies & Harré, 1990,
p. 7). As I describe these positions, I also describe how my analysis of the discourse
provides answers to the other two sub-questions: what understandings about the
characteristics of a good mathematics teacher are expressed, constructed, or contested
through discourse; and what beliefs and emotions are communicated in response to
pressures to change pedagogical practices?

Illustrating the Positions

The discourse reveals a number of positions in response to pressures to refigure mathematics education. While there is naturally a lot of variation among people, there are discursive features shared by groups of texts that indicate these positions. I call these positions of identification, limited engagement, ambivalence and resistance. By naming them as such, I am engaging in power relations, placing the participants' discourse as an object of study. I hope to communicate in this chapter that my intention is to do so with as much fairness to participants' discourse as is possible. To illustrate these positions, I use both full and partial excerpts of teachers' end-of-day reflections. The complete reflections for the fourteen teachers are found in Appendix C.

Because this professional development was requested by the district and a district representative attended the meeting, there is undoubtedly pressure for teachers to communicate ideas that align with the philosophy of the professional development. However, the model of classroom instruction presented is considerably different from what is typical of mathematics classrooms in the United States. It relies on teachers changing their approach to lesson planning without a curriculum to guide them. Teachers are guided by a progression of representations and an awareness of their students' understandings. Therefore, expressing alignment with these beliefs, or identification with the philosophy, would be a stretch for many teachers. This gap between the normative vision of a refigured world and the resources, experience, and mathematical knowledge of the teachers enables me to draw distinctions among comments that may appear to conform to the instructional model on the surface, but do not engage any of the deeper ideas of pedagogical change.

Positions of Identification with a Refigured World

Discourse indicates identification with changing pedagogical beliefs by demonstrating alignment with a relational orientation toward mathematics instruction, in particular seeing students' ways of thinking and participating as a crucial aspects of knowledge construction. Rather than drawing on the mathematical content of the meeting, this discourse communicates identification with the vision of a more prominent role for students' thinking in classroom activities. The discourse places priority on ways teachers can change aspects of their pedagogy for the purpose of better understanding how the students think about the mathematics or to more actively involve students in the instruction. These contributions by teachers express the importance of knowing what their students understand, starting with their students' conceptions, and making the mathematics accessible to struggling students—pointing to these as important characteristics or actions of a "good" mathematics teacher.

Christie provides a typical example of this type of discourse. Her statement expresses the importance of meaningful engagement with mathematics and describes a way to include that in her instruction. She first describes the problematic nature of instruction that lacks context:

1   like to go off of that \

2a   like if you don't have the context there /\ to start it off with /\

2b   like .. it just really .. doesn't really mean much \

3   and some kids will just look at and be like what are you guys talking about \

Christie's use of insistent and matter-of-fact intonation patterns and the way she has constructed the Mood make these lines an assertive statement that this is an important issue. By using "you don't" instead of "I don't" in line 2a, she is saying this applies to

teachers in general. She simply states things are or are not a certain way, rather than hedging with verbs like "might." As she chooses her words in line 2b, she ends up repeating "really," intensifying the reality of the problem. As Christie continues to elaborate on the problem in line 3, she puts value on how students are engaging with the activity.

As the text shifts from describing the problem to describing the solution, it reveals the importance she places on using students' thinking in instructional decision making:

> 4a   so I think .. for <u>me</u> or at least maybe for the two of us because we work together \
>
> 4b   really starting our units off with some sort of <u>big contextual problem</u> \
>
> 5   so we can <u>see</u> where they're at \

Using contextual problems from the beginning aligns with the professional development model in which the concepts were initiated through context. Christie not only describes why this is valuable for students, in line 5 she describes the value this has for the teacher—knowing what students do and do not understand, what they are able to do, and in what they still need instruction. This final statement is not further justified or explained, indicating that its value is self-evident.

While students function as a Participant only in line 3, they are an important component of the text. They are unstated in lines 2a–2b, and their responses to instruction are the reasons for the instructional decision described in lines 4a—4b. Finally, they are the focus of attention in line 5. Also, a feature that distinguishes this discourse from others is that application to a specific mathematics unit is absent; this is a general instructional approach.

This text has several discursive effects. One is to assert that the problem of mathematics that doesn't mean much to students is common, something experienced by teachers in general. Another is to create a relationship between using context and students understanding, a relationship that would serve as a solution to the problem just described. This passage communicates that a good mathematics teacher accesses students' conceptions through meaningful instruction that is placed in context.

In a similar fashion, another teacher, Gina, communicates a desire to begin with students' conceptions. She follows this with several claims about those conceptions and mathematics:

1a   I appreciated your comment earlier about

1b   this would be the unit to <u>start</u> with students' <u>conceptions</u> or <u>ideas</u> of how to solve this problem \

2   we started with <u>statistics</u> \

3a   we just finished a unit on <u>decimals</u> a little mini-unit \

3b   it's <u>not</u> like there's a lot of ways to <u>solve</u> that / \

4a   and when come to <u>statistics</u> it's like

4b   … <u>they</u> don't have any preconceived real notions of statistics \

These claims are made on the basis of experience. In lines 2 and 3a she makes claims about what has happened in the recent past. She elaborates on this in 3b and 4b with statements about the way things are, such as "it's not like there is" and "they don't have." She is describing aspects of her figured world.

Up to this point, it seems that Gina, unlike Christie, is going to emphasize the mathematics; the Circumstances lines 2a–4b all include specific topics. However, the next lines reveal that it is students' thinking that given more attention, and thus value:

5a   but solving problems like <u>this</u>

5b   would be the one opportunity for them to solve it <u>lots</u> of different ways / \

By discussing this unit as an opportunity to encourage students to solve a problem "lots of different ways" and show "lots of student work," Gina is building significance and connections in a way that reflects the re-figured vision of student participation. While she states that the units she has already taught would facilitate this approach, she says she has an "opportunity" to start her proportional reasoning unit with current conceptions or ideas about solving a contextual problem. If Gina had not described this as an opportunity, the statement would have communicated less commitment to the importance of this type of instruction.

Gina's statement differs from Christie's in an important way. Whereas Christie's text presents a strong argument based on beneficial outcomes, Gina's statement sounds less confident about the outcomes:

6a   and so while it seems <u>very</u> <u>scary</u> to me /

6b   I .. I am hoping to <u>try</u> it \

6c   and show <u>lots</u> of student work \

6d   so we'll <u>see</u> how it goes _

The phrase "very scary," a slight pause, and "hoping to try it" communicate uncertainty. Had her statement stopped after line 6b, one might think Gina is not expressing commitment to these ideas. If that were the case, this text might be read as a polite statement of compliance in the context of the meeting rather than as tending to identify with the vision presented by the professional development.

However, line 6c reveals a parallel construction of the verb phrase beginning with "am hoping to" indicating that the expression of hope also applies to showing student work. Seen in light of line 4b, this indicates concern as to whether students will generate enough ideas to make this approach successful. Other features of the text argue for this

meaning as well. Stress on "try" and "lots," suggests that she hopes to try and get lots of student work. In the final line, "so we'll see how it goes," the verb "will" indicates a future intention to put these ideas into practice. Her intonation at the end also supports this claim; the line ends with a flat intonation associated with uncertainty, locating the uncertainty with the outcome.

This text enacts figured worlds and the building task of politics in several ways. Like text tending toward resistance (described later in this chapter), this makes a point of describing the way things are. However, she also describes what she hopes will happen and, therefore, what ought to be. This creates value for students' ideas. There are two implications for the characteristics of a good math teacher—incorporating students' ideas into instruction and being willing to make a change that feels scary.

A third example of discourse that communicates some degree of identification comes from Cindy. Like Gina, Cindy's discourse has a focus on students and an expression of emotion:

1a   I like the idea that…that what I got out of it is not to feel guilty / \
1b   if you have to step back and go back to the enactive with some kids / \
1c   and try to move the other ones along with it \
2a   they move along at a different pace \
2b   but they may be all working on the same problem \

Though both are related to designing instruction, different circumstances are associated with these feelings. Gina is discussing the uncertain outcomes of making a big change in her pedagogical approach. Cindy is discussing the idea that this pedagogical approach can alleviate a sense of guilt she might feel when "backing up." Based on this text and the context, it makes sense to attribute this feeling of guilt to an obligation to

move students forward through the curriculum, an obligation that may have been stronger than the desire to provide more support for students who need it. This statement, then, asserts that scaffolding with multiple representations will enable her to do both.

Despite linking fear and guilt with the practice of planning based on student thinking, the texts both enact a professional identity that places high value on students' thinking or understanding. Gina's discourse communicates this by repeatedly discussing using students' ideas as the starting point for instruction. Cindy's discourse communicates this through discussing not only using different representations to support students, but also by making students the focal point of lines 2a and 2b. Both statements indicate instructional planning based on students' thinking.

These discursive contributions discuss using student thinking as a basis for instruction, suggesting identification with the relational orientation of the reform. Other excerpts express positions that are moving toward identification; they are considering ideas that represent deep change to pedagogy. While discourse of this type contains some ideas that are not aligned with the professional development philosophy, it does focus on changes that rely more on conceptual teaching and meeting students' needs. Such is the case with Edward, whose reflection returns to an idea introduced by Gladys earlier in the afternoon, (*E:* indicates Edward's speech and *G:* indicates Gladys' speech):

E: 1a   I like the fact what you <u>said</u> a little bit ago

    1b   because I think we sometimes tend to <u>see</u> <u>kids</u> like you said move that <u>dot</u> \

    1c   everybody needs to be at <u>this</u>… / \

G: 2   everybody's <u>here</u> and everybody's gonna go <u>here</u> \

E: 3a   and .. well .. whether we like it or <u>not</u> that's not gonna <u>happen</u> / \

    3b   you <u>always</u> have that .. you know .. <u>variety</u> of … abilities / \

    4   and I <u>like</u> that that expression where you want to <u>mo:ve</u> the box and <u>not</u> individual [dots] \

G: 5   [yep]

In this first part of Edward's statement, he describes a problem with how "we" (teachers in general) do things, indicating that these perceptions of students are part of the figured world of mathematics teaching. He contrasts this with a metaphor of a box plot. Gladys used this metaphor to communicate the idea of turning one's focus from a single achievement goal to the variety of students' needs. It contains the idea of seeing the variability in students, where they are in terms of mathematical understanding and skill, and working with that variability to move everyone along toward higher achievement.

Edward contrasts this with how he has typically thought about teaching:

6a   and … I … for <u>years</u> now I have always you know wanted the kids to do things a <u>certain way</u> \
6b   because <u>my gosh</u> that's the little kids way / \
6c   you now need to be thinking like <u>this</u> / \
7   well some kids don't <u>have</u> that <u>ability</u> \

He describes a pattern of instruction that he has used for years—one based on a single right way to do things determined by an external authority, indicative of an instrumental orientation.

Edward's discourse expresses a fixed ability belief—the idea mathematical ability is something you are born with. This is not a belief that would be supported by the professional development model, nor would it fit well with the re-figured world. The strength of this belief is evident in lines 3a and 3b through the use of stress (on "not," "happen," "always," and "variety") coupled with insistent intonation. The fixed ability belief is also evident in line 7 with an unmarked, matter-of-fact intonation, having already established its validity in the earlier statement.

However, Edward then goes on to describe the ways his thoughts about student participation have changed based on the activities from the day:

8a	so what we <u>did</u> today like enactive and like \
8b	<u>that</u> would serve a <u>purpose</u> for <u>those</u> kids who are of the lower ability to <u>still</u> participate / \
8c	and <u>get</u> the concept in a different way… / \
9	you know so it just got me <u>thinking</u> \

He is thinking about changing the way he has done things for years, because he is drawn to providing students of all abilities access to the content and concepts. As he did with the statements about ability, he uses stress and intonation to make strong assertion. Edward is drawn to the idea because, as seen in line 8b, it would enable more democratic participation. This text communicates that the value of all students' participation in classroom activities outweighs the idea that there is a right way to do things.

In summary, this discourse varies in the degree of commitment it expresses to implementing the ideas and the degree of identification with the vision of a refigured world of mathematics education. Some discourse communicates the value of students' ideas as given (Christie), thus representing strong identification. Through expression of emotion, other discourse communicates identities that are likely undergoing some (re)construction in the direction of identification, an emotional process (Gina and Cindy). Finally, some discourse communicates consideration of approaching instruction in a new way (Edward). However, they are communicating the idea that designing instruction based on students' knowledge and needs is a critical component of what it means to be a good mathematics teacher.

<u>Limited Engagement with a Refigured World</u>

In this section and the following two, I describe discourse that has more features in tension with the vision of a refigured world of mathematics education of the kind outlined and advocated in the professional development session. Again, along with pointing out the characteristics of these positions, I will focus on the features that communicate understandings about the characteristics of a good mathematics teacher. I will also highlight ways this discourse draws on beliefs and emotions as resources for expressing, constructing or contesting these understandings.

Discourse I describe as limited engagement is focused on a specific tool or technique presented in the professional development. These teachers discuss pragmatic solutions to specific dilemmas they have experienced in the classroom or focus on an aspect of the mathematical content of the meeting. They communicate excitement at finding a something that will address a specific need in regard to their work as teachers of the curriculum. Despite sharing a positive appraisal of a feature of the professional development, this discourse differs from the previous category in two ways. First, the texts communicate the importance of knowing and understanding the mathematics curriculum. Second, these texts do not discuss students' role in the classroom. I classify these as limited engagements because these statements communicate an intention to use a new technique but do not describe a change in pedagogy.

Mary's discourse is an example of that which expresses a lot of enthusiasm about an idea from the meeting:

1a   so <u>I</u> .. on that last problem .. I just <u>can't</u> get over / \
1b   how much I really <u>like</u> the fact that you had the <u>four</u> .. different .. rows in
         that ratio table \

And, like Edward, Mary contrasts this with the way she has always done things:

2a   because I would <u>always</u> teach it as just <u>two</u> / \

2b   I would teach it with the <u>number</u> of cookies and the <u>total</u> <u>cost</u> \

Yet, unlike Edward, this idea is about communicating a mathematical concept rather than being about giving more students access to the activity:

3a   and it would <u>bother</u> me / \

3b   that the questions like you said in the curriculum would <u>always</u> say is it a proportional relationship\

3c   and it's <u>not</u> when you look at just <u>those</u> <u>two</u> \

3d   but then there's the <u>slope</u> and the slope is a <u>proportional</u> <u>relationship</u> / \

4a   and so it was <u>hard</u> for me to say no it's not a proportional relationship \

4b   but yet there's a <u>slope</u> / \

4c   and it has the <u>same</u> <u>pattern</u> go up <u>five</u> over <u>two</u> up five over two \

5   and so .. I .. from <u>now</u> <u>on</u> I'm gonna teach it with the four rows\

Mary's discourse is focused on the mathematics of the situation, taking time to expand on the features of the ratio table in line 1c and the features of the slope in line 4c. These details show she is able to picture how this mathematical model fits into her classroom instruction in a very specific way. Also, several uses of insistent intonation combined with emphatic language in lines 1a and 5 suggest a high likelihood that she will use the model in the future.

What contrasts this example of limited engagement from discourse tending toward identification is that Mary is not talking about a substantial change to her instruction or a focus on student understanding or participation. The main Participant in this text is "I," paired with these Processes: "I … can't get over" (line 1a), "I … like" (line 1b), and "I …teach" (lines 2a, 2b, and 5). Also, in "it… bother me" (line 3a) and "it was hard for me to say" (line 4a) the mental Process is paired with "me." Students are not

present as Participants and only indirectly as Circumstances in this text. Mary is describing herself as a teacher, and as a person who aims to clearly communicate mathematical ideas. The discourse communicates passion and commitment to teaching mathematics. However, it does not align with the vision of refigured mathematics education because the instruction described is essentially based in teacher demonstration.

A similar pattern can be seen in Bill's comment, though he includes students in the Circumstances. Bill expresses appreciation for a specific idea:

1a   I <u>like</u> the fact that in doing it this way \
1b   you could take the same <u>question</u> and ask a third grader \
1c   and you can ask an eighth grader the <u>exact</u> same question / \
1d   but have more <u>depth</u> of knowledge

After giving an example, he goes on to explain what the teacher can do in a way that does not involve students as Participants:

4a   but <u>then</u> you can start stacking them / \
4b   and say what's the relationship between sixteen cookies and eight <u>dollars</u> \
4c   and <u>graphing</u> \
4d   and then predict how much is this is gonna <u>cost</u> /
4e   which is why you need a <u>graph</u> \
5a   so it's the <u>same</u> question \
5b   just different .. just different things that you're <u>focusing</u> on when you're stacking them \
6a   so you <u>don't</u> have to <u>come up with</u> new math questions / \
6b   you just have to <u>understand</u> what .. what it is that that you are asking for \

Bill describes a benefit to using context; it relieves some of the workload involved in teaching many skills to many different students. It also illustrates connections between mathematical ideas. I have classified this as limited engagement because, like Mary's, Bill's statement is focusing attention on the teachers' actions in the classroom. While Bill

does mention students in lines 1a and 1b, they are the receivers of the action rather than actors themselves. Lines 4c and 4d include activities that might be performed by students, but notably students are absent from both of those lines. The limited presence of students not only contrasts with discourse tending toward identification, it indicates a lack of agreement on pedagogical approaches.

Both Bill's and Mary's contributions express appreciation and enthusiasm for ideas or tools they have seen in the professional development. They talk about implementing these ideas or tools in a very concrete manner, and in doing so they communicate a good understanding of the mathematical content they teach. The discourse indicates a likelihood that the teachers will implement some features of the professional development. However, the discourse does not communicate a refigured pedagogy. This discourse communicates different characteristics of a good mathematics teacher—it places value on strong content knowledge, clarity in communicating concepts, and purposeful instruction.

Ambivalence Toward a Refigured World

Ambivalent discourse differs from previous categories in several ways. First rather than positive appraisals, these texts express concerns about implementation. Second, rather than focus on a specific idea in the classroom, the speakers consider broader issues, such as curriculum, scope and sequence, and testing. Third, this discourse is distinguished from the previous categories because students play, yet again, a different role.

Merald's discourse is representative of this category. His statement is similar to Edward's in sense that they both contrast their typical instructional practice with the idea

of using multiple representations to support students who need extra help. However, Merald perceives more barriers to the implementation and is less convinced of the efficacy. Here is the beginning of Merald's statement:

1a   going back on what <u>she</u> said about <u>backing up</u> \

1b   and being <u>not</u> afraid to go <u>back</u> up / \

2a   I've always been afraid to back up a little bit \

2b   I can <u>once</u> in a while/ \

2c   but .. not very <u>much</u> \

2d   and I <u>feel</u> like I gotta .. I don't have enough <u>time</u> already / \

2e   so I <u>can't</u> <u>afford</u> to take much time on this / \

Merald is responding to Cindy, though he changes the emotion from guilt to being afraid. The text focuses on his personal experience. He hedges the description of being afraid with "a little bit" and "I can once in a while." The hedging is then negated in lines 2d and 2e. as Merald explains where the fear comes from—his figured world seems dominated by time constraints. He does not have enough time, cannot afford, to back up to support lower achieving kids, implying that something valuable is lost by doing so.

Both the perceived barrier and a possible reason to change are expressed in spatial metaphors. Merald is afraid to "back up," and he can imagine jumping head:

3a   but I kinda .. <u>today</u> for <u>something</u> that <u>someone</u> said along the way I don't know <u>what</u> but \

3b   .. made me think you know .. I <u>can</u> <u>imagine</u> backing up <u>just</u> <u>enough</u> with <u>maybe</u> even going over ratio tables or I don't…\

3c   might just <u>wake somebody up</u> \

3d   and make 'em jump <u>leaps</u> <u>ahead</u> <u>faster</u> than they would have .. <u>ever</u> done /\

3e   and we might end up .. eventually <u>farther</u> ahead than \

This reason to change, however, is not more than speculative. Merald has organized his comments in a way that contrasts what he knows to be the case with an imagined world.

The text shifts from "I have always been," "I feel," and "I can't" to "I kinda," "made me think," and "I can imagine"—from perceiving to imagining. In lines 3a–3b, verbs such as "can" and "might," and adverbs such "just" and "just enough" indicate limits to the degree of commitment; he is not as certain about benefits as Edward who says "that would serve a purpose." The imagined world is described in lines 3c–3e, two of which have no Subject. The third has "we" as a Subject referring to the class as a collective and abstract group. The imagined world ends, incomplete, with the word "than."

Merald's contribution ends with the following lines:

4a   …if I'd back up
4b   if I'd be willing to do that

His comments end with a return to "I" as the Subject and to real experience. This indicates a low commitment to the previously imagined scenario by creating back-to-back dependent clauses with the word "if" and further removes commitment with the verb "would."

Not only does the text indicate the unlikelihood that Merald will "back up," it also positions students differently than does the previously described discourse. Students have a limited presence here; they are not the Subjects of clauses and they are not performing any action. They receive the action in 3c and 3d, with the implication that at least one is asleep, and they are part of a passive verbal construction in 3e. Rather than students' thinking being driver of instructional decision making, students' play a much more passive role.

Merald indicates he is imagining an alternative to moving through the curriculum at a steady pace. He considers the idea that one step back ("just enough") might lead to

bigger leaps forward. Yet, he is motivated by fear to maintain instruction at a certain

pace, giving significance to negative consequences for backing up or slowing down.

These negative consequences may include failure to teach the material that students need

to have to succeed on upcoming assessments and in future coursework. The central

communicative function of this comment, then, is to share how he feels, what he believes

he can and cannot do, what he can imagine, and what he is willing to do.

Merald's discourse is representative of those that express ambivalence. The

discourse acknowledges possible benefits to pedagogical change, but also points to

perceived realities, aspects of the figured world such as time, that act as barriers to that

change. The discursive effect is to contribute a different characteristic of a good

mathematics teacher than those I have already described. This places value on making

sure you have taught what is expected of you—the material that students will be assessed

on and that they need as they move on to their next mathematics classes.

Resistance to a Refigured World

The findings from the analyses show that this category of discourse was different

from other categories in several ways. This discourse may express ideas in conflict with a

relational orientation, may not engage with ideas from the professional development at

all, and/or may express a negative appraisal of a suggested instructional practice. What

these excerpts hold in common is the discursive effect of countering particular aspects of

the refigured vision, thus creating resistance.

Whereas other categories discussed ideas from the professional development

directly and with generally the same situated meanings, discourse expressing resistance is

more indirect or more confused in that regard. Because these teachers are in a district

sponsored professional development meeting, it is likely they felt pressure to conform to the model of instruction presented. This discourse indicates this may be the case; resistance is expressed indirectly by either not including pedagogy at all or by reframing the ideas. In some cases, ideas from the professional development are reframed in ways that actually reflect a more instrumental orientation.

This discourse is also indirect in the way it gives value to alternative ideas. It creates alternatives by communicating different situated meanings for mathematics, but does so with language that, at least initially, communicates agreement. Also, rather than focus on students' roles in the classroom, a central concern of the professional development, this discourse turns attention to other concerns such as mathematics in the world outside the classroom, mathematics as a discipline, and the teachers' roles in preparing students for their futures.

Brenda provides an example of discourse that communicates different situated meanings and a more instrumental orientation than the professional development, with the discursive effect of resistance:

1   I think <u>my</u> takeaway for today is gonna be how you said that … um… \

2   that <u>math</u> traditionally teaches to the concept _

3   but the <u>real</u> idea is to teach to the <u>activity</u> or the <u>critiquing</u> or critical <u>thinking</u> of a solution \

4   and where <u>English</u> or <u>any</u> other subject .. I think <u>all</u> subjects .. it's.. that's <u>always</u> been like that \

5a   it's <u>not</u> just to teach capitalization \

5b   but <u>why</u> are we teaching capitalization \

6   and so I <u>like</u> that .. when you made that comparison \

Brenda's statement partially reflects comments made by Gladys in regard to CCSS-M. When Gladys described traditional mathematics instruction, she stated it has been about

procedures and conventions for the sake of the skills. Gladys says that, in fact, the idea of mathematics is critical thinking and problem solving. Skills, procedures, and conventions are taught, when appropriate, with a clear purpose in mind that furthers the aim of critical thinking or problem solving. She states that in language arts this has been the approach, as is the case with capitalization in service of writing, but this is not the way things are seen in mathematics.

Brenda's discourse confuses these ideas by saying that math traditionally teaches the concept in line 2. It does not discuss problem solving for the sake of problem solving; it is in service of finding a solution (line 3). Also rather than focus on expansion beyond procedures and conventions, attention remains on a convention in lines 5a, 5b, and 6. In this way, Brenda's comment reinforces Gladys' assertion that people tend to see mathematics as being about procedures and conventions. The discourse mixes relational and instrumental orientations and has the discursive effect of reframing Gladys's meaning and perhaps reinforcing traditional approaches to mathematics.

Though this expresses agreement with Gladys, there is some linguistic distancing from the ideas. Brenda is commenting on these ideas without stating that they will impact her practice. She is a Participant only in lines 1 and 6, which contextualize what she is saying as appreciation for a statement made by Gladys, possibly a response to normative pressure. Otherwise the Participants are concepts—math, the real idea, English or any other subject, and a general "it" that stands for the real idea. The only material Process is "teaches" in line 2, associated with math; the others describe characteristics of the "real idea." She does not indicate a change in her practice in any concrete way.

The strongest emphasis in this passage falls in lines 3 and 4 where Brenda is describing a "real" idea and relating it to other content areas. This focus on what mathematics is really about is characteristic of this discourse. This is suggestive of discourse performing the work of defining the discipline and constructing a figured world. What receives value is the idea that students should know why they learning the skills—their importance or use. Therefore, a characteristic of a good mathematics teacher may be someone who knows what skills are valuable to students and can communicate and demonstrate that value to them.

The statement made by Jimmy also reframes an idea from earlier in the day. Several times during the day, Gladys talked about the importance of proportional reasoning for supporting students' understanding of mathematics. Jimmy reframes this importance in economic terms:

1a	isn't it something that they <u>look</u> for in a lot of like job .. placement _
1b	.. not placements but like a little <u>test</u> they give you a .. some sort of <u>assessment</u> / \
2a	and see <u>oh</u> then if you have excellent ratio or what's it called .. <u>proportional</u> <u>reasoning</u> \
2b	that's like \<bing bing bing bing\> \
2c	and you .. they will put you in certain <u>jobs</u> \
3	I know it's a <u>big</u> thing on the military assessment \
4a	so like you know you can sell to it kids in <u>that</u> way <u>also</u> \
4b	like this is <u>the</u> essential understanding of math \

By discussing proportional reasoning in terms of job placement and the military, this passage places value on the role that mathematics place in the economic and political system. While the professional development philosophy does not take up a position

opposed to this, it also does not discuss this role for mathematics. Therefore, Jimmy is putting the topic of proportional reasoning in a different contextual frame.

Also, this passage does not include any references to changing pedagogy. Students appear only as a Circumstance in line 4a; you (teachers) can sell the idea to them. The word "sell" has several effects: it reinforces the economic theme of the passage; it puts teachers in the role of selling content to students; and it implies that students will be motivated by future job prospects.

Although the text is expressing agreement with the value of the mathematical content, it does not incorporate pedagogy that reflects the vision of a refigured world. Despite discussing using the word "reasoning" in 2a and "understanding" in line 4b, the text builds significance for job placement assessments and associated job skills. Also, the teacher is seen as selling content to motivate students, rather than using student thinking to make instructional decisions. This does, therefore, communicate ideas about mathematics teaching and the characteristics of a good mathematics teacher that are different from the professional development. This text gives value to connecting the mathematical experiences in the classroom to those the students will have once they leave school. Motivation is an important component of the work a teacher does.

The most direct resistance comes from Eleanor. She begins by situating her comments in a frame that appears to agree with what Bill has said immediately before:

1a   and along with that <u>too</u> with the <u>not</u> having to make up <u>more</u> things \
1b   I mean you can just <u>twist</u> the question around \
2a   I mean .. I .. we'd already.. we'd <u>already</u> done our ratio and proportion and stuff \
2b   and and we had some <u>questions</u> in there \
2c   and they'd get kind of <u>awkward</u> \

Despite starting off with a phrase "along with that," which sounds like she is establishing

agreement, Eleanor then turns to what happened in her experience—reversing a unit rate

questions to ask for the other rate makes it awkward. Eleanor goes on to use the terms

twist(ing) and awkward a total of five times to describe the questions they had. The

repeated use of these words draws a strong connection between them and, at the same

time, reinforces the negative connotations of each:

3a   because you know when you.. we had one that was like if you read like 39
        pages per <u>minute</u> what would the ratio be of minutes per <u>page</u> \

3b   and it is <u>twisting</u> that <u>around</u> / \

4a   and it it <u>is</u> awkward / \ because you don't you just don't <u>talk</u> like that / \

4b   we <u>don't</u> you don't <u>hear</u> that / \ or you know nobody <u>thinks</u> like that / \ or
        whatever \

This is creating a progressively stronger assertion. The comment starts with a

matter-of-fact intonation that becomes insistent in lines 3b—4b as Eleanor asserts her

point about the math questions. The lines become less modalized as hedging phrases,

such as "kind of" and "you know" are dropped. After line 3a, Eleanor uses modality to

make assertive statements: "it is," "you don't," "we don't," "nobody thinks." This is the

case for 5 clauses (main and dependent) in a row. The work this discourse is doing is

constructing a picture of how things "really" are.

Eleanor ends this critique in a manner similar to that with which she started—a

move away from direct challenge:

5a   but anyway it's really <u>interesting</u> \

5b   when you do start <u>twisting</u> them around how <u>different</u> the answer is \

At the very end of line 4b, Eleanor backs off of these assertions with "or whatever." She

re-incorporates hedging phrases in lines 5a and 5b: "but anyway," which continues the

tone of backing away begun in the previous line; "really" which shifts the assertion away from factual toward opinion, and "do" which lessens the obligation. Instead of describing the twisting as "awkward," the terms "interesting" and "different" are introduced. Both terms have considerably less negative connotation (though, arguably, they are often used to imply a negative assessment of a situation) than did "awkward."

Eleanor opens and closes her statement with softer, indirect language perhaps again due to power relations and social pressure in this context. Her entire statement, however, makes very direct challenge to the idea of using contexts in this way, supported by both Gladys and Bill, because it does not reflect how people really think or talk about mathematics in life. Therefore, by implication, what is valued in this text is mathematics that reflects the real world.

Discourse that indicates resistance puts value on different ideas despite the normative pressure of the environment. Brenda, Jimmy and Eleanor focus their comments on general mathematics concepts or methods, creating different meanings for mathematics and what types of knowledge are valued. Brenda's concern is with the "why" we need this math. Jimmy's concern is instrumental, in terms of finding a job. Eleanor's concern is with the curriculum reflecting the way people think or talk about math. This discourse is communicating the importance of considering mathematics instruction in light of its relation to broader social interactions.

There are different values communicated by all of these texts and the positions I describe—instruction responsive to students' needs, students' participation, teachers' content knowledge, teaching the material that students need to know for the test or for the next class, making math accessible and real to students, and understanding the role of

mathematics in life outside of the classroom. What distinguishes these discourses is a matter relative value, not exclusion.

<u>Negative Case Analysis</u>

My analysis was a recursive process of looking for patterns and themes and looking for disconfirming evidence for those patterns and themes. When that evidence was found, I went through a process of determining what ways the interpretations I had made were "off the mark" or needed to be adjusted. Eventually, the process led to the positions described so far in part two. When the claims are supported by the evidence, negative cases become exceptions "to the pattern, but not to the claim made about the pattern with respect to the function of the discourse" (Wood & Kroger, 2000, p. 118).

<u>Negative Case 1--Florence.</u> On first inspection, Florence's statement appears to indicate identification. Florence's comment is focused on students. She is describing instructional planning using a progression of representations aimed at scaffolding student understanding. However, Florence's comment does not fit the pattern of identification two important reasons—one in terms of structure (its form) and one in terms of content (its function). As in the discourse that appears to resist the refigured vision, there is an overall sense of ambiguity that may be attributable to the power differential in the setting. Also, though the comment is focused on students, there is a distinctly different attitude toward students that is more similar to the ambivalent category described above.

Here is Florence's statement:

1   <u>I</u> like the display back here \

2a   because <u>I</u> think sometimes students that are at the…enactive /

2b   and when they <u>see</u> how far they can <u>go</u> /

2c   and it's the <u>same</u> thing \

2d   but it's in a <u>different</u> format \

3a   … they .. some of the kids <u>don't</u> ever think that they can <u>get</u> there /

3b   but when they <u>see</u> all of the examples \

3c   and they have an idea \

First, in terms of structure, Florence's comment is confusing in a grammatical sense. A close look at the textual metafunction reveals this confusion. Line 1 and perhaps line 3a have the only main clauses in the text. All the rest of the clauses are introduced by conjunctions. Line 2a begins with a coordinating conjunction, linking it to line 1. Then line 2b starts with "and when," creating a dependent clause. The location of the associated independent clause is ambiguous; the next two lines also have conjunctions, and line 3a seems to have a different message. This pattern of beginning an idea unit with a conjunction is present in all but two lines. Also there is a mix of uncertain and matter-of-fact intonation. The effect of this ambiguity, or grammatical confusion, is that you are waiting for something more to be said. This is similar to the rhetorical effect of the excerpts from Brenda and Eleanor in that the message is somewhat confusing.

A closer look at the content of Florence's comment confirms an interpretation that students are not considered in the same way as in discourse that indicates identification. "I" in lines 1a and 1b and the first "they" in line 3a are the only Participants in main clauses, giving those more functional priority. (The conjunctions described above place all other Participants in downgraded clauses.) Considering both main and downgraded clauses, the following is a line-by-line analysis of the Processes:

1: "like," mental

2a: "think," mental ("are" is part of a Phenomenon, not a Process)

2b: "see," downgraded, mental

2c: "is," downgraded, relational

2d: "is," downgraded, relational

3a: "think," mental

3b: " see," downgraded, mental

3c: "have," downgraded, relational

It is notable that none of the Processes are material; no one in this comment is *doing*

something. This pattern is much more similar to the ambivalent and resistant types of

discourse that put an emphasis on mental and relational Processes, communicating how

things are, than it is to identification or limited engagement discourse that more often

communicated what teachers might do in the future. Also, the majority of processes

associated with students as Participants are downgraded (with the exception is line 3a),

with the rhetorical effect of giving them less importance.

Whereas in a refigured vision teachers are seeking to understand students'

thinking and use it to plan instruction, close study of this comment suggests something

different. The teacher is not present, and the students are involved in mental processes of

seeing, thinking, and having ideas. Using alternative language, but still focused on mental

processes, two opposing interpretations can be suggested: students who do not believe in

themselves will see these possibilities and be inspired, or students who do not think they

can do the work will see it and figure it out. Regardless, either interpretation puts students

in a position of receiving ideas and suggests motivation may be an issue, rather than on

the teacher eliciting and using their ideas for instructional planning.

The significance of this text as a negative case comes from the fact that over the

in addressing the issue of coverage across the entire transcript, it was clear that

Florence's discourse does not communicate an understanding of the pedagogical

approach and the epistemological beliefs that are the basis of the re-figured vision. The

negative case analysis accounts for this discrepant finding.

Negative Case 2--Diana. At first, Diana's comment appears to fit more closely

with the resistance discourse than identification:

1	and going off of that \
2	I think .. I .. I've never really had that same feeling of rushing through anything / \
3a	because I think .. I have always thought \
3b	that I would much rather be successful and have them retain one unit/ \
4a	if I could do one unit good .. or well / \
4b	than if the other ones that I just kinda can't do as well then okay \
4c	instead of doing everything not well / \
5	.. I .. I just refuse to do that .. so \

This comment lacks the discursive features that characterize discourse associated with

identification. Diana uses "I" as a Participant in combination with mental and relational

Processes, describing her experience as the teacher, in a way that it very similar to limited

engagement and ambivalence. It is not focused on student thinking; students never appear

as Participants and only appear once as "them" in a Circumstance. Also, the focus is on

mathematics curriculum. Diana is discussing her practice more in terms of the curriculum

as a whole, something that is more common in the resistance discourse.

However, seen in terms of context and the interpersonal metafunction, Diana has

constructed this text to directly challenge several comments that were resistance. Prior to

Diana, four of the comments had referred to the speaker feeling guilty or afraid to "back

up," to return to a previous topic, or to slow down to support the understanding of all

students. In these cases, phrases such as "I feel" or "I have" introduced the issue of

backing up. Discursively this makes challenges to the validity of the proposition difficult;

it is hard to say that someone does not feel the way they claim to feel. With four

statements similar to this, Diana is discursively directed toward making her challenge in

similar terms. Therefore, her comment is a challenge by presenting her own experience as

an alternative way of thinking or feeling. Diana is directed into the same language

pattern, dominated by "I" and mental and relational Processes, as does discourse that

does not identify with the refigured world.

Seen in this light, it becomes evident that the comment does indicate

identification with the refigured world. She presents an image of instructional practice

and decision-making that counters the focus on moving through the curriculum. Her

refusal to change practice is strong statement in favor of teaching for student mastery. It

also communicates that a sense of responsibility to an internal standard of quality is

stronger than responsibility to an external authority or system.

Using the Discourse Analysis to Answer the Sub-Questions

This chapter describes how the reflections at the end of the day communicate a

range of positions relative to the philosophy of the professional development. Answers to

the research sub-questions were intertwined throughout this chapter. To summarize, I will

briefly answer each of the sub-question separately.

In what ways does discourse reveal positions of identification, compliance, or

resistance to changing pedagogical practices, and on what bases are these positions taken

up?

Rather than the three positions listed in the question, there were four positions

relative to the philosophy of the professional development—identification, limited

engagement, ambivalence, and resistance.

Positions of identification aligned with aspect of a refigured world that focuses on students—either their meaningful participation in activities or placing their ideas and methods of problem solving as a central component of instructional decision making. This discourse was focused on planning and structuring classroom activities and assessing students' understanding.

This discourse also communicates ambivalence or limited engagement. These positions describe a feature or characteristic of the pedagogy that is appealing. However, they do not argue in favor of any deep pedagogical change.

Discourse that appears to resist the vision of a refigured world is focused on mathematics as a discipline and its place in society. This discourse works to frame mathematics in a way that is different from the refigured vision. This position is focused on mathematics as it "really" is—from finding a job to how people "really" talk about math to describing the "real" idea that underlies mathematics education.

What understandings about the characteristics of a good mathematics teacher are expressed, constructed, or contested through discourse?

My analysis shows that understandings about the characteristics of a good mathematics teacher are tied to the relative weight placed on student understanding, mathematics as a discipline, and mathematics education as a system. These characteristics may include: being in touch with what students do and do not understand, teaching something well or not at all, and viewing change as an opportunity to improve one's practice. Alternatively, these characteristics may include: having a good understanding of the mathematics or presenting the mathematics in a way that is clear and

reflects how people use it in life. While these characteristics are not mutually exclusive, the discursive contributions did privilege some characteristics over others.

One of the more openly contested characteristics was meeting one's responsibility to progress through the curriculum according to an externally defined pace, such as a scope and sequence guide. This debate highlights the role that each teacher plays in the system, meeting the expectations for completing the curriculum or ensuring that students have a strong understanding of the material.

What beliefs and emotions are communicated in response to pressures to change pedagogical practices?

Beliefs and emotions in regard to changing practice are communicated both explicitly and implicitly in these excerpts. Direct references to emotion are fear, guilt, and hope about making instructional decisions to support students, especially those who are low achieving. Several teachers also directly express excitement about an idea they believe will help them improve their teaching.

Beliefs are addressed directly as a refusal to change current practice or statements about what the teacher has always done. Beliefs are also communicated indirectly, particularly in regard to students' abilities and motivations. The direct and indirect references to emotions and beliefs further point to contrasting views of a teachers' responsibilities in the classroom.

I take up this issue of teachers' responsibilities in the next chapter as I describe how this analysis answers my central research question.

CHAPTER SIX: PROFESSIONAL IDENTITIES IN THE DISCOURSE

Introduction

This chapter considers how the findings from the discourse analysis relate to the central research question. The reflections described in the previous chapter were a productive place to look for evidence of themes related to professional identities and normative pressures. During this part of the day teachers were directly and indirectly sharing their viewpoints, experiences, and attitudes. The discourse analysis of these reflections showed the answers to the research sub-questions were intertwined. I identified positions taken up through discourse—positions of identification, limited engagement, ambivalence, and resistance. These positions also explicitly and implicitly communicated beliefs about the proper role of the teacher in the classroom. In many cases, beliefs or emotions served as resources for communicating this positioning. Based on these interpretations, I will now discuss answers to the central research question:

In a case of mandatory mathematics professional development, in what ways are professional identities for mathematics expressed, (re)constructed, and negotiated through discourse?

Expressing Identities

An aspect of a teachers' professional identity most expressed, and validated, by the philosophy of the professional development and by other teachers' reflections is a belief in one's obligation to support students' understanding of the mathematics. For example, it is evident that this obligation was validated for Diana when she states that she

"refuses" to teach any other way and, with this statement she further validates others who share this belief. The way she has always thought and always done things has been affirmed, and she is able to make a statement that openly challenges several of her colleague's statements. Other examples come from Christie and Gina, who describe ways to make student thinking more prominent in the learning process. The validation of this goal enables them to discuss expanding their use of student thinking to improve their teaching. This discourse places value on students' conceptions and ways of understanding mathematics.

This aspect of a professional identity was expressed repeatedly. It is fair to ask if that is because of the power relations involved in the mandatory professional development meeting and the presence of Lynda, a district representative. If the pressure to express an obligation to develop student understanding was indeed pervasive, it would likely have been a feature of nearly all discursive contributions. As it is, it was "only" a feature of many. However, I believe the discourse analysis does indicate that many teachers were sincere in their expression of this feature of their professional identities. Regardless of the sincerity, the cumulative effect of these statements is normative pressure to enact this aspect of a professional identity.

However, some aspects of identities were expressed but not validated; they appear to have been challenged by the normative pressures of the meeting. These are certain beliefs and understandings about mathematics as a discipline. This seems to be the case with Eleanor's contribution. Her statement indicates that she disagrees with a particular way of using contextual problems, in particular her perception of questions that are reversed. In her classroom experience, this was not a success. What Bill sees as a feature

of the contexts that will save him from having to make up more questions, Eleanor

repeatedly describes as twisted and awkward and does not reflect what people really

think, say, or hear. This points to the idea that perhaps part of Eleanor's professional

identity is to ensure that mathematics instruction focuses on developing knowledge that

reflects mathematics as it is enacted in daily life. With her comment, Eleanor may be

rebutting a perceived challenge by the refigured vision to this responsibility she feels to

make math "real."

Similarly, Merald's discourse communicates concerns about the appropriateness

of this refigured vision given "real world" constraints. Resistant and ambivalent texts,

like Eleanor's and Merald's, share a sense of obligation to mathematics education beyond

the teacher's own classroom, whether to reaching a pre-determined point in the

curriculum or to preparing students for "real" world expectations. By asserting the value

of this position, there is an implication that the value was threatened to some degree by

the focus on students' understanding. This suggests those aspects of professional

identities that were challenged during the day were those understandings of what should

be the focus of mathematics instruction and one's role as a mathematics teacher in a

larger system.

(Re)constructing Identities

Edward provides an example of discourse that is suggestive of a professional

identity undergoing (re)construction. He picks up on Gladys's box plot metaphor, and he

interprets it as working with the variation among students rather than trying to get them

all to do the same thing. Edward then reveals that for years now, he has been focused on

doing it one way—his way. However, the metaphor has revealed to him the limitation of

that approach by appealing to something of more value for him—participation by all students, regardless of ability. Edward's discourse is representative of that which describes rethinking pedagogy and the values that drive it, a (re)construction of professional identity.

The idea of (re)constructing one's professional identity is present in several other discursive contributions. For example, Gina's discourse indicates that this process may have begun for her before this meeting, and she appears likely to continue change in that direction. Cindy's discourse may also communicate a process of (re)constructing identity. The idea of using a progression to support students' development of understanding allows her to fulfill an obligation to students as well as relieves her of a sense of guilt for not meeting an obligation to move students through the curriculum. However, the idea of (re)construction as change, though present, seems to be rejected by Merald. Though describing a possible benefit, he does not indicate he is likely to overcome the fear that motivates his approach to instruction.

It is the discourse of change that most often (though not exclusively) uses emotion as a resource for communicating positioning. For example, positive emotion is expressed when Mary and Bill talk about using new ideas in their classrooms. However, their discourse does not communicate a changing professional identity, only incorporation of a new idea into their current ways of teaching. When (re)construction of an identity is part of the discourse, the emotions become more complex. Both negative emotions (guilt and fear) and positive emotion (hope) are used as resources to communicate how the teacher is positioning him or herself and why they will or will not make a change.

Negotiations of Identities: Responsibility

The discourse analysis indicates that negotiations are taking place; there is explicit and implicit disagreement about what teachers should do to support students. This is most explicit in discussions about how quickly to move through the curriculum. It is most implicit in comments that hint at student ability and motivation. The major theme of these negotiations is responsibility.

Responsibility is never discussed outright, but it is a common thread running through the reflections. A type of responsibility that is closer to the surface of the negotiations is "responsibility to" playing one's part in the system or to the particular needs of the students. More subtly, discourse reveals different assumptions about "responsibility for" student achievement.

Some discourse discusses responsibility first and foremost as a responsibility to play one's part in a broader system. This view is expressed in two ways. One view is that the primary responsibility is to move forward through the curriculum. This is evident in the comments about moving forward, backing up, and time constraints. This is a major factor in Merald's statement that acts as a barrier to change. Also discussing this responsibility, Cindy is relieved that backing up for some kids does not mean that her responsibility is unmet. Considering negative consequences for slowing down suggests the basis for this responsibility. If each teacher presents the curriculum that is expected of them, students are prepared for assessments and future classes and future teachers know what students have been taught.

Another view of responsibility to a system is the relationship between mathematics education and society. This discourse is focused on what knowledge is

important and how people really do things. This viewpoint is evident in Eleanor's, Jimmy's and Brenda's reflections. This responsibility is to do one's part in a system ensuring that students are presented with the material they need for success—knowing why a particular skill is needed, communicating with others outside of school, or being prepared for the work force.

The other side of this negotiation is discourse that focuses on a teacher's responsibility to students within the classroom, a responsibility that is focused on developing all students' understanding rather than meeting curriculum goals. From this point of view, a responsibility to ensure students are able to participate, and to do so with understanding, takes precedence over expectations that the curriculum will be covered or presented in a certain way. This viewpoint is evident, for example in Edward's and Diana's discourse.

Additionally, there is an interesting sub-text in relation to "responsibility for". In several comments there are assumptions about responsibility for student achievement.

Christie's and Diana's comments are representative of those that communicate an assumption of responsibility for student achievement through the teacher's instructional decision making. Christie states that presenting new information without placing it in a contextual story problem "really doesn't mean much." Diana refuses to move on until she knows that she has taught a unit well. In both cases, student success is linked to how the teachers present the material. If a teacher makes instructional decisions that embed the information in a meaningful context from the start, more students will be able to participate. Also, if a teacher makes pacing decisions based on students' understanding and mastery of the content, at least one unit will be taught well, even if they run out of

time for the others. From this perspective, teachers' instruction appears the critical factor in student success.

In contrast, Jimmy's and Merald's comments are representative of an assumption that students are responsible for their own achievement through their levels of motivation and engagement. Jimmy suggests that teachers can use potential job placement to "sell" the idea to students. This implies that students will be, and need to be, motivated by future job prospects. Merald imagines that backing up just enough might wake somebody up, putting responsibility on the student for missing the content because he or she is asleep or tuned out. In these examples, the teacher does act with the aim of improving student achievement, but those actions are focused on motivation rather than on pedagogical decision making.

Therefore, the discourse analyzed here is negotiating features of professional identity—what a good mathematics teacher's role and function is in relation to supporting students' achievement and curriculum expectations. There remains disagreement as to whether the primary responsibility is to deliver the curriculum to the students or to ensure that the students are constructing mathematical understanding in a meaningful way. The negotiations address issues of "responsibilities to" and "responsibility for."

Summary

By drawing on the findings from the discourse analysis and answers to the research sub-questions, I have discussed what this discourse reveals about the expression, (re)construction, and negotiations of professional identities for mathematics in the context of a mandatory professional development meeting. My analysis suggests that beliefs about one's role in supporting student understanding were validated and

strengthened during the meeting. However, beliefs about one's position within a system of mathematics education that prepares students for future expectations were used as counter-arguments to the normative pressure to change instructional practice. This points to the use of beliefs in the expression of professional identities. The analysis also indicates that emotions were used as resources to communicate reasons for changing (or not) an aspect of one's practice or identity. The discourse shows that the different positions taken up in negotiations reflect the way perceived responsibilities operate as aspects of professional identity.

CHAPTER SEVEN: DISCUSSION

In this chapter, I discuss my interpretations of the discursive work that took place in light of my theoretical and conceptual framework and the related literature. This is followed by contributions of this discourse analysis and implications for professional development. Then, I provide recommendations for future research. The chapter ends with some concluding remarks about my positioning and role in conducting this research and writing this dissertation.

Central Research Question

My central research question is: *In a case of mandatory mathematics professional development, in what ways are professional identities for mathematics expressed, (re)constructed and negotiated through discourse?*

Through the data analysis process, I saw that the concepts I had been examining--epistemology, self-understandings, moral purposes, and emotions—were present in the discourse and took on different functions in the expression, (re)construction, and negotiation of professional identities. I will structure this discussion of these functions by returning to the three premises my theoretical and conceptual framework, starting with the last premise and ending with the first, moving from the more specific to the more general.

<u>Premise Three</u>

Pressure to refigure the world of mathematics education will lead teachers to negotiate professional identities and (re)position themselves.

Discourse indicates teachers did position themselves in response to the normative pressures of the professional development. This is evident in the discursive patterns that lead me to identifying a continuum of positions between identification with and resistance to the professional development philosophy.

Previous research indicates that when understandings about the characteristics of good mathematics teachers are contested, teachers engaged in a politics of identity (Kelchtermans, 2011). This politics involves actions "aimed at (re)gaining the social recognition of one's professional self-understanding" (p. 78). In other words, teachers may engage in activity, including discursive activity, to negotiate or regain footing for features of their personal professional identities that they perceive are being challenged. In this research, teachers whose discourse indicates they were experiencing some challenge to an aspect of their professional identity did engage in this politics. One form of this politics was the reframing ideas from the professional development to better align with the speaker's epistemological beliefs (i.e., what is valued in mathematics or its purposes). Another form this politics took was in the construction of the discourse, such as adoption of a particular discursive pattern to make a forceful counter-argument, or connecting to a previous comment in a way that either validated or challenged the other speaker's position. Also, as teachers described reasons for changing (or not) their practice, they drew on beliefs about professional responsibilities and on emotion to elicit recognition for their positions.

The presence of emotion in the discourse is further evidence that negotiation and (re)positioning were taking place. While used in opposing ways, the presence of fear and guilt in the discourse adds to previous research that found frustration and anger were

emotions experienced in the face of perceived obstacles to progress (Day & Lee, 2011; Saunders, 2013). In this discourse, external pressure was expressed as an obligation to move forward through the curriculum. Fear and guilt were used as resources five times to gain social recognition of positions taken in regard to a teachers' understanding of this as an obligation. These positions reflect different beliefs as to the efficacy of the pedagogy to outweigh the pressure.

The use fear as a resource for communicating beliefs about professional identity adds further evidence that emotion is a key factor in reform and pedagogical change. If a teacher is to use this model of instruction, he or she will need to make instructional decisions based on what students actually do and do not understand, without the support of a teacher's manual to outline the next steps. The teacher needs to have the ability to interpret students' work and to press students to the next level of understanding. The teachers who describe fear of slowing down to support student understanding are explaining why they have not done so in the past and why they continue forward with the curriculum plan and materials they have been given. It is possible their fear may also be related to feeling a loss of control and confidence if they do not have curricular resources for support (Day & Lee, 2011; Pekrun, 2006).

The presence of a "politics of identity" and emotion in the discourse act as indicators of ways that aspects of professional identities are negotiated and how teachers position themselves. Next, I discuss how the discourse reveals ways that subjectivities have been constructed.

<u>Premise Two</u>

The figured world shapes mathematics educators *qua* subjects and thus constitutes, though not deterministically, their professional identities, including their personal epistemologies, moral purposes, and self-understandings about the work of teaching mathematics.

This research shows that personal epistemologies, moral purposes, and self-understandings are useful ways of categorizing components of professional identities. Based on my analysis and interpretations of this discourse, I believe that these components of professional identities had the following functions: a.) self-understandings, particularly agency, confidence, and goals, were resources used to frame and contextualize positions that are taken up; b.) moral purposes, though implicit, represent the major resource used in negotiations; and c.) personal epistemologies are the deep, taken-for-granted beliefs that provide the foundation for a particular position.

<u>Self-understandings.</u> Different components of self-understandings are key resources as teachers contextualized the positions they were taking up. Describing goals, particularly those likely to be shared by others, is a way of communicating personal professional identities and positioning oneself relative to others. A goal may be using a particular instructional strategy as a means for becoming a better teacher. Also, the goal of a creating a more inclusive classroom is used as a reason for making a pedagogical change.

Reaching goals requires agency. Self-understandings related to agency are resources for expressing why this pedagogy might or might not be taken up. When a teacher feels that an external pressure, such as time, outweighs the benefits of reteaching,

they are communicating a lack of agency. Conversely, when a teacher states that using context or a progression of representations will make them a better teacher, they are describing an enhancement of agency.

In the previous section, I discussed how emotions played an important role in social recognition of one's position. Emotions also help communicate self-understandings. Fear communicates a limited sense of agency. Being hopeful that an instructional technique will be successful communicates a greater sense of agency, but somewhat limited confidence.

The presence or absence of confidence is used as a resource to communicate understandings about good mathematics instruction and position oneself. This is evident when teachers state that they will implement a new approach in order to improve their instruction, or when teachers express confidence in their understanding of the mathematics content and ability to teach students. Also, a combination of uncertainty and willingness to try something new is a resource that enacts an identity and communicates a position—that of someone who recognizes vulnerability but is willing to face it. As these teachers communicate these intentions for their instruction, their degree of confidence acts as a resource for constructing expectations of what abilities and attitudes are part of a good mathematics teacher's repertoire.

Moral purposes. Leithwood et al. (1994) describe two bases for adoption of reform, moral identification and pragmatic needs. This research is considering both positions of identification and resistance, as well as positions between the two. Pragmatic needs were a feature of the positions in between—limited engagement and ambivalence. Moral purposes, the desire to do what is right or good, played a stronger role in positions

of identification and resistance. They are also the resources that really drive the negotiations, as teachers present opposing ideas about how to approach pacing their instruction. Is a teacher responsible for making sure the curriculum is made "real" to students or responsible for doing it right or not at all? Responsibility beliefs, both in terms of responsibility to and responsibility for, are grounded in moral purposes. Responsibility is a matter of "ought" and "should." As teachers debate what goals should take precedence over others, what they should do in regard to students who do not understand, whether they ought to back up, they are making arguments based on moral purposes.

Personal epistemologies. Personal epistemologies represent the component of professional identities most taken-for-granted. These are assumptions about students of different abilities and assumptions about the sources of students' struggles with mathematics. These assumptions reflect orientations toward mathematics and mathematics learning—who can learn mathematics, how one learns mathematics, and what kinds of mathematics learning is valued. The discourse that identifies with the refigured world communicates beliefs that are more similar to a relational orientation in which students' ways of thinking are valued as part of the pedagogy. It also communicates a belief that authority for constructing and verifying knowledge should be shared with the student. As the discourse moves along the continuum toward resistant, it is more reflective of an instrumental orientation in which the teacher presents the mathematics to students. It also reflects a belief that the mathematics students learn is created, determined, and validated an external authority. Whichever the orientation that

underlies the discourse, it is a position that is not overtly communicated but still defines which side is taken in the negotiations around instructional practice.

Identities as Subjects in a Figured World

I have described a professional identity for mathematics as the understandings one has about the work of teaching mathematics, or how a person conceptualizes the qualities and actions that make someone a good mathematics teacher. Based on my literature review, I have operationalized this construct as a combination of self-understandings, moral purposes, and epistemological beliefs. These components of professional identity develop and change through experience and social interaction in figured worlds.

The theory of figured worlds describes how we are constituted, though not deterministically, through discourses, experience, and social interaction (Holland et al., 1998). For mathematics teachers, the figured worlds that constitute their identities include their own schooling experiences, their preservice education and professional experiences, and their in-service experiences, including professional development. They also include all the discourses around mathematics, mathematics education, and the role of mathematics in society.

Seeing teachers as objects of this figured world focuses on how the worlds have constituted and perhaps constrained these identities. Seeing teachers as subjects of this figured world focuses attention on how their identities influence the instructional choices they make and the interactions they have with others. The positions I have described illustrate the ways teachers are both objects and subjects of this figured world. For example, we can see how discourses about the role of mathematics in the economy play a role in the positions of resistance. We can see how the discourses around supporting all

students' academic success play a role in the positions of identification. As subjects each of the teachers makes choices that affect their students' experiences in mathematics, (re)producing the figured world of mathematics education. Their comments in the professional development also act as discursive pressure on what it means to be a good mathematics teacher in this figured world.

Premise One.

The figured world of mathematics education is constructed by Discourses that define relationships knowledge and authority.

The aim for deep pedagogical change is challenging the figured world of mathematics education. The processes of maintaining or refiguring a world flow through networks of power. Power acts at different levels—from macro-levels such as boards of education or legislatures to micro-levels as individual subjects interact in figured worlds.

Interactions in classrooms and in professional development are embedded in Discourses. Discourses involve deeply interconnected relations of truth, power, and right (S. J. Ball, 2013; Foucault, 1980). In terms of this research, I have translated that dynamic into concepts of knowledge and authority. The refigured vision of a classroom that is the aim of this professional development involves a shift in authority, such that authority for constructing knowledge is shared by teachers and students. This vision suggests a disciplinary matrix (Kuhn, 2012) that holds epistemological beliefs based on seeing mathematics as a human construction. This challenges a disciplinary matrix that views mathematics as a static and eternal collection of facts and relations.

This discourse analysis reflects how these views of mathematics play out in interactions and how Discourses that define knowledge and authority play a part in the

construction of the world of mathematics education. As you shift from one epistemological orientation to another, you are changing established relations of knowledge and authority. Taken-for-granted epistemological beliefs are evidence of these Discourses at work, shaping our understanding of whose knowledge is valued and based on what authority. Yet self-understandings and moral purposes emerge at the same time from these understandings of knowledge and authority. The discourse analysis reveals ways teachers recreated and pressed against Discourses, as they positioned themselves and negotiated ideas of responsibility using emotions, obligations, and values as resources.

Contributions of this Study

This discourse analysis can help inform research on professional development that must deal with the complexity of change in a context of reform and the challenge of supporting teachers in the process (Goldsmith et al., 2014; Hill et al., 2013). This study shows how professional identities can be used as conceptual frameworks to address the complexity involved in teacher learning by accounting not just for cognition (learning new content or techniques), but also motivation (e.g., obligations, responsibilities, beliefs, and values), and emotions (as indicators of change or normative pressure to change). Not only are these three processes of learning accounted for, but the methodology and framework can shed light on learning in contexts (Goldsmith et al., 2014)—narrowly defined contexts such as mandatory professional development for grades 6–8 teachers in rural/suburban schools, as well as contexts of figured worlds and power/knowledge.

This study shows how discourse can communicate teachers' understandings of these figured worlds. It adds to the research that shows the importance of providing

affective support, but it also shows a more nuanced picture of that support. The findings provide further evidence that self-understandings such as agency and confidence are important factors in changing instructional practice. However, it also suggests that positions of identification with or resistance to pedagogical reform are tied to personal epistemologies, deeply held and often unexamined beliefs about learning. Further, and importantly, it points to the importance of a teaches' senses of obligation and responsibility and how these are weighed. It suggests that motivation for making those deep changes, or not making them, may stem from a teachers' moral purposes—his or her desire to do what is right.

This research also points to a conflict between discourses that are a part of the world of education. Educators often use and hear phrases such as "student support," "leaving no child behind," and "all children can learn." These phrases seem to align with the values and responsibilities that were expressed in discourse that identified with the professional development. Educators also use and hear discourses about "student achievement," "preparing for the future," and "college readiness." These phrases seem to align with the values and responsibilities expressed by teachers whose positioning was other than identification. This suggests that these discourses, while perhaps not inherently in opposition to one another, are felt to be at odds in the lived experience of teachers.

Implications for Professional Development

As described in the introduction to this dissertation, research on educational reform indicates that in addition to providing support, teachers' identities and experience matter (Coburn, 2003; Darling-Hammond, 2010; Elmore, 2007; Fullan, 2000). Often support is conceived of, by teachers and researchers alike, as a need to develop content

knowledge and provide resources. While content knowledge and resources were often

aspects of discussion throughout the day, notably they were a minimal part of the

reflections. Instead, the reflections were largely negotiations of responsibility that called

upon emotions, obligations, and values as resources for communicating one's position.

Therefore, this study suggests that these factors are important to consider when providing

professional support.

Locating the source of fear and guilt for changing one's habitual way of teaching,

and dispelling it, seems critical for teachers who express ambivalence. One way to do this

may be to push the discussion toward areas that were left unexplored in teachers'

discourse, such as describing the perceived negative consequences for changing

instruction. If the discussion of these negative consequences focuses on ways teachers

can actively mitigate or dispel them, it may integrate their creativity and experience. This

may then serve as an enhancement of agency that will support their ability to change

practice (Brooks et al., 2008; Day, 2002).

Negotiations around curriculum pacing reveal an opening for a professional

development programs such as this, or for academic coaches or administrators, to provide

more support as teachers undergo a process of (re)constructing professional identity. As

this discourse reveals, efforts to shift instruction to a socio-cognitive model that focuses

on student thinking may be perceived as incompatible with a teacher's sense of obligation

to complete the scope and sequence or a sense of obligation to prepare students for future

expectations. Therefore, to shift instruction it may be necessary to make time for

discussions about how new instructional practices contribute to fulfilling one's

responsibility to meet scope and sequence expectations, as well as other obligations to the

educational system and to the "real" world. Additionally, by making time for these discussions, or allowing time for teachers to express resistance and negotiate obligations and responsibilities, there is a shift in the power relations involved in mandatory professional development. Like sharing the authority for knowledge creation in the classroom, this would allow shared authority in refiguring the world in which the teachers work.

Suggestions for Further Research

I believe this research has shown that discourse analysis, grounded in a post-structuralist framework, is a productive and interesting methodology that merits continued use. There are many aspects of the text that could be considered in more detail than I have done here. There are many aspects of the text that I left for later because they did not contribute directly to my research questions.

This analysis is necessarily focused on a very small section of discourse with a particular group of teachers in a particular context. The study aimed to explore discourse and professional identities in a way that had not been done previously. It reveals many paths for future research.

Further research should continue to study how professional development works in different contexts with different groups of teachers (Goldsmith et al., 2014). There are many questions that could be explored. Some questions are related to the grade levels with which the teachers work—what negotiations of professional identity take place among elementary school teachers or among high school teachers? Another approach would be to ask questions about normative professional identity negotiations that take place in different communities. Also, in this study, I did not compare how professional

identities were communicated among the smaller group discussions at tables to how they were communicated in the whole group. Understanding discourse in different contexts with different groups of teachers would help to elaborate, disconfirm, or refine the claims I have made here.

This research also suggests other questions might be interesting and may provide insights into teachers' experiences with reform. For instance, there is potential to further explore the issue of emotion as a discursive resource. Also, this analysis did not fully explore expressions of emotion that took place throughout the day. Further, this study did not explore how teachers discuss emotions experienced as they implement some of these pedagogical changes.

Finally, I believe the way I have conceptualized professional identities can prove both interesting and valuable. Studies can further explore how professional identities are expressed in contexts such as professional development or through interviews. While there is much research on aspects of self-understandings and some on moral purposes, there is very little on teachers' personal epistemologies. To my knowledge, there are no other studies that consider the relationships between these aspects of identity. This conceptual framework for professional identity may be useful for further research on teacher learning, teacher response to reform, and, most importantly, teacher well-being.

Concluding Thoughts

The idea of a "good" teacher has played a prominent role in this research and writing. To conclude, I would like to discuss this idea and my positioning. I believe it is important to be honest about my position and take responsibility for the power that flows through my participation this professional development and research. If I were to place

myself on the continuum, I would fall in a position of identification of the professional development philosophy. Yet, it has been my intention to step aside from my role as a reformer. It has also been my intention to maintain my professional identity as a mathematics teacher in order to better connect with the lived experience of other teachers. This is a difficult task, embedded as we are in Discourse. In order take responsibility for the effects my positioning may have had, I would like to discuss what, in my mind, makes this refigured world desirable and defensible, and why we should seriously consider the professional identities of teachers.

Recently, as I crossed campus, I passed by a group of potential students and their parents on a campus tour. The tour guide said, "And this is the math building. But don't worry! We offer free tutoring." I thought to myself that this is more evidence that there is something wrong about the way we are teaching mathematics. There is much evidence that is based on the way we measure achievement—too many kids are not reaching the level we call proficient. But also we can also see that too many people are afraid or anxious about math.

Research shows that most math classes today look much as they did for most of us, with a teacher showing how to do some problems and students practicing 20 or 30 of those problems. This is how I taught math for many years. Perhaps there is something wrong with that if the outcome is that so many people are worried and afraid, and our achievement is not what we would wish it to be.

For years there have been attempts at reform, to change the way we teach mathematics. The pressure has intensified with the adoption of CCSS-M. These standards

represent a big change in the way mathematics is presented to students and what students are asked to do with it. It is very unfamiliar to most people, including teachers.

This research looks at ways teachers communicate who they are—and how that influences their response to change and what they might do in the classroom. I am interested in this topic because who we are as people shows up in how we teach (Palmer, 2007). I believe that most teachers want to be good teachers. So my question is in what ways do we understand what good means? Does good mean the same thing to all of us? And how does that affect what we do in classrooms?

When these teachers were asked to share their thoughts about the professional development and changing their instruction, they spoke in terms of self—their identities are fully engaged in the way they talk about teaching. They may have deeply held beliefs about students and learning and mathematics that are not necessarily changed by sitting in a meeting, beliefs that are likely influenced by their years as students and teachers. These beliefs may align with the vision I have for mathematics education, and they may not. But I also found that these teachers are basing their decisions, at least in part, on the moral purposes they have for teaching, their senses of responsibility. For these teachers, this was the entry point for supporting change, the place of negotiation of what really matters.

There was disagreement in how they weigh their responsibilities. Some teachers communicated a responsibility to move the students along a path, however far they can move them. And other teachers communicated a responsibility to prepare students for the next grade, or for their assessments, or for college. These responsibilities were related to the way they communicated willingness or unwillingness to change their practice. What

this means, I believe, is that teachers take their responsibility very seriously. So much so that it influences the way they respond to normative pressures to change.

As we try to improve mathematics instruction, we need to consider this role of responsibility and understand that people weigh their responsibilities differently. We ought to consider how these ways of conceiving our responsibilities are in conflict, and how the discourses we have around education, such as supporting every child and college readiness, might be perceived as being in conflict.

I hope my research provides those who work with teachers with some ways of understanding the barriers to change that are not easily isolated and measured. It is important that we consider cognition, motivation, and emotion as intertwined in the process of learning. And it is important that we understand our professional identities as complex interactions between self, belief, moral purposes, and contexts.

A question that has been presented to me several times as I worked on this project regards the value of spending so much time analyzing what we say when we rarely spend much time thinking about what we will say. From a poststructuralist point-of-view, that is precisely the reason we should spend the time. What we say has force, especially a cumulative force. What these teachers say and believe and do has an impact on children's experiences in mathematics classes. It has an impact on children's identities. What poststructuralist discourse analysis of mathematics professional development provides is a mirror in which we can glimpse the figured worlds in which we—teachers, students, and researchers—are constituted and which we are constituting.

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APPENDIX A

Transcription Symbols

Units		
	Intonation unit	Return
	Word	Space
	Truncated word	-
	Speaker identity/turn start	*X*:
	Speech overlap	[ ]
	Stress	<u>Word</u>
	Strong stress	<u>Word</u>
	Lengthened sound	wo:rd
Intonational Contour		
	Fall	\
	Rise	/
	Fall-rise	\ /
	Rise-fall	/ \
	Level	_
Pause		
	Long	…(N)
	Medium	…
	Short	..
Laughter		@
Quality		
	Laugh quality	<@ @>
	Quotation quality	<Q Q>
Transcriber's perspective		
	Researcher's comment	(( ))
	Uncertain hearing	<X X>
	Indecipherable syllable	X

Adapted from: DuBois, et al., (2014); Gee (2005).

APPENDIX B

26 Building Tasks and Tools for Discourse Analysis

Building Task	Questions that Integrate Tasks and Tools
Significance	1. What are the situated meanings of some of the words and phrases that seem important in the situation?
	2. What situated meanings and values seem to be attached to places, times, bodies, people, objects, artifacts, and institutions relevant in this situation?
	3. What situated meanings and values are attached to other oral and written texts quoted or alluded to in the situation?
	4. What figured worlds seem to be at play in connecting and integrating these situated meanings to each other?
	5. What institutions and/or Discourses are being (re)produced in this situation and how are they being stabilized or transformed in the act?
Activities	6. What is the larger or main activity (or set of activities) going on in the situation?
	7. What sub-activities compose this activity (or these activities)?
	8. What actions compose these sub-activities and activities?
Identities	9. What identities, with their concomitant personal, social, and cultural knowledge and beliefs (cognition), feelings (affect), and values, seem to be relevant to, taken for granted in, or under construction in the situation?
	10. How are these identities stabilized or transformed in the situation?
	11. In terms of identities, activities, and relationships, what Discourses are relevant (and irrelevant) in the situation? How are they made relevant (and irrelevant), and in what ways?
Relationships	12. What sorts of social relationships seem to be relevant to, taken for granted in, or under construction in the situation?
	13. How are these social relationships stabilized or transformed in the situation?
	14. How are other oral or written texts quoted or alluded to so as to set up certain relationships to other texts, people, or Discourses?
	15. In terms of identities, activities, and relationships, what Discourses are relevant (and irrelevant) in the situation? How are they made relevant

	(and irrelevant), and in what ways?
Politics	16. What social goods (e.g., status, power, aspects of gender, race and class, or more narrowly defined social networks and identities) are relevant (and irrelevant) in the situation? How are they made relevant (and irrelevant), and in what ways?
	17. How are these social goods connected to the Discourse models and Discourses operative in the situation?
Connections	18. What sorts of connections—looking backward and/or forward—are made within and across utterances and large stretches of the interaction?
	19. What sorts of connections are made to previous or future interactions, to other people, ideas, texts, things, institutions, and Discourses outside the current situation?
	20. How is intertextuality used to create connections among the current situation and other ones or among different Discourses?
	21. How do connections of the sort in 18, 19, and 20 help (together with situated meanings and figured worlds) to constitute "coherence"—and what sort of "coherence"—in the situation?
Sign systems and knowledge	22. What sign systems are relevant (and irrelevant) in the situation (e.g., speech, writing, images, and gestures)? How are they made relevant (and irrelevant), and in what ways?
	23. What systems of knowledge and ways of knowing are relevant (or irrelevant) in the situation? How are they made relevant (or irrelevant), and in what ways?
	24. What languages (in the sense of "national" languages like English or Spanish) are relevant (or irrelevant) in the situation?
	25. What social languages are relevant (or irrelevant) in the situation? How are they made relevant (or irrelevant), and in what ways?
	26. How is quoting or alluding to other oral or written texts (intertextuality) used to engage with the issues covered in questions 22-25?

Note. Source: Gee (2005).

APPENDIX C

End-of-Day Reflections for Fourteen Teachers

These portions of the transcript are presented in the order in which they occurred.

These do not represent all of the comments that were made during the end-of-day

reflections.

<u>Brenda:</u>

1	I think <u>my</u> takeaway for today is gonna be how you said that … um… \
2	that <u>math</u> traditionally teaches to the concept _
3	but the <u>real</u> idea is to teach to the <u>activity</u> or the <u>critiquing</u> or critical <u>thinking</u> of a solution \
4	and where <u>English</u> or <u>any</u> other subject .. I think <u>all</u> subjects .. it's.. that's <u>always</u> been like that \
5a	it's <u>not</u> just to teach capitalization \
5b	but <u>why</u> are we teaching capitalization \
6	and so I <u>like</u> that .. when you made that comparison \

<u>Bill:</u>

1a	I <u>like</u> the fact that in doing it this way \
1b	you could take the same <u>question</u> and ask a third grader \
1c	and you can ask an eighth grader the <u>exact</u> same question / \
1d	but have more <u>depth</u> of knowledge
2	and <u>I</u> was writing I was trying to write it down so I didn't forget \
3a	so you know you can <u>have</u> you know like the sixteen cookies cost eight dollars or five cookies cost two dollars that's an easy one how much would eight dollars get you \
3b	<XXXXXXX>
4a	but <u>then</u> you can start stacking them / \
4b	and say what's the relationship between sixteen cookies and eight <u>dollars</u> \
4c	and <u>graphing</u> \

4d and then predict how much is this is gonna <u>cost</u> /

4e which is why you need a <u>graph</u> \

5a so it's the <u>same</u> question \

5b just different .. just different things that you're <u>focusing</u> on when you're stacking them \

6a so you <u>don't</u> have to <u>come up with</u> new math questions / \

6b you just have to <u>understand</u> what .. what it is that that you are asking for \

<u>Eleanor:</u>

1a and along with that <u>too</u> with the <u>not</u> having to make up <u>more</u> things \

1b I mean you can just <u>twist</u> the question around \

2a I mean .. I .. we'd already.. we'd <u>already</u> done our ratio and proportion and stuff \

2b and and we had some <u>questions</u> in there \

2c and they'd get kind of <u>awkward</u> \

3a because you know when you.. we had one that was like if you read like 39 pages per <u>minute</u> what would the ratio be of minutes per <u>page</u> \

3b and it is <u>twisting</u> that <u>around</u> / \

4a and it it <u>is</u> awkward / \ because you don't you just don't <u>talk</u> like that / \

4b we <u>don't</u> you don't <u>hear</u> that / \ or you know nobody <u>thinks</u> like that / \ or whatever \

5a but anyway it's really <u>interesting</u> \

5b when you do start <u>twisting</u> them around how <u>different</u> the answer is \

<u>Christie:</u>

1 like to go off of <u>that</u> \

2a like if you don't have the context there /\ to <u>start it off</u> with /\

2b like .. it just really .. doesn't really <u>mean</u> much \

3 and <u>some</u> kids will just look at and be like what are you guys talking about \

4a so I think .. for <u>me</u> or at least maybe for the two of us because we work together \

4b really starting our units off with some sort of <u>big contextual problem</u> \

5 so we can <u>see</u> where they're at \

Cindy:

1a	I like the idea that…that what I got out of it is not to feel guilty / \
1b	if you have to step back and go back to the enactive with some kids / \
1c	and try to move the other ones along with it \
2a	they move along at a different pace \
2b	but they may be all working on the same problem \

Barbara:

1	Off the same chart ((pointing to progression)) \
2a	…I have kids draw their .. like do their work on my whiteboards a lot /
2b	and so then I have them make connections like oh what does .. whose does yours look like \
3a	and they do that /
3b	but I don't do that \
4a	so I don't have them like turn in work to me /
4b	and then like lay it out like we did back here and figure out what stages they are in /
5a	and I think if I did that it would help improve my teaching /
5b	as opposed to just improving their learning /
6a	because they do get a lot from when they do it \
6b	but I need to do it as well

Mary:

1a	so I .. on that last problem .. I just can't get over / \
1b	how much I really like the fact that you had the four .. different .. rows in that ratio table \
2a	because I would always teach it as just two / \
2b	I would teach it with the number of cookies and the total cost \
3a	and it would bother me / \
3b	that the questions like you said in the curriculum would always say is it a proportional relationship\
3c	and it's not when you look at just those two \
3d	but then there's the slope and the slope is a proportional relationship / \

4a	and so it was <u>hard</u> for me to say no it's not a proportional relationship \
4b	but yet there's a <u>slope</u> / \
4c	and it has the <u>same</u> <u>pattern</u> go up <u>five</u> over <u>two</u> up five over two \
5	and so .. I .. from <u>now</u> <u>on</u> I'm gonna teach it with the four rows\

Merald:

1a	going back on what <u>she</u> said about <u>backing up</u> \
1b	and being <u>not</u> afraid to go <u>back</u> up / \
2a	I've always been afraid to back up a little bit \
2b	I can <u>once</u> in a while/ \
2c	but .. not very <u>much</u> \
2d	and I <u>feel</u> like I gotta .. I don't have enough <u>time</u> already / \
2e	so I <u>can't</u> <u>afford</u> to take much time on this / \
3a	but I kinda .. <u>today</u> for <u>something</u> that <u>someone</u> said along the way I don't know <u>what</u> but \
3b	.. made me think you know .. I <u>can</u> <u>imagine</u> backing up <u>just</u> <u>enough</u> with <u>maybe</u> even going over ratio tables or I don't…\
3c	might just <u>wake somebody up</u> \
3d	and make 'em jump <u>leaps</u> <u>ahead</u> <u>faster</u> than they would have .. <u>ever</u> done /\
3e	and we might end up .. eventually <u>farther</u> ahead than \
4a	…if <u>I</u>'d back up
4b	if <u>I'd</u> be willing to do that

Gina:

1a	I appreciated your comment earlier about
1b	this would be the unit to <u>start</u> with students' <u>conceptions</u> or <u>ideas</u> of how to solve this problem \
2	we started with <u>statistics</u> \
3a	we just finished a unit on <u>decimals</u> a little mini-unit \
3b	it's <u>not</u> like there's a lot of ways to <u>solve</u> that / \
4a	and when come to <u>statistics</u> it's like
4b	… <u>they</u> don't have any preconceived real notions of statistics \
5a	but solving problems like <u>this</u>

5b   would be the one opportunity for them to solve it <u>lots</u> of different ways / \

6a   and so while it seems <u>very</u> <u>scary</u> to me /

6b   I .. I am hoping to <u>try</u> it \

6c   and show <u>lots</u> of student work \

6d   so we'll <u>see</u> how it goes _

Diana:

1   and going off of <u>that</u> \

2   I think .. I .. <u>I</u>'ve never really <u>had</u> that same feeling of rushing through <u>anything</u> / \

3a   because I <u>think</u> .. I have <u>always</u> thought \

3b   that I would <u>much</u> rather be successful and have them retain <u>one</u> unit/ \

4a   if I could do <u>one</u> unit <u>good</u> .. or <u>well</u> / \

4b   than if the other ones that I just kinda <u>can't</u> do as well then <u>okay</u> \

4c   instead of doing <u>everything</u> <u>not</u> well / \

5   .. I .. I just <u>refuse</u> to <u>do</u> that .. so \

Edward (with Gladys [G]):

E: 1a <u>I</u> like the fact what you <u>said</u> a little bit ago

   1b because I think we sometimes tend to <u>see kids</u> like you said move that <u>dot</u> \

   1c everybody needs to be at <u>this</u>… / \

G: 2   everybody's <u>here</u> and everybody's gonna go <u>here</u> \

E: 3a and .. well .. whether we like it or <u>not</u> that's not gonna <u>happen</u> / \

   3b you <u>always</u> have that .. you know .. <u>variety</u> of … abilities / \

   4   and I <u>like</u> that that expression where you want to <u>mo:ve</u> the box and <u>not</u> individual [dots] \

G: 5   [yep]

   6a and … I … for <u>years</u> now I have always you know wanted the kids to do things a <u>certain way</u> \

   6b because <u>my gosh</u> that's the little kids way / \

   6c you now need to be thinking like <u>this</u> / \

   7   well some kids don't <u>have</u> that <u>ability</u> \

   8a so what we <u>did</u> today like enactive and like \

   8b <u>that</u> would serve a <u>purpose</u> for <u>those</u> kids who are of the lower ability to <u>still</u> participate / \

8c   and <u>get</u> the concept in a different way… / \

9   you know so it just got me <u>thinking</u> \

Langston:

1a   and bouncing off what <u>Mr. D6</u> just said \

1b   … @ …

1c   <u>I</u> have to do that <u>all</u> the time with <u>my</u> students / \

2a   like when I work with Mr. D3 or when I work with ((another teacher)) here or someone \

2b   <u>I</u> have to look at some of those <u>general</u> education <u>common</u> core concepts that they are teaching \

2c   and find out <u>how</u> can I get a special ed k- student to participate in that activity \

3a   so they can at least have <u>access</u> to it/ \

3b   whether they're gonna come <u>close</u> to mastering it or understanding it is one thing \

3c   but they have to have <u>access</u> to it / \

4   and so we can <u>do</u> that through the <u>different</u> methods \

Jimmy:

1a   isn't it something that they <u>look</u> for in a lot of like job .. placement _

1b   .. not placements but like a little <u>test</u> they give you a .. some sort of <u>assessment</u> / \

2a   and see <u>oh</u> then if you have excEleanort ratio or what's it called .. <u>proportional</u> <u>reasoning</u> \

2b   that's like <bing bing bing bing> \

2c   and you .. they will put you in certain <u>jobs</u> \

3   I know it's a <u>big</u> thing on the military assessment \

4a   so like you know you can sell to it kids in <u>that</u> way <u>also</u> \

4b   like this is <u>the</u> essential understanding of math \

Florence:

1   <u>I</u> like the display back here \

2a   because <u>I</u> think sometimes students that are at the…enactive /

2b   and when they <u>see</u> how far they can go /

2c   and it's the <u>same</u> thing \

2d   but it's in a <u>different</u> format \

3a   … they .. some of the kids <u>don't</u> ever think that they can <u>get</u> there /

3b   but when they <u>see</u> all of the examples \

3c   and they have an idea \

APPENDIX D

Complete Figured World Analysis

The table below presents the complete figured world analysis. Text is taken directly from the transcript unless italicized, in which case it is paraphrased to simplify or highlight a point. The two groups of teachers are clustered together, with identification discourse first and resistance second, to help reveal the patterns within and distinctions between the groups. The last two teachers, Diana and Florence, represent "negative cases" and are describe in detail in part two of this chapter.

Teacher	Characters	Activities	Settings	Artifacts	Spatial- temporal References	Commentary on typical situations & change
Christie	kids *self* partner teacher	starting with contextual problem	*classroom*	*math problems*		*some students are confused without context, starting with big context will help (improve)*
Gina	*self* you *(pd)* students	start with students' conceptions solving problems lots of different ways showing work	*classroom*	students' conceptions *students'* work		*uncertain outcomes in regard to students generating lots of different ideas*
Langston	*self* teachers special education students	participate in activities have access	*classrooms*	common core activities		*students' access and participation doesn't guarantee understanding or mastery (improve)*

Name			Setting			
Edward	*self* you *(pd)* we *(teachers)* kids kids of lower ability	move the box, not the individual dots do things a certain way participate get the concept	*classroom*	activities	*box plot metaphor-- linear movement shifts from of single point to a range of points*	*not everyone will be able to do it the way he has always expected, but will be able to participate and get the concept (improve)*
Barbara	*self* kids	do work make connections learning teaching	*classroom*	work on whiteboards		*students share with each other, if teacher collects this work it will improve her teaching (improve)*
Cindy	*self* some kids, others	stepping back, moving back trying to move along	*classroom*		*backward and forward movement*	*backward and forward movement don't have to feel guilt (improve)*
Merald	*self* someone *(in pd)* somebody *(student)* we *(class)*	backing up think, imagine wake up, jump leaps ahead	*classroom*	ratio tables	not enough time back up jump ahead end up farther ahead	*afraid to back up, if there was more time, ratio tables might help a student jump ahead, uncertain*
Mary	*self* you (pd)	Teach	*classroom*	ratio tables slope proportional relationship	from now on	*teaching prop. relationships, has a tool to better communicate concept (improve)*
Bill	*self* you *(teacher)* 3rd or 8th grader	ask, say, predict, graph, *saving time or energy* understand	*classroom*	graphs questions	stacking	*creating lots of contexts for different lessons, don't have to create more if you understand (improve)*
Eleanor	we *(teacher and class)* you, nobody *(general)*	asking awkward questions how people really think, talk	*society in general*	awkward questions		*twisting questions around will be awkward, don't fit the way things really are*
Jimmy		something they look for	*society in*	assessments	*future orientation*	*this understanding helps get*

	they *(general)* you *(general)* self you *(teachers)* kids	put you in jobs selling it	*general*	jobs		*jobs, need to sell it to kids*
Brenda	self you *(pd)* we *(teacher)* subjects	activity, critiquing, critical thinking teach	*educational system*	other subjects	all subjects that's always been like that	*focus was on concept (skill?), change to why you are teaching it*
Florence	*self* students some are at the enactive	seeing don't think they can get there have an idea	*classroom*		see how far they can go	*students who are stuck will see the examples, get ideas, see what they can do (improve)*
Diana	*self* them *(students)*	doing one unit well instead of everything not well	*classroom*	unit		*not rushing through anything, won't get through it all*

Note: Plain text is direct quote. Italicized text is paraphrased to simplify or highlight a point. The first six rows are examples of identification discourse. The second six rows are examples of resistance discourse. The last two rows represent negative cases.

APPENDIX E

Experiential Metafunction Analysis

In Table F1, examples of identification discourse are listed first, resistance

discourse second, and negative cases last. Words and numbers in italics refer to

Participants, Processes, and Circumstances that occur in downgraded clauses. Processes

are abbreviated: material (mat.), mental (ment.), relational (rel.); verbal (ver.), behavioral

(beh.), and existential (exis).

Table F1

Complete Experiential Metafunction Analysis

Teachers	Participants	Processes	Circumstances
		have (rel.)	
		mean (rel.)	
		look (beh.)	*context*
	teachers	be (ment.)	much
	it	think (ment.)	at it
	students	starting (mat.)	like what …
	I	see (ment.)	our units
Christie	the two of us (2)	*work (mat.)*	where...
		appreciated (ment.)	
		start (mat.)	your comment earlier that…
		finished (mat.)	with statistics
		is (rel.)	the unit to start with …
	I (2)	have (rel.)	ideas (1, *1*)
	this	be (rel.) (1, *1*)	opportunity
	teacher and class (3)	*solve (mat.)*	lots of different ways
	it (2)	*seems (rel.)*	scary to me
	students (1, *1*)	hoping (ment.)	student work
Gina	solving problems…	see (ment.)	how it goes
		do (mat.) (2)	
		work (mat.)	*with*
		look at (ment.)	some of those general ed…
	I (2, *2*)	find out (ment.)	how…
	students (2)	*get (mat.)*	*a special ed student*
	whether they…	have (rel*.) (2)*	access, that (4)
Langston	teachers	is (rel.)	one thing
	I (4)	like (ment.) (2, *1*)	the fact …
Edward	*facilitator(2)*	*said (ver.)(2)*	*a little bit ago*

	teachers (2, *2*)	think (ment.) (3)	students (2)
	students (3, *1*)	see (ment.)	at this
	that (2)	be (rel.) (1, *1*)	*it*
	what we did today…	happen (mat.)	ability (2)
	it	have (rel.) (2)	that expression
		want (ment.) (1, *1*)	the little kids' way
		is (rel.)	like this
		serve a purpose (rel.)	*concept*
		participate (mat.)	me
		get (ment.)	
		have (mat.) (2)	
		do/*did* (mat.) (3, *1*)	students (3)
	I (6, *1*)	think (ment.)	that (3,*1*)
	students (2)	help improve (mat.)	my teaching not just …
Barbara	it	get (ment.)	a lot
		like (ment.)feel (rel.)	the idea
		step back and go	guilty
	I	*back (mat.*	*to the enactive*
	what I got out of it	*try (mat.)*	students (1, *1*)
	teachers	move (mat.)	at a different pace
Cindy	students (2)	working (mat.)	on the same problem
		be (rel.) (1)	
		can (mat.)	
		feel (ment.)	
		gotta (mat.)	
		have (rel.)	
		to do (mat.)	afraid to back up
		afford (rel.)*know (ment.)*	once in a while
		think (ment.)	like…
		imagine (ment.)	*enough time*
		wake up (mat.)	to take much time
		make jump (mat.)	me
	I (6, *4*)	might end up (rel.)	student (2)
	today	*would have done (mat.)*	leaps ahead faster than…
	backing up just enough	*back up (mat.)*	farther ahead
Merald	we (teacher & class)	*be willing (ment.)*	that`
		get over (ment.)	
		like (ment.)	how much…
	I (4, *1*)	*had (rel.) (2)*	*the fact that...*
	facilitator (3)	teach (mat.) (3)	*ratio table (2)*
	it (3, *1*)	bother (ment.)	it (3)
	the questions	*say (ver.) (3)*	me (2)
	teachers	is (rel.) (3, *3*)	proportional relationship (1,*1*)
	there	is (exis.)	when…
Mary	slope	*look at (ment.)*	slope
		like (ment.)	
		take (mat.)	
		ask (ver.) *(1,3)*have (rel.)	
		(1, *1*)	that…
		write (mat.)	*students (2)*
		forget (ment.)	question *(2, 2)*
		stacking (mat.)	*more depth of knowledge*
		graphing (mat.)	it
	I (3)	predict (ment.)	you know like…
	teachers (4, *3*)	is (rel.	them
Bill	it (1, *1*)	come up with (ment.)	what it is…

		understand (ment.)	
		twist (mat.) (2)	
		done (mat.)	
	teachers (1, *1)*	had (rel.) (2)	
	I	get (rel.)	
	we (teacher & class) (3)	is (rel.)	question (3)
	questions	is (exis.)	ratio and proportion stuff
	people (4, *1)*	talk (ver.)	awkward (2)
	it (3)	hear (ment.)	that (4)
Eleanor	*answer*	think (ment.)	interesting
			something that…
			reasoning
		is (rel.) (3, *2)*	people
	it (2)	*look for (ment.)*	a big thing on the military
	people (1, *2)*	*see (ment.)*	assessment
	that	*have (rel.)*	it
	teachers	put (mat.)	students
Jimmy	this	sell (mat.)	essential understanding
			how…
			that
		think (ment.)	*to the concept*
	I (2)	is (rel.) (3, *1)*	*to teach to the...*
	my takeaway	*said (ver.)*	like that
	facilitator (2)	*teaches (mat.)*	just to teach…
	math	be (rel.)	why…
	real idea	like (ment.)	when…
Brenda	it (2)	*made (ver.)*	*that comparison*
			the display
			at the enactive
		like (ment.)	*how far...*
		think (ment.) (2)	*the same thing*
		are (rel.) (2, *2)*	*in a different format*
	I (2)	*see (ment.) (2)*	that…
	students (1, *5)*	is (rel.) (2)	*all of the examples*
Florence	it (2)	*have (rel.)*	*an idea*
			that same feeling…
		think (ment.) (3)	*successful*
		have/had (rel.) (2)	*students*
		have (rel.)	*one unit*
		be (rel.)	*other units*
	I (5, *3)*	*do/can't do (mat.) (2)*	okay
Diana	it	refuse (ment.)	that

Table F2 provides the number of times a particular word or phrase was used as a

Participant in the texts I've classified as tending toward identification or resistance.

Italics indicate that the word was part of a downgraded clause, such as a dependent

clause, and therefore was given less functional importance.

Table F2

Participants in Discourse Associated with Identification and Resistance

Identification	Resistance
I 20	I 20
I 7	*I 5*
we (self and another adult) 2	teachers 9
teachers 3	*teachers 4*
teachers 5	students 3
students 11	*students 3*
students 2	teacher and class 4
we (teacher and class) 3	my takeaway 1
solving problems like this 1	*facilitator 5*
facilitator 2	people 5
what we did today 1	*people 2*
what I got out of it 1	math 1
it 5	the real idea 1
that 2	other subjects 1
this 1	math questions 1
	math questions 1
(65 total)	*answer 1*
	slope 1
	today 1
	backing up just enough 1
	it 11
	it 3
	there 1
	(85 total)

Note: Italics indicate Participants in downgraded clauses. Number indicate number of occurrences.

The Processes that were present in discourse tending toward identification and resistance discourse are shown in Table F3. Material, mental, and relational types make up the majority of the Processes in the discourse. Material Processes tend to describe either the work of the teachers or the work of the students. Mental processes are generally statements of how the speaker thinks or feels about an idea or how students think about the mathematics. Relational processes are defining critical features of mathematical tools or tasks. Relational processes can be either identifying (naming in a particular way) or attributive (describing a feature).

Table F3

Processes by Type in Identification and Resistance Discourse

Process Type	Identification	Resistance
material	*work (2)*	think
	starting off	would teach (2)
	started	am gonna teach
	just finished	*teaches*
	are teaching	*could take*
	have to step back	was trying
	go back	to write
	to try	can start stacking
	try	graphing
	to move (2)	don't have to come up with
	move	can twist
	may be working	have done
	to participate (2)	is twisting
	have (2)	*do start twisting*
	do	can
	don't do	*to do*
	don't have	*might wake up*
	did	*make jump*
	would have	*would have done*
	would help improve	might end up
	to do	would back up
	need to do	will put
	have to do	can sell
	can do	
	could do	
	can't do	
	to show	
	is not gonna happen	
	can get	
	[33 in category]	[24 in category]
mental	be like	like (3)
	can see	*like*
	will see	didn't forget
	tend to see	predict
	have to look at	have to understand
	like (3)	don't hear
	like	think
	do get	thinks
	to get	can't get over
	appreciated	would bother
	am hoping	feel
	think (3)	made think
	have thought	can imagine
	need to be thinking	*look for*
	got (me) thinking	*see*
	refuse	*would be willing to do*
	want	
	have wanted	
	find out	
	[23 in category]	[18 in category]
relational	identifying	identifying

	would be	is (3)
	is (2)	is not (3)
		is gonna be
	attributive	*is (2)*
	have	
	have to have	attributive
	can have	is (2)
	don't have (3)	*is (3)*
	doesn't mean	are
	is	has always been (2)
	seems	have
	have never had	can have
	would be	*have*
	needs to be	*don't have*
	would serve	had (2)
		had (2)
		would get
		was
		can't afford
	[16 in category]	[28 in category]
behavioral	will look	
	[1 in category]	[0 in category]
verbal	*said*	say
		say
		to say
		said (2)
		ask 2
		don't talk
	[1 in category]	[8 in category]
existential	is not	is (2)
	[1 in category]	[2 in category]
Total	75	80

Note: Italics indicate Processes in downgraded clauses.

APPENDIX F

Complete Interpersonal Metafunction Analysis

In the following chart, examples of identification discourse are listed first, resistance discourse

second, and negative cases last. Words in italics refer to Subjects, Finites, and Adjuncts that are in

downgraded clauses. The type of validity claim in a Finite is abbreviated: polarity (pol.),

modality (mod.), temporality (temp.). Fused finites are indicated with italics and parentheses.

Teacher	Subject	Finite	modal Adjuncts and downgraded Mood
	it	doesn't (pol.)	
	some kids	will (mod.)	you don't, just, really
	we	*will (mod.)*	
Christie	we	can (mod.)	I think, really
	I	*(past)*	
	we	*(past)*	
	it	's (temp.)	
	it	's (temp.)	
	solving problems…	would (mod.)	they don't
	I	'm (temp.)	them *(non-finite)*
Gina	we	'll (temp.)	it *(present)*
	I	*(present)*	
	I	*(present)*	
	they	can (mod.)	I *(do),* how I can
	they	*(present)*	at least
Langston	we	can (mod.)	they're
	I	*(present)*	you *(past)*
	we	*(present)*	I think, sometimes, you *(past)*
	that	's (temp.)	we *(present),* not
	you	*(present)*	always
	I	*(present)*	
	I	have (mod.)	for years now, always
	some kids	don't (pol.)	
	what we did…	would(mod.)	kids *(non-finite)*
Edward	it	*(past)*	just
	I	*(present)*	
	I	*(present)*	
	they	*(present)*	
	I	don't (pol.)	
	I	don't (pol.)	
	It	would (mod.)	
	They	*(present)*	
Barbara	I	need (mod.)	I think, I did
	I	*(present)*	what I…it is,
Cindy	they	*(do) (temp.)*	you *(present), (present)*

	they	*(present)*	
	they	may (mod.)	
	I	've (mod.)	always
	I	can (mod.)	once in a while, but not very much
	I	don't (pol.)	I feel like
	I	can't (pol.)	
	Something…	*(past)*	
	I	can (mod.)	
	Backing up …	might (mod.)	just, they would
Merald	we	might (mod.)	I'd, I'd
	I	can't (pol.)	
	I	would (mod.)	
	it	would (mod.)	
	it	was (temp.)	just
Mary	I	'm (temp.)	always
	I	*(present)*	
	I	was (temp.)	I didn't
	you	can (mod.)	
	you	can (mod.)	
	it	's (temp.)	you're, you're
	you	don't (pol.)	
Bill	you	have (mod.)	just, you are
	you	can (mod.)	just
	we	've (temp.)	already
	we	*(past)*	
	they	'd (mod.)	
	it	is (temp.)	
	it	is (temp.)	you just don't
	you	don't (pol.)	
	nobody	*(present)*	
Eleanor	it	's (temp.)	you do, the answer is
	it	isn't (pol.)	
	they	will (mod.)	they *(present)*
	it	's (temp.)	
Jimmy	you	can (mod)	I know
	math	*(present)*	traditionally
	the real idea	is (temp.)	
	that	's (temp.)	English…all subjects
			I think
	it	's (temp.)	not just
	(it)	('s) (temp.)	
Brenda	I	*(present)*	you made
	I	*(present)*	
	students are at….	[no Finite]	I think, sometimes, they *(present)*
	it	's (temp.)	
	it	's (temp.)	
Florence	some of the kids	don't (pol.)	ever, they can, they *(do)*, they *(do)*
	I	've	
	I	have (mod.)	I think, never really
			I think, always, I would, I could,
Diana	I	*(present)*	I just kinda can't

APPENDIX G

Complete Textual Metafunction Analysis

In the following chart, examples of identification discourse are listed first, resistance discourse second, and negative cases last. This chart shows connections made to other statements and the Themes of the major clauses. The column on the right has commentary about the effects of those Themes.

Teachers	Connections to other statements	Themes of major clauses	What themes are doing
Christie	Like to go off of that	Like if you don't have the context there to start it off with And some kids So I So we	Establishing a problem that is encountered Giving solution to problem
Gina		I We We It And when it comes to statistics But solving problems like this And so while it seems very scary to me I And so we	Establishes takeaway Makes teacher and class a participant Describes situation Describes attitude
Langston	And bouncing off of what (Edward) just said	I When I work with Mr. or … So they Whether they're gonna come close to mastering it or understanding it But they And so we	Establish his role Give reason Establish limit Give reason Connect to new practice
Edward		I like the fact that Because I think Everybody And well whether we like it or not You I And for years now Because my gosh You Well some kids So what we did today	Establish takeaway Describe reasons Describe what he's always done Describe benefits of new practice

		You know so	
Barbara	Off the same chart	I And so then I And they But I So I And I think Because they But I	Establishing current practice in regard to what teacher does and what student does Gives alternative and justifies
Cindy		I like the idea that What I got out of it They But they	Starts and restarts statement about self Shifts focus to students
Merald	Going back on what she said about backing up and not being afraid to go back up	I I I So I But I I If I If I	Establishes context of being afraid Describes attitude Describes a different possibility Repeats a dependent clause that contributes to unlikelihood of possibility
Mary		So I…on that last problem Because I I And it And it But the there's And the slope And so it So from now on	Establish takeaway Describe problem Describe solution Describe resolution
Bill		I like the fact that And I And so you know you But then you So it So you You	Establishing a takeaway, Describe new practice Describe advantages
Eleanor	With the not having to make up more things	I mean you I mean I..we.. And we And they We And it (repetition—twisted question) And it (repetition—twisted question) Because you We You You know But anyway it	Begins to contradict previous statement with I mean Uses pronouns to identify participants in real experiences Shift pronouns to apply to people generally Signal summary statement
Jimmy		Isn't They I know So like you know you	Begin as question Shift to assertion

		Like this	
Brenda		I think And where English or any other subject I think all subjects It (repetition--the real idea) And so I (conjunction)	a statement attributed to the facilitator is placed in context of other content
Florence		I I (In dependent clauses: they, it, it) They…some of the kids (In dependent clauses: they, they)	Themes embedded in dependent structures makes it difficult to determine theme. Students are participant
Diana	And going off of that	I think Because I think If I could do one unit good..or well I	Describing belief

APPENDIX H

Complete Building Tasks Analysis

In the following chart, examples of identification discourse are listed first, resistance discourse second, and negative cases last.

Teachers	Significance	Activities	Identities	Relationships	Politics (Social Norms, Value)	Connections	Knowledge
Christie	Context for meaningful learning See where they're at	Agreement Adding to idea of starting with context	Plans for meaning, including all Know where students are	With listeners, students, co-teacher Informal Identification with PD	Some students confused Student involvement is important	Context-meaning-formative assessment Building on previous statement	Students know what's going on Teacher knows what they can do
Gina	Students' conceptions Multiple ways to solve	Agreement with PD Sharing emotional response	Confidence enough to try Scary to make change	With listeners (emotion and teacher talk) Informal Appreciate	Worth trying, even though giving some control to students is unfamiliar	Shift of pedagogy is tied to scary and hopeful	Wants to privilege students' ways of knowing and doing
Langston	Access for special ed students Participation	Agreement	Someone who ensures access	With listeners, some disalignment (always had to do this)	Access Responsibility for ensuring access	Participation is not necessarily going to be mastery or understanding	Doesn't shift to valuing ideas, just access
Edward	Box plot metaphor Participation Ability How he's always done it	Agreement	Always done one thing but willing to change when he sees value	With listeners, informality, "we tend to", like it or not, maybe we should change	Variety of ability is given Participation should be valued	To progression, metaphor	Thinking about other ways of knowing and getting the concept
Barbara	Progression	Agreement	Sharing and	With listeners,	Protecting	Dialogue and	Students' ways of

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	Students' work		dialogue Connecting Continuous improvement	alignment. Closer understanding of students	reputation while talking about improvement	learning. Disconnect between teaching and learning	knowing, important for both student and teacher
Cindy	Not to feel guilty All kids moving along	Agreement with previous	Guilty for stepping back, wants to help move along	With listeners, alignment, students	Need to get all kids to some point	Stepping back connected to guilt	Different pace, same ideas.
Merald	Time Backing up Being afraid	Partial agreement, resistance	Obligations to "time" outweigh appeal of waking someone up	With listeners, very informal, alignment of values outweighed by consequence	Normal: time pressure, kids asleep Value—moving forward (responsible for progress not achievement)	Backing up connects to negative consequence, loss of something valued Willingness	Not students' knowledge. Move through curriculum
Mary	Understanding slope Coherence in teaching	Agreement with a model	Seeking consistency, caring about teaching well	With M, less to listeners Informal, Identification with math	Teaching and explaining, Good models are valuable,	curriculum tends to be incoherent	Her knowledge
Bill	Single question, many objectives Depth	Agreement with context	Knows the math content, teaching many things, practical solution to problem	With listeners, identification with context ideas (questioned earlier), math language	Busy, many students at different grades Mathematical knowledge,	Connects to PD idea of knowing your purpose or goal	Focused on teacher knowledge and actions
Eleanor	Twisting questions around, unnatural	Challenge previous comment and PD	Should be meaningful and natural, guardian?	With listeners, politeness through veneer of alignment	What people really do, natural or real problems	Twisting is awkward, is not what happens in real life	Real talk/ real thinking in society Not students' ideas
Jimmy	Job placement Selling to kids Essential understanding	Agree with value of content, nothing else in statement	Focus on motivating students, future orientation	With listeners as teachers	Economic value, motivation is key (not SES)	Motivation to achievement and success	Instrumental orientation
Brenda	Why we teach this skill	Saying agreement but content is	Purposeful instruction	With M, but not really	What the real idea is, what is	Other subjects, disconnect	Discusses a skill and why it is

	Real idea	contradictory	Important ideas is meaning	identification, polite, distant?	traditional	contradiction-- different understanding	needed, Give this to kids
Florence	Students at enactive stage Seeing Having ideas	Agreement	Knows that students don't believe they can, need ideas	With listeners, informal	Students don't believe, should have ideas, good to show them	Seeing the progression will give you ideas	Visuals are important, (does "see it" mean understand?)
Diana	Doing one thing well Not rushing	Challenge previous statements	High standards, do it right or not at all	With listeners, respectful but strongly disagree	What you describe is not like me, driven by internal values	Value of retention of info, doing it right	Important to be sure students understand