

DOCUMENTING TEACHERS' EXPERIENCES OF PARTICIPATING IN A
LOCALLY INITIATED DISTRICT-BASED PROFESSIONAL DEVELOPMENT
PROGRAM

by

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ABSTRACT

DOCUMENTING TEACHERS' EXPERIENCES OF PARTICIPATING IN A LOCALLY INITIATED DISTRICT-BASED PROFESSIONAL DEVELOPMENT PROGRAM

Linda JaKyung Choi

Professional development (PD) is often viewed as essential to improve classroom practices—as a way to create changes in districts, changes in classrooms, and changes in teachers—which, in turn, strives to improve student learning. Many insist that for a PD initiative to be successful, it needs to create changes in teachers' classroom practices, who are indeed at the ground level of interpreting, implementing, adapting, and enacting what PD offers. Researchers claim that teacher resistance is the central problem of PD failure (Janas, 1998).

Confined to the duality of compliance vs. resistance to PD, teachers either change or do not change according to the grading system that the administrators and researchers impose. A binary view of teachers who meet the expectations and those who do not meet

the expectations of the district and PD personnel is, then, inadequate to studying the process of what happens beyond that narrow conception of teachers who participate in district/school-wide PD. V. Richardson (2003) argues that teacher resistance is a symptom of a disconnect between a structural reform agenda and teachers' concern for teaching students well.

Within the context of a locally initiated PD program that included elements of effective PD proposed by a body of research, I examined a select group of participating teachers' experiences. Based on the classroom practice of a teacher whose students have shown drastic growth on high stakes tests despite social factors, the district had expanded the program as a district-wide initiative. Using care theory, I specifically explored changes in 12 teachers' beliefs and practices as a result of their PD participation, in addition to identifying factors that facilitated program implementation.

The results showed that the "caring teacher" identity mediated classroom practice changes, that teachers selectively used PD based on the feedback from their students rather than changes to their knowledge and beliefs. Based on this reciprocity, teachers' self-identification as caring teachers defies traditional labeling of participating members as "compliant" or "resistant"; all teachers in the study described how caring about and caring for their students led to program implementation with a varying degree of fidelity.

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DEDICATION

To mom and dad, of course.

And to Benjamins, the greatest detours of my life

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It took me a very long time to make the leap from Chapter III to Chapter IV. During that time, I learned a good deal about life and its teachable moments. But through it all, Professor Goodwin never lost her faith that I will finish. And Professor Knight-Manuel always welcomed me back to the process. I cannot imagine being able to write this portion of the dissertation without their patience and guidance. And Professors Drago-Severson and Oyler, who witnessed the last stage of the journey, offered kind words and encouragement. I do not know that many doctoral candidates who can say they truly, thoroughly enjoyed the defense. I am forever grateful for the experience.

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No one likes being reminded that there is an unfinished task. For that, to my family, thank you for your love and patience. Here it is.

LJC

TABLE OF CONTENTS

	Page
Chapter I – INTRODUCTION	1
Background of the Problem.....	6
Statement of the Problem	9
Purpose of the Study	12
Research Questions.....	13
Conceptual Frameworks.....	13
Significance	16
 Chapter II – REVIEW OF LITERATURE.....	 18
Professional Development as a Way to Provide Teacher Learning	18
Functions of Professional Development.....	19
Forms of Professional Development.....	21
Successful Professional Development: Where Function and Form Meet Support.....	23
The School District at the Center of Meaningful Change in Classroom Practices.....	33
Teacher Change through Teacher Learning	36
Teachers’ Knowledge and Beliefs	38
Ecological model of teacher belief	41
Cultural norms and values	41
State and national context.....	43
Immediate context.....	44
Self	46
Context model of teacher knowledge	48
Teachers’ knowledge of mathematics	48
Teachers’ pedagogical knowledge	50
Teachers’ knowledge of students’ cognition in mathematics	51
Caring.....	52
Changing Teachers’ Knowledge and Beliefs.....	56
 Chapter III – METHODOLOGY	 60
Pilot Study.....	61
Contexts of the Study.....	68
Overview of Long Beach Unified School District.....	69
Math Achievement Program (MAP).....	70
<i>It’s All About the Facts</i> lessons	71
60-inute math lessons.....	73
Math Achievement Program Professional Development (MAP2D).....	75
Results of MAP Evaluation Study Conducted by the District.....	77
Role of the Researcher	78

Research Design	81
Site and Participants.....	83
Site Selection	83
Participant Selection.....	84
Data Collection	85
Interview	86
Observations	90
Researcher’s Journal.....	91
Data Analysis.....	92
Validity.....	96
Limitations	99
Chapter IV – FINDINGS.....	101
Profile from In-Depth Interviews	102
Barbara.....	103
Charles	105
Elizabeth	106
James	109
Jennifer	112
Jessica	117
Margaret.....	121
Mary	125
Michael	127
Patricia.....	131
Sarah	133
Susan.....	135
Discussion of Findings in Relation to Research Questions	138
Research Question One	141
Teachers’ belief of MAP’s goal	141
Teachers’ beliefs that the goal of MAP was to raise scores.....	144
Teachers’ beliefs of the goal of MAP2D as to ensure implementation fidelity	145
Teachers’ beliefs in modifying MAP.....	147
Research Question Two.....	152
Changing practices to follow MAP pacing guide.....	153
Changing practices to include multiple modalities.....	157
Research Question Three.....	159
School leadership.....	159
Collaboration with colleagues	162
Having a MAP2D coach dedicated to the site.....	163
Positive relationships with coaches	165
Common Themes	168
Chapter V – CONCLUSION	174
Finding One: The Role of Caring in Program Implementation.....	175

Finding Two: MAP Pacing Guide as a Compromise between Policy and Student Needs	180
Finding Three: Teacher Professional Identity and Its Role in Professional Development.....	184
Implications of the Study	188
Implications for the District.....	188
Implications for Research.....	190
Critique of the Study	192
Further Research	193
REFERENCES.....	198
APPENDICES	
Appendix A – Mapping of Interview Questions	220
Appendix B – Interview Protocol.....	223

LIST OF TABLES

Table	Page
1 Overview of the Participants in the Study and Their Years of Teaching	103

Chapter I

INTRODUCTION

The underlying question of this research study revolves around teachers' experience of the change process as a consequence of their participation in a professional development (PD) program. While the goals of all PD programs eventually aim at changing teachers' classroom practices, literature indicates this change in classroom practice is a result of the changes in teacher knowledge and belief. Furthermore, their knowledge and beliefs are mediated by their experiences. The main goal of this research lies in documenting how teachers experience PD, as their experience with PD, among other factors, impacts their knowledge and beliefs related to classroom teaching. But before discussing the elements of the changes in detail, I need to describe PD in general in order to establish what I have come to understand as PD—its purpose and what makes it effective.

What is professional development? Here, I introduce the term “professional development” to encompass any organized activities geared toward deepening teachers' understanding of students' needs in classrooms and the utilization of instructional approaches to meet the needs of students. In its narrowest definition, PD is a simple transmission of information from the “expert” to the “trainee” through which the learners acquire new technology and implement the technology in their classrooms (Guskey, 1998). From a policy-oriented view, PD is a way to improve classroom instruction: that through PD teachers acquire “new knowledge and turn that knowledge into new practice”

(Elmore, 1997, p. 2). Whether teachers are learning about new technology, that is, a new way to teach, or learning how they can incorporate standards into schooling, PD offers opportunities for teachers to deepen their professional knowledge (National Commission on Teaching and America's Future, NCTAF, 1996).

Just as the function of PD varies, the forms of PD differ across settings. Some are grassroots organizations that might meet in someone's home (Little, 2001), and some are offered by national organizations, such as the International Dyslexia Association, which aims to train teachers in methods that would benefit students with dyslexia (LD OnLine, n.d.). In any case, the form and function of PD converge to create learning opportunities for teachers. Researchers have indicated that even though all forms of PD benefit those who participate in them, in order for PD to be successful—that is, to foster lasting changes in the culture of learning for teachers—systemic change is necessary (Darling-Hammond, 1997; Darling-Hammond et al., 2005; Elmore, 1993, 1997; Fullan, 2001; Glickman, Gordon, & Ross-Glickman, 2007; Huberman, 1995; Loucks-Horsley et al., 1987).

Among those who advocate for systemic change, many point to district-based PD as the smallest possible unit of schooling structure (in comparison to the state or other national organizations) that can bring about meaningful, sustainable changes. School districts have a unique advantage over individual schools because they are better equipped to secure and manage resources (research, solicitation, organization and disbursement of resources); school districts also have an advantage over state or national organizations because, as a community-based agency, districts can put forth a unified vision of PD that is aligned with that of the community.

Districts across the country offer numerous PD programs for their teachers. Some are voluntary and some are mandated; some are activities that teachers initiate and expand to the district-level, and some are products of Title II funding, “intended to augment resources that would address [educational] inequalities by assuring...students’ access to highly qualified teachers” (Shirley, 2005, p. 140). Numerous teacher education researchers have stated that teacher quality matters in student achievement, and improving in-service teacher quality is one of the ways that schools can better prepare students for their future (Ancess, 2000; Cross & Rigden, 2002; Kauffman, Johnson, Kardos, Liu, & Peske, 2002; Louis & Marks, 1998; Spillane, 2002). It is difficult to define student achievement and teacher quality in unified terms because each teacher improvement program that purports to improve student achievement has its own definition that is unique. Likewise, each district, each school within the district, and each teacher within schools may not share the same definition of student achievement.

Loosely defined, effective PD initiatives would deepen teachers’ understanding of their students’ needs and help them take proactive steps to improve student achievement. But what makes effective PD? While researchers agree that teachers face increased demands to “teach in ways that promote critical thinking and problem-solving skills that require deeper subject matter knowledge,” teachers face a lack of support from professional structures (e.g., professional organizations, school districts, collaborating higher-education institutions) to continue their learning process beyond their formal education in pedagogy (Scribner, 1999, p. 240). PD is initiated by the schools and districts and is intended to address the needs of content and pedagogical knowledge, yet it is where the “tension between institutional imperatives and individual prerogatives

exists” (Little, 1993, p. 141). The lack of resources and misaligned agenda of PD have been the source of discussions for educational researchers concerned about ineffective PD.

Because of the close link between improving teacher quality and student learning, creating effective PD has also been at the center of school and curriculum reform. Some argue that rather than utilizing PD as a simple transmission of the “latest” pedagogical technology, PD as a space and time needs to be reconstructed as a vehicle of reform embedded in the school culture, in which teachers can use the resources to better understand their own students’ needs (Scribner, 1999). In their study assessing the effectiveness of PD programs at the elementary school level, Schwartz, Lederman, and Abd-El-Khalick (2000) illustrated the importance of the alignment between the goals of the PD initiative and the curriculum reform vision (in this case, project-based learning in science content) shared among PD specialists and classroom teachers. Although other contributing factors, such as the quality of the PD program, as well as the opportunities for shared planning time, lesson modeling, and collaborative teaching, were examined, the interviews and artifact studies revealed the importance of a PD program led by specialists who share the same reform vision as the district.

However, sharing the same vision does not automatically translate into a successful PD program. If school and curriculum reforms begin at creating opportunities for change, then all the participants, PD specialists, participating teachers, building and district administrators need to commit to constructing a community of learning in and outside of the school building for the purpose of using a PD initiative as a vehicle of reform (Supovitz, 2002). In order to focus on instructional improvement, even in the

small-schools movement, Supovitz argued for structural support from the principal and the district, in addition to pedagogical freedom for teachers, coupled with an ongoing PD program to enrich and support teachers' choice of instructional methods (2002). Even though a PD program might initially appear successful, if the district continues imposing pedagogy and curricula despite the direction of the program, then the reform effort only results in a short burst of a detour from the status quo, rather than a long-term change to school and classroom practices and culture sustained by participating teachers, schools, as well as the district.

Much of the literature indicates that schools and districts need to become learning communities, not top-down hierarchical structures (Rashid, 2000). In order for this transformation to be successful, the PD process and mechanism need to be changed from inside out—by including teachers in decision making in the reform, rather than by mechanically adhering to the management-driven approaches set by the larger system (Fullan, 2001; Smith-Maddox, 1999). However, the complexity of the teacher-school-district system needs to be considered (Craig, 2003), and teachers are urged to take initiative in developing PD to meet their own needs as much as the administrations are urged to allow room for the change, creating a model for collaboration (Lawrence & Dubetz, 2001; Wheelan & Kesselring, 2005). Successful PD that creates lasting change in the community learning culture would depend on the structural support of the district as well as the individual commitment of the teachers.

This research took place in a district that took pride in its support of the commitment of teachers with district-level resources. In the following sections, I will

describe the district and its support for the PD program that serves as a context of this study and elaborate on the problem at the center of this research.

Background of the Problem

Long Beach Unified School District (LBUSD), located in southern California, serves students and families from diverse backgrounds, and is often hailed as one of the best “urban” school districts in the nation. About two decades ago, as he started the term, the then-new superintendent initiated a large community-based survey to gauge what the community members wanted in their schools. As a result of the survey and numerous public town-hall meetings, the district centralized its curriculum development and teacher development (new teacher induction, PD, and mentoring). As a part of centralization, the research and planning department’s main function shifted from generating accountability reports for the school board and the state to also include supporting schools through providing assessment and survey result data and analyses; schools and teachers use the data to see where students’ strengths and weaknesses are, around which curricula are built.

This shift in the function of the research department—helping teachers use assessment data to guide instruction—helped provide the impetus for the PD program that serves as the context of this study. Math Achievement Program Professional Development (MAP2D), is a two-year-long PD program that was initiated by one teacher, Si Swun. After being frustrated with repeated low-scores from his students in math on both district and state assessments, Swun devised an additional lesson component to accompany his pre-existing math curriculum, now called the Math

Achievement Program (MAP). When the district and state assessment results revealed that his students' scores drastically improved—so much that the average score of his students exceeded that of students in the district's gifted and talented program—other teachers in his school wanted to learn what he was doing; later on, teachers from other schools wanted to participate. When approached by the teachers to create PD opportunities to incorporate what Swun initiated in his classroom, the district saw an opportunity to provide teachers with something they could use in order to help their students improve math skills along with assessment scores. From that point on, the academic year 2003-2004, the district implemented a system wide PD opportunity, open to any schools volunteering to participate in the program.

When I first met with the district mathematics coordinator, I was intrigued by this addition to the district math curriculum that these teachers were implementing in their classrooms. What I saw then was a rigid protocol for how each student could learn basic math facts for addition, subtraction, multiplication, and division. I was concerned that the program was yet another way to “dress-up” a drill-and-kill activity. Although the students would learn a few facts a day through discovery learning (discovering the relationship between the numbers through hands-on activities) and practice using the facts in multiple ways, students were expected to “master” the facts through rote memorization and worksheet activities after an initial discovery/learning period. Borrowing from the developmental view of reading instruction (i.e., decoding automaticity is necessary for reading fluency and comprehension), the district chose to ascertain student automaticity in math facts in hopes of increasing application and problem solving. Although some math educators would oppose this approach to learning math facts, this particular PD

program was initiated by district teachers and was continuously supported by schools and teachers who found the program useful for their students—a crucial factor recommended by much PD literature (e.g., Fullan, 2001; Smith-Maddox, 1999; Supovitz, 2002).

However, after meeting the coaches who were more intimately involved in the project, I realized that the information I was given by the math coordinator was only a component—that is, the basic math facts learning part—of the entire MAP. The missing information on the rest of the program and more detailed description of the entire MAP and MAP2D follow in Chapter 3; for the purpose of this introduction, I realized that MAP was actually a balanced and integrated way for students to learn mathematics, given the context of standardization of mathematics curriculum in the state of California and the demands of the Long Beach school community.

In addition to responding to what teachers wanted to learn in order to help their students, what seemed to align MAP2D with the factors of effective PD described by literature was structural support from the district. The district organized and allocated materials to ensure that teachers have resources, including modeling of lessons that teachers could access via the district intranet and borrowable videotapes; schools allowed teachers to attend off-site training and for coaches to come into the building on a weekly basis to provide mentoring to the teachers. The program had been so successful in increasing student achievement on district and state math assessments and basic math skills acquisition, that districts around the country and the world were now visiting the schools to see how they could replicate the success of the program in their own schools, according to the math coordinator.

Still, further discussions with the mathematics coordinator revealed that teachers were no longer enthused about the program, despite the outward appearance of the program's success. In fact, even with teacher buy-in, the project coordinator and the coaches (the coaches are the original teachers who started the program at their school) were beginning to realize that teachers were not implementing the program the way they (coaches) envisioned. Even with two-way support of district resource allocation and teacher buy-in, the district was concerned that MAP2D was not creating changes in teachers so that they could "help students acquire grade level appropriate math skills and reach Proficient or Advanced Proficient level" in math assessments (LBUSD, Office of Research, Planning and Evaluation, 2007, p. 6).

Statement of the Problem

This dilemma brings us back to the role of PD as a way to create changes in districts, changes in classrooms, and changes in teachers. Many insist that for a PD initiative to be successful, it needs to create changes in the classroom practices of teachers, who are indeed at the ground level of interpreting, implementing, adapting, and enacting what PD has to offer. V. Richardson (2003) states that even though researchers claim that teacher resistance is the central problem of PD failure (Janas, 1998), many ignore that teacher change is a phenomenon difficult to measure. V. Richardson (2003) instead argues that teacher resistance is a symptom of a disconnect between a structural reform agenda and teachers' concern for teaching students well. V. Richardson's argument is not only aimed at a mere communication between teachers and those at different levels of schooling structures who make decisions regarding school and curricula reform. It also

points to the problems of reform agendas that do not consider the process of how teachers use PD to improve instruction.

In order for PD to successfully change teachers' classroom practices, teachers need to learn new ideas and how their existing practices differ from these new ideas (M. M. Kennedy, 1999). Once teachers are aware of this dissonance, they can perceive PD as a starting point to resolve the conflict between the old and the new way of teaching. This process of teacher learning as a way to move from the existing practice to a new practice is a change in classroom instruction (Jennings, 1996).

The predominant research in cognitive psychology suggests that changes in behavior are a result of changes in a person's knowledge and belief mediated by the environment. Accordingly, teacher's classroom practice changes as the teacher's knowledge and beliefs about pedagogy, student learning, and the content, among others, change. Novice teachers' learning is influenced by the ideas, beliefs, and experience with teaching and learning acquired before and during their professional education (Kagan, 1992). On the contrary, an experienced teacher's learning is influenced by knowledge that they draw from theories about learning and teaching and their experiences accumulated on the job (Clandinin, 1985).

Even though researchers argue that teacher change is difficult to measure in a positivistic sense and that teacher resistance is a major barrier to change hoped to be attributed to PD (Zellermayer & Margolin, 2005), there is a gap in research that specifically studies the quality of the change in teachers as they experience various aspects of PD. The underlying assumption, I argue to be rethought, is that in traditional educational research, change in teachers through PD is a static state, determined by

operationally defined indicators that lead the researchers to conclude whether the change has taken place or not. Those teachers whose behaviors do not conform to the anticipated behaviors of a changed state are labeled “resistant” since the logic of PD should lead to changes; the responsibility of change is then solely upon the teachers. But what if there are aspects of teachers that are changing, but not captured by narrowly defined terms of the research agenda? In this study, I propose that teacher change, as in teacher learning, is a fluid state of constant negotiation, and hence cannot be measured by traditional surveys or observations that do not probe into various aspects of teachers’ experiences and how these experiences relate to dimensions of teacher change.

I believe there is a dualism of change-vs.-not-change in how administrators and researchers view their teachers who participate in PD programs. In this view, teachers either change or do not change according to the grading system that the administrators and researchers impose. When framed in this dichotomy, the only possible research objectives form around purposefully examining teachers who appear to “change” or “resist” according to the PD agenda. A binary view of teachers who meet the expectations and those who do not meet the expectations of the district and PD personnel is, then, inadequate to studying the process of what happens beyond that narrow conception of teachers who participate in district/school-wide PD.

I further propose that PD should be considered as a process, rather than a product, in order to fully understand how teachers adopt and implement programs in their classrooms. This involves abandoning the idea that implementation of a program is manifested in behavioral changes when observed by “neutral” observers; considering the classroom dynamics unique to each teacher and her/his students, and political dynamics

unique to each school, a researcher needs to place a teacher in the context of the classroom, the classroom in the context of the school and the school in the context of the district. And since the equation of “implementation = observable changes in behavior” does not apply in this reasoning, the equation needs to include factors that accompany and influence changes in behaviors, such as changes in knowledge and belief that are mediated by how each teacher experiences the process. Then the problem of the study becomes examining the experiences and changes in knowledge and belief of teachers participating in the PD program, rather than examining the behaviors of the teachers.

This departure from traditional evaluative studies can offer deeper understanding of teachers’ change process as a consequence of their participation in PD, which can in turn offer alternative, if not additional, support for teachers to better meet the needs of the students and the community.

Purpose of the Study

The goal of this study was documenting teachers’ experiences in PD participation, as literature indicated that teacher knowledge and belief are greatly influenced by an individual teacher’s experience. In turn, this change in knowledge and belief influences teacher classroom practice, which is the goal of PD. In order to contextualize teacher experience, I enlisted teachers who were participating in a district-based PD program, MAP2D, that sought to change teacher practice. By purposefully selecting teachers who have completed and were participating in MAP2D program, this study aimed to understand the teacher change aspect of PD by focusing on how their experiences influence their knowledge and beliefs as a result of their participation in MAP2D.

Research Questions

1. How do teachers describe changes in their knowledge and beliefs as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?
2. How do teachers describe changes in classroom practice as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?
3. Based on teachers' experiences in participating in MAP2D training, what are the factors that contribute to teacher change?

Conceptual Frameworks

At the proposal stage, I intended to employ two conceptual frameworks to highlight the experiences of teachers and how their experiences impact their knowledge, belief, and practice of classroom teaching, as they interpret, adapt, and enact what they acquire from PD. Complexity theory and the theory of community of practice influenced how I framed and designed the study. However, as I began data collection, I realized that complexity theory was not applicable in this study. I had proposed to examine teachers' experiences embedded in their contexts—i.e., how their relationships to the organizational structure within the system influences their changes. Furthermore, complexity theories used to point out a critical point initiating the change did not explain teachers' experiences since their changes began as they participated in MAP2D.

The breaking point for me to abandon complexity theory initially came during the first interview. When the teacher asked me to elaborate on my dissertation, I mentioned the changes that can occur at the larger system level (district) due to the changes at the

smaller system level (teacher and classroom). The teacher pointed out that MAP2D was being used as a mandate and the downward direction of power hierarchy from district to teacher could not be altered on most occasions. The teacher added that MAP2D was an exceptional case because of the political forces around test scores, and that I was going to find out that many teachers were circumventing faithful implementation of MAP. Over the next several interviews with other participating teachers, I was able to confirm the warning from the first teacher. While the changes to the smaller system were being handed down from the larger system, the larger system was unmoving unless the directives came from the state—a system even larger than the district. From the point of complexity theory, I was not going to be able to document change to the system, even over time, within the scope of the study.

I also found the theory of Community of Practice (CoP) inadequate to interpret emerging data. While I wanted to use complexity theory to orient the larger frame of the study, I set out to rely on the theory of CoP to explain the change within the smaller system (i.e., individual teachers) over time as a result of teachers' participation in MAP2D. I envisioned that through MAP2D, teachers were socialized to implement the MAP curriculum in a certain way. This part was proven to be accurate. However, Wenger, McDermott, and Snyder's (2002) conceptualization of participants in three groups (i.e., core, active, and peripheral) based on their level of participation was inadequate to describe teachers' experiences.

As beginners and newcomers to MAP2D, teachers were mentored by experienced MAP teachers and coaches. As they participated in learning activities, including workshops, coaching, and group discussions, participating teachers became more active

and engaged within the culture of MAP implementation, and some assumed the role of experts—signifying the move from the periphery of this community of practice to its center (Lave & Wenger, 1991). What I found was that teachers’ expertise, the critical movement to the center of the CoP, was not an indication of CoP. The degree of expertise in MAP implementation did not correlate to the participation level in CoP; some MAP2D newcomers were much more enthusiastic about implementing MAP and all the community activities and collaborations, while some veteran MAP2D teachers maintained their distance from the program. Some even reported that they were active participants at their grade level meetings where all the teachers were starting to steer away from MAP.

Instead of complexity theory, the theory of CoP, and the merge of the two, I found Nel Noddings’ theory of caring to be useful in explaining teachers’ experiences in this study. In care ethics, caring is described as a relation. Involving only two parties in its simplest terms, a *caring relation* is defined as “a connection or encounter between two human beings—a carer and a recipient of care, or cared-for.” (Noddings, 2005, p. 15). Noddings is very specific about the difference between a relation and a caring relation. According to Noddings, both carer (one-caring) and cared-for must contribute to the relation in order for it to be a *caring* relation (1984).

A failure on the part of either carer or cared-for blocks completion of caring and, although there may still be a relation—that is, an encounter or connection in which each party feels something toward the other—it is not a *caring* relation. . . . No matter how hard teachers try to care, if the caring is not received by students, the claim “they don’t care” has some validity. (2005, p. 15, emphasis in original)

Noddings conceded that people have come to embrace differing perspectives on the meaning of caring since the first publication of *The challenge to care in schools: An alternative approach to education*. However, she insists that the virtue of sense of the

word caring often misrepresents the reciprocal characteristic of caring relation. A teacher might express her care by conscientiously setting a certain goal for her students and coerce her students to achieve that goal. In order for this to be considered *caring* in care ethics, then her students need to recognize the caring and respond in some manner, e.g., acknowledging with expressed gratitude or independently pursuing that goal without teacher guidance. A caring relation needs an affirmative response from the cared-for and a carer needs to respond to the cared-for's legitimate expressed needs (Noddings, 2002).

In the context of MAP2D, I applied the ethics of caring to make sense of the interview data. I was cognizant that the virtue of caring, by definition, differed from care theory's caring and sought students' responses to teachers' caring in the interview data. What I found was that teachers were responding to students' needs, not based on their conviction that certain curriculum was superior for students' sakes, but based on their attention to their students' responses. Teacher accounts indicated that they were adjusting lessons and curricula in the context of MAP implementation, based on what students were expressing, not based on what they *thought* students needed. While I assumed that teachers indeed experienced changes, I found that care ethics could be useful in analyzing those teacher experiences.

Significance

This study offers to contribute to teacher change research focused on the quality and process of the change itself. Educational researchers have been frustrated with the idea that certain teachers "resist" PD while other teachers take on a more active participant role in PD and "change" their teaching. However, I argue that a majority of

the studies have overlooked the changes that occur even in “resistant” teachers who may not have implemented the curricula the way researchers envisioned. I believe this study will contribute to understanding of what change looks like, away from the change-vs.-not-change dichotomy and how PD experience relates to teacher change.

In particular, I painted the portrait of teacher change in the context of MAP2D implementation. This study departs from the traditional notion of longitudinal studies of teacher change, where research follows a particular group of teachers for a period of time documenting each teacher’s change over time. I instead explored the notion of teacher change at a given time points, like a snapshot, as teachers reflected on their experiences that have already occurred earlier. I would like to argue that change, since it is dependent on an individual’s experience and the individual’s experience is dependent on her or his context, is a relative, fluid phenomenon rather than a static entity, and that the reflection of change process is also a fluid phenomenon, depending on the person’s memory and reflection of her or his experiences.

Chapter II

REVIEW OF LITERATURE

The purpose of this study was to explore how teachers' experiences in professional development programs impact teacher change in terms of teacher knowledge and beliefs. This review of literature examines two strands of research relevant to studying teacher change experience in professional development. The first strand examines what constitutes professional development and characteristics of successful professional development as a way to influence classroom teaching. The second strand examines teacher change in classroom practice as a result of changes in teacher knowledge and beliefs, mediated by their experiences. Since the professional development program that serves as the context of this study is in mathematics, I will incorporate literature based on mathematics teacher education whenever possible.

Professional Development as a Way to Provide Teacher Learning

Functions and forms of PD differ across settings, depending on the needs of the individuals who participate in the activities that make up the PD. But the main purpose of PD has been considered as a way to improve student learning by creating learning opportunities for teachers. The following sections indicate that no one single factor stands out as *the* solution for successful PD, fostering lasting changes in the culture of learning for teachers. Among many factors, systemic change emerges as a crucial component when considering PD as a vehicle of education reform. For PD to serve as a platform for

school and curriculum reform, a system-wide effort for change needs to be considered. Many organizations can serve as the structure that can initiate and/or maintain effective, systemic PD initiatives. However, in a complex web of various government agencies and professional structures (e.g., departments of education at both federal and state levels, school districts, professional organizations, collaborating higher-education institutions) that constitute our education system, community school districts stand out as the smallest possible unit of educational structure capable of bringing about meaningful, sustainable changes. But structural support alone cannot result in long-term changes in the culture of learning for teachers. Each district's structural support needs to be met with individual teacher commitment.

Functions of Professional Development

Loucks-Horseley et al. (1987) define PD as engagement in a wide variety of opportunities for growth in knowledge and skills within the education profession. School is a place for teachers to work but also a place for teachers to learn (Smylie, 1995). PD can take various forms of school improvement—ranging from collective efforts that focus on long-term, positive change in schools to a skill-development program in which teachers learn new models of teaching (Glickman et al., 2007). Overall, professional development programs are considered learning opportunities for teachers (e.g., Little, 2001).

However, PD does not only serve the function of providing learning opportunities for teachers. It also serves as a vehicle to improve student learning. Over a decade ago, the National Commission on Teaching and America's Future (NCTAF, 1996) reported that the single most important solution to achieve America's educational goal was in

recruiting, preparing, and supporting teachers. This report, *What matters most: Teaching for America's future*, pointed out three premises from which the Commission began their investigation: "What teachers know and can do is the most important influence on what students learn; recruiting, preparing, and retaining good teachers is the central strategy for improving our schools; School reform cannot succeed unless it focuses on creating the conditions in which teachers can teach, and teach well" (NCTAF, 1996, p. 6). More specifically, the report outlined professional development as a vehicle to offer teachers career-long opportunities to deepen their professional knowledge.

Elmore (1997) emphasized the importance of PD as a direct way to improve classroom instruction. Noting that educational reform has been concentrated on "what students should be taught (content standards), changing the structures and processes by which schools are held accountable (student performance standards, assessments, rewards, and penalties), and changing the governance structures by which accountability is defined (site-based management)," he argued that the key to connect policy to practice is PD because it is the "occasion for educators to seek new knowledge and turn that knowledge into new practice" (p. 2).

Due to increased interest in PD as a way to improve classroom instruction and hence improve student achievement (Elmore, 1993), there has been an increased body of research as well as resource allocation for PD since the mid-1980s. States have increased their expenditures for PD in local districts and schools (Glickman et al., 2007), hoping to reap learning gains for students (Darling-Hammond, 1997). While the role of a teacher is to give students the skills to analyze and think for themselves rather than indoctrinate them into a certain way of thinking, the role of PD is to support teachers to reach the

same goal for themselves (Glickman & Alridge, 2001). In this sense, PD has been seen as a simple transmission of information (Guskey, 1998) as well as a vehicle for education reform (Little, 2001), in which teachers learn new ways to improve classroom instruction and therefore improve student learning.

Forms of Professional Development

According to Killion and Harrison (2006), the PD models “in which an expert imparts new techniques in drive-by workshops” are now considered old and ineffective (Darling-Hammond, 1997, p. 326). Also outdated are the noncumulative sessions and workshops that are often intellectually superficial and disconnected from deep issues of curriculum and learning (Ball & Cohen, 1999). Often criticized as “shallow and fragmented” (Fenstermacher & Berliner, 1986), old models of PD activities often include “one-shot deals,” where there is “no integration with a comprehensive plan to achieve school goals” (Tetenbaum & Mulkeen, cited in Glickman et al., 2007).

Based on these observations, “new” models of PD would include cumulative sessions that connect to deep issues of teaching and learning that are integrated with a comprehensive plan to achieve school goals. Furthermore, PD activities follow the support-time model, in which teachers are actively engaged in various activities anchored in their classroom practice, ranging from workshops to mentoring, rather than the “seat time” model in which teachers take a course and get credit only for attendance and efforts (Petrides & Nodine, 2005). While the “seat time” model allows for passive participation of teachers, support-time models actively engage teachers in PD so they can achieve active learning.

Collinson (1996) summarized the shift effort in PD organization:

In the old paradigm, in-service workshops emphasize private, individual activity; are brief, often one-shot sessions; offer unrelated topics; rely on an external “expert” presenter; expect passive teacher-listeners; emphasize skill development; are atheoretical; and expect quick visible results. In contrast, in the new paradigm staff development is a shared, public process; promotes sustained interaction; emphasizes substantive, school-related issues; relies on internal expertise; expects teachers to be active participants; emphasizes the why as well as the how of teaching; articulates a theoretical research base; and anticipates that lasting change will be a slow process. (p. 134)

The new paradigm in PD organization can explain the proliferation of various forms of PD in recent years. As the function of PD activity sets the form, PD activities can have different structures based on how the program was initiated. They are roughly in two categories: self-organized by teachers in order to seek education outside of the district setting, and district-organized PDs. Although self-organized PD activities are informal and close-knit, they often lack the structural support that larger organizations or districts can offer.

Organized and maintained by teachers, self-organized PD activities form networks, partnerships, coalitions, and grassroots groups. They become a way of engaging school-based educators in directing their own learning, and by allowing them to circumvent the limitations of institutional roles, hierarchies, and geographic locations, encourage teachers to work together with many people outside their schools (Lieberman & Grolnick, 1999). These can form networks across districts, as they are not limited by structural constraints. Some snowball into an elaborate set of activities as one gives rise to another. Some start out with an explicit purpose of networking with a small number of teachers, then become larger by allowing and recruiting additional members.

According to Lieberman and Grolnick (1999), tensions abound in these networks, including around: purpose vs. activities (“no matter how meaningful or well intentioned the purposes of the network, activities have to be compelling enough to keep people coming back,” p. 303); inside knowledge vs. outside knowledge (content knowledge of school-based educators is respected as much as that of “experts”; however sometimes they need “expert” knowledge to be brought in to feel validated by an outside authority); centralization vs. decentralization (loose federations or tighter structures—district office approach might be very efficient, but fail to involve the membership in helping to shape the work; a total grassroots approach might promote a committed membership but fail to link with other partners who have different perspectives, different knowledge bases, or different ways of working); informality and flexibility vs. formality and rigidity (tension arises as the network matures and the leadership tries to institutionalize so they will endure—growing pain or stop to exist); inclusivity vs. exclusivity of membership (who to include and how to socialize new members into the network). It seems unavoidable that as self-organized PD activities grow larger and mature, they resemble PD activities organized by large school structures.

Successful Professional Development: Where Function and Form Meet Support

Little (2001) described four broad conceptions of PD that combine the functions and forms of PD: as inquiry, as inspiration and goal-setting, as collaboration and community, and as knowledge and skill development. PD as inquiry focuses on student work, resulting in PD activities that concentrate on the combination of teachers’ knowledge of subject, knowledge of teaching, and knowledge of students. PD as inspiration and goal-setting places emphasis on rallying and sustaining school-wide

endorsement for PD goals and strategies, devoting a large share of time to activities designed to inspire and persuade. PD as collaboration and community relies on the generative power of teacher collaboration—resources and time are reserved in order for teachers to meet and work together on curriculum and student assessment, among other tasks. The conception of PD as knowledge and skill development is the most familiar form of PD. Schools develop or implement PD that reflects their priorities for curricular and instructional change. School-wide priorities sometimes have backfired since they would excite some teachers while disturb others, depending on each teacher's perception of the PD demands. Some teachers become excited about being a teacher when a new classroom practice is proposed. The same PD effort can garner resentment from teachers who were content with the way they were teaching before.

Whether teachers become inspired or resentful at the suggestion of changing classroom practices, PD provides opportunities for teachers to learn to improve classroom instruction. According to Darling-Hammond (1997), PD strategies that succeed in improving teaching tend to be: experiential, engaging teachers in concrete tasks of teaching, assessment, and observation that illuminate the processes of learning and development; grounded in participants' questions, inquiry, and experimentation as well as profession-wide research; collaborative, involving a sharing of knowledge among educators; connected to and derived from teachers' work with their students as well as connected to examinations of subject matter and teaching methods; Sustained and intensive, supported by modeling, coaching, and problem solving around specific problems of practice; connected to other aspects of school change (p. 326). The activities should also be job-embedded and focused on teachers' theoretical understanding of their

work (Miller, 1995), and need to be grounded in the activities of practice (Ball & Cohen, 1999). In addition, creating opportunities to encounter diversity in attention, interpretation, and judgment in using teaching methods is crucial in order to connect engagement in PD activities to classroom application (Ball & Cohen, 1999).

In addition, a large body of correlational and case study research have produced a list of “best practice” frameworks that lay out essential elements for effective PD. Teacher engagement was often absent from these frameworks, which can explain the failure of these PD to take root (e.g., Garet, Porter, Desimone, Birman, & Yoon, 2001; M. M. Kennedy, 1998). Wayne, Yoon, Zhu, Cronen, and Garet (2008) added that “intensive, sustained, job-embedded PD focused on the content of the subject that teachers teach is more likely to improve teacher knowledge, classroom instruction, and student achievement” (p. 470). Gulamhussein (2013) reported that PD that is sustained over time is in response to teachers’ long-standing objection to “one-shot” workshops. Furthermore, she outlined that PD must provide intensive support to teachers during the implementation stage rather than passively increasing PD hours in order to secure teacher commitment to practice changes.

Aforementioned strategies that succeed in improving teaching can be better organized with the systemic, structural support that small, self-organized PD cannot provide. In this section, I argue that even though self-organized activities may be closer to addressing the issues that teachers find important in their teaching, structural support is critical to maintain the initiatives. On the other side of this argument is that PD becomes ineffective and fails to produce change if its agenda is far removed from concerns of the teachers. A balance between an agenda close to teachers’ concerns and interests and

sustained support is essential for a PD program to be successful (see Gulamhussein, 2013, for examples).

While researchers agree that teachers face increased demands to “teach in ways that promote critical thinking and problem-solving skills that require deeper subject matter knowledge,” teachers face lack of support from the structure to continue their learning process beyond their formal education in pedagogy (Scribner, 1999, p. 240). One way of addressing the needs of content and pedagogical knowledge initiated by the schools and districts has been PD, yet it is “where the tension between institutional imperatives and individual prerogatives exists” (Little, 1993, p. 141). The lack of resources and misaligned agenda of PD have been the source of discussions for educational researchers concerned about ineffective PD. Rather than utilizing PD as a simple transmission of the “latest” technology in pedagogy, PD as a space and time needs to be reconstructed as a vehicle of reform embedded in the school culture, in which teachers can use the resources to better understand their own students’ needs (Scribner, 1999).

Structurally, leadership is necessary in order to allocate resources, initiate or approve projects, and sustain PD. PD as a way to address a school’s organizational capacity (i.e., teachers’ knowledge, skills, dispositions, technical resources, program coherence, and professional community) necessitates principal leadership to effectively manage components of the school capacity (Young & King, 2002). Through PD, effective principals establish trust, create structures that promote teacher learning, connect with external expertise, and help teachers generate reforms based on the outcome of the PD. In this model, PD was a platform to create an agenda for curricular change and

to develop the means of changing the curricula based on teachers' discussions. Zepeda (2004) asserted that "learning communities cannot exist without leadership that facilitates teacher growth" (p. 144) and proposed a different "paradigm" in school leadership that allowed teachers to self-direct their goal and use of PD rather than impose teachers to a strict accountability. In this age of Common Core content standards adoption, many states have made PD systems a critical component of their instructional improvement efforts (see Berry, Daughtrey, Darling-Hammond, & Cook, 2012; Borko, Elliott, & Uchiyama, 2002).

Yet, school leaders face a public that demands to know how the tax-payer's money is spent, "whether the overall level of professional development spending makes a difference," or "whether investment levels in certain strategies...has a greater impact on instructional quality than other investments" (Miles, Odden, Fermanich, & Archibald, 2004, p. 22). Even though school leaders allow teachers to be self-directive in their PD needs, the attitude toward teachers' learning communities is economy-driven and not immune to accountability reports based on measurable outcomes. In that sense, PD is a public sphere where not only the needs of the students and teachers are discussed, but also where the needs of the funders of the programs (i.e., tax-payers and voters) must to be addressed. Jacob and McGovern (2015) estimated that large urban districts spent on average \$18,000 per teacher per year with the goal of improving instructional practices, which is between 4 and 15 times the cost per employee in other comparable industries. Despite still struggling after taking a hit with the recession and sequestration, PD efforts in schools account for over 40% of Title II's \$2.33 billion (Gulamhussein, 2013).

One study, in particular, examined the relationship between a district's organizational capacity and professional development. In comparison of three districts in urban settings, Firestone, Mangin, Martinez, and Polovsky (2005) suggested that district offices can influence professional development by prioritizing their resources to develop a long-term PD program (rather than common "one-shot" professional development sessions) that aims to improve teacher knowledge in content as well as pedagogy. One particular district in the study led a successful PD program that also included developing culturally relevant pedagogy for diverse students in the district. Despite rave reviews from the teachers and school leaders in the district and the record of increased student achievement, "the cosmopolitan approach [to pedagogy] that fit well with current research-based recommendations, and appeared to be influencing teachers, did not play well with those who influenced school board elections" and the superintendent, who was the driving force behind the cohesion of the PD programs, consequently took a job in another state (p. 440).

If school leadership needs to be held accountable for the outcome of the PD, then teachers must also become accountable for the outcome of the PD. Teacher resistance to PD has been studied as a failure to meet the expected outcome of the PD or failure to exhibit a set of expected behaviors according to the design of the PD. In its most restrictive way, PD can be viewed as a behavior modification program, that certain programs hope to change teacher behaviors as a result of PD. Considering that behaviorist notions of change need to be measured by a specific set of standards, teachers would need to exhibit specific behaviors in order to be considered "implementing" the PD. Given the constantly changing nature of classroom interactions, such expectations

would be unrealistic. Instead, Silin and Schwartz (2003) explored teachers' resistance to PD as a result of their frustration and difficulty negotiating with the demands of the PD design and the demands of their daily classroom activities. When the PD agenda is far removed from teachers' needs, teachers were caught between two sets of demands that were not aligned; conflict and resistance are expected.

Janas (1998) argued that teacher resistance is also a symptom of disconnect between a structural reform agenda and a teacher's concern for teaching students well. In their study of assessing the effectiveness of science PD programs at the elementary school level, Schwartz et al. (2000) illustrated the importance of the alignment between the PD goals and the curriculum reform vision (in this case, project-based learning) shared among PD specialists and classroom teachers. Although other contributors, such as the quality of PD, shared planning time, modeling lessons, and collaborative teaching were examined, the interviews and artifact studies revealed the importance of PD led by specialists who share the same reform vision as the district.

However, sharing the same vision does not automatically translate into successful PD. In order to use PD as a vehicle of reform by creating change, all the participants, PD specialists, participating teachers, building and district administrators need to commit to constructing a community of learning in and outside of the school building (Supovitz, 2002). In order to focus on instructional improvement, even in the small-schools movement, Supovitz argued for structural support from the principal and the district, in addition to the pedagogical freedom for teachers, coupled with ongoing PD to enrich and support teachers' choice of instructional methods (2002). However successful PD might

be in and of itself, if the district continues imposing pedagogy and curricula despite the direction of PD, then the reform effort is a waste.

In Hague and Walker's study (1997), PD was designed to change teachers' deficit perception of their students—from an at-risk designation that emphasizes students' weaknesses to a more holistic view of the child that emphasizes students' strengths—by departing from teachers' role as a traditional transmitter of information and educational technician. In the process, teachers were exposed to constructivist learning theories and practices facilitated by university faculty members and shared their findings and experiences with their partners. However, after three years of PD implementation, teachers were beginning to see their colleagues as “experts” and also began to view their students through a strengths-model. The emphasis was given to the shift in ownership of the PD from the coaches and university faculties to the teachers and schools, meaning they needed to “assume major responsibility for their own continued growth and progress with the project” (p. 487)—once again, self-organizing group activity needed structural support.

Another attempt at changing the structure of schooling through PD purported by self-organizing groups is the formation of “learning communities.” In learning communities, teachers are allowed to work in groups to deepen their understanding of various issues related to education and their students' needs of their choice rather than what the structure imposes. However, as before, these activities take place with the sanction and support from the structure which itself shows a degree of structural cohesion. While larger urban school districts, the New York City school system in this case, attempted participatory management of PD, this effort failed not because of teacher

“resistance,” but because of “loosely joined units in bureaucracy” including the teachers union that serves the teachers of the entire system, district cultures that differ from one district to another, and building leaders who are not aware of the change effort due to lack of communication between bureaucracy units (Sullivan, Shulman, & Glanz, 2002). Even good intentions of participatory management yield “questionable results” if the targeted change effort is not embedded in each school’s culture.

The lack of contextualization of PD at the building level has been behind the latest push for PD designed to give control to the teachers. “Authentic learning communities” need to be customized for each school’s culture and needs while providing “high-quality PD, research-based literature, shared leadership, collaborative processes, and context [of the students’ community]” (Phillips, 2003, p. 240). Teachers benefited from being a part of a learning community, especially when their shared interest in employing critical pedagogy often stood in contrast to the traditional pedagogy practiced in the district (Morrell, 2003). However, the conflict with the rest of the structure’s culture can be prohibitive for PD to continue (Xu, 2003). In response, some teachers seek support by joining learning communities outside of their own schools and districts; however, this effort provides strength of diversity of perspectives and experiences which does not necessarily outweigh the weakness of decontextualized conversations that typically drive the communication around theories and away from one’s teaching contexts, “inhibit[ing] particular conversations from evolving” (Klecka, Clift, & Cheng, 2005, p. 424). All and all, it appears that PD projects and professional learning communities need to rely on the support of the structure as well as self-governance to fit each setting’s needs (Fishman, Marx, Best, & Tal, 2003).

Some teachers maintain their affiliation with institutions of higher education, especially teacher education schools, for support networks. They often find comfort in returning to the familiar foundations that they share with other participants of PD and even advocate for formal partnerships involving schools of education and school districts (Hines, Murphy, Pezone, Singer, & Stacki, 2003). Some networks are formed among the residual members of the learning community that flourished during university-sponsored learning community projects but withered away once the funding ended (Abu El-Haj, 2003). It seems like a common practice: an education school enters schools and districts to create a PD program and the program initially succeeds while it functions as the “expert.” But when the funding ceases, the education school pulls out. Then what happens to PD without the presence of that authority figure and its “expertise”?

In a study of seven teachers who formed a university-initiated inquiry group that was also supported by their building principal, the formula of teacher directive, school sanction, and university support seemed to be aligned (Duncan-Andrade, 2004). However, in-depth examination of teacher communication indicated that even though teachers were “familiar with each other’s commitments to social justice education” (p. 342), “shared more than just a lesson plan” and were “empowered to share experiences” (p. 346), in the short duration of the study, teachers were more engaged in intellectual discussions around theories rather than deep emotional support. In light of the urban teacher retention crisis, Duncan-Andrade problematized lack of sustained, long-term emotional support among urban teachers that eventually leads to a complete disconnect from the initial commitment to “bring about change” in urban schools. He suggested avoidance of over-dependency on outside sources (in this case, the university) as the

authority figure and development of partnership between teachers and school and district administrators to provide emotional support for starting urban teachers (2004). While relying on the university or outside sources can provide a sound basis for PD initiatives, Duncan-Andrade suggests depending on school and district support instead.

So far, I have presented elements of successful PD that serve as catalysts for improving classroom practices. Whether the PD activities involved addressing student achievement or shifting teacher's deficit-perception of students to highlight student strengths, or forming learning communities to help explore new ideas in critical pedagogy or forming networks for emotional support, it is clear that both the structure and individuals need to be committed for a PD program to be successful. In the next section, I argue that community school districts serve as the "right-size" unit of schooling structure in which PD can succeed. School districts are smaller than other government agencies and professional structures in our education system, yet large enough to provide systemic support.

The School District at the Center of Meaningful Change in Classroom Practices

As described above, PD serves a range of purposes depending on the participants' needs and concerns. However, the issues regarding scope and longevity of the PD organizations are better resolved when the programs are supported by larger structures. Researchers point to school districts for their capacity to initiate, sustain, manage, and provide support for effective PD (Elmore, 1993, 1997; Darling-Hammond, 1997; Darling-Hammond et al., 2005; Darling-Hammond, Hyler, & Gardner, 2017; Gulamhussein, 2013; Loucks-Horseley et al., 1987). District-organized PD programs have advantages of having a structural support: facilitation of meetings, workshops, and

institutes become easier due to available physical and monetary resources. Aligning goals and visions to PD activities becomes easier since the district serves as a central organizer of different PD activities, despite the danger of the PD activities becoming top-down initiatives. In addition, Elmore (1993, 1997) argued that in order to organize successful PD so as to influence practice in large numbers of schools and classrooms, PD efforts need to be formed at the district level, meeting the needs of the community and the mandates of the state.

In a teaching quality and policy study, Darling-Hammond and her colleagues (2005) described the PD effort in the San Diego school district as a core of the reform that aimed to change classroom instruction with full district support. In this program, PD served as the key mechanism for spreading the theory of instruction across the district. Goals of and rationale for the PD were communicated clearly throughout the district so school leaders as well as teachers shared the same vision of PD. PD opportunities were embedded at the district level so that there was instructional alignment between, as well as within, schools. All PD activities incorporated time and structures to enable teachers and leaders to interact with peers and reflect about practice in continuous, context-specific learning networks. Extensive PD of teachers including workshops was held on school sites, and teachers were compensated for attending. A network of trained peer coaches/staff developers were placed in schools to work directly with classroom teachers on teaching practice.

Despite its effort to implement all the factors of successful PD, major questions were raised based on this centralized, district-wide PD. Some participants resented its centralized, one-size-fits-all use of the same language across the school and the district;

however, some saw the same effort as an equitable treatment that all schools receive the same types of PD and opportunities as other schools regardless of their student population (no remedial vs. accelerated here). The structures were intended to embed adult learning within the school and connect it to teachers' daily practice—this required both a large cultural change in school organization and new structural supports. The cultural change began with redefining the district system as one of learners at all levels—instructional leaders, principals, teachers, and staff developers. PD strategies and structures for all school levels including workshops, institutes, networks, and coaching were available to all the personnel to curriculum and instruction, whom Darling-Hammond and her colleagues call “the core technology of education” (Darling-Hammond et al., 2005, p. 183).

What resulted were individual, as well as organizational, changes as everyone involved in the PD effort became “more comfortable with living in questions rather than having to have the answer immediately” (p. 85). They were also more willing to risk change, experiment, and inquire to pursue student learning toward clearly articulated goals for learning. Communities of practice were formed so that participants received support as well as felt the pressure at the same time to improve instruction. Through prioritizing high-quality instruction and professional learning through district-wide PD, the San Diego school district was able to create a holistic approach to school change as a result of “inside-out” and “outside-in” as well as “top-down” and “bottom-up” mechanisms.

Although not as sweeping as Darling-Hammond and her colleagues' case in San Diego (2005), Long Beach school district's MAP2D exhibited elements of successful PD.

Created by a teacher to address the achievement gap in mathematics, MAP2D was a bottom-up answer to the standards-based math instruction that does not address the existing gap at the point of school entry (Elmore, 1993). MAP2D recruited administrative support, including the provision of teacher release time and meeting locations, as well as resources to hire full- and part-time coaches (Glickman et al., 2007). It also utilized multiple activities that included workshops, coaching, and support meetings that were connected to the overall objectives of the program (Loucks-Horseley et al., 1987). In this sense, MAP2D served as an ideal vehicle to provide teacher learning to change classroom instruction.

In this strand of literature review, I explored teacher change at a contextual level. I presented function and form of PD and the factors found in successful PD. While individual commitment by teachers is important, structural support is also crucial for a PD effort to succeed. In addition, the community school district serves as a better sized schooling structure to facilitate effective PD. In the next strand, I examine teacher change at the individual level.

Teacher Change through Teacher Learning

Teacher change is described in terms of “learning, development, socialization, growth, improvement, implementation of something new or different, cognitive and affective change, and self-study” (Richardson & Placier, 2001, p. 905). Among these descriptors of teacher change, this study sought to study it as a goal and byproduct of MAP implementation in classrooms—teacher change as a result of learning how to implement MAP. MAP2D activities were designed to support classroom implementation

of MAP; the criterion for successful implementation was related to the degree of fidelity—how much a teacher’s adoption of the new method conforms to the original developer’s view of what MAP should look like in classroom. As a result of MAP2D participation, teachers were expected to conform to the program designed by using classroom activities in the way that they were designed to fit MAP. As will be discussed in depth in the next chapter, these activities were structured to be used everyday in a specific format.

The fidelity orientation of MAP implementation places MAP2D within an empirical-rational approach to change (Chin & Benne cited in Richardson & Placier, 2001). In this approach, teacher learning takes the form of the training model, which has “at its core a clearly stated set of objectives and learner outcomes,” including teaching skills, thinking processes, and teacher action in addition to teacher behaviors (Richardson & Placier, 2001, p. 917). As teachers participated in MAP2D, they were expected to learn different components of MAP and learn relevant teaching skills and thinking processes to support those components. This learning was expected to change teacher behavior—the way the teacher instructs—and ultimately to conform to the design of MAP.

Early examples of the research examining teacher effectiveness (before 1950) utilized a simple model: changing teacher behavior leads to changes in student outcomes. Although this assumption in causal relationship does not consider other factors that influence teacher behavior or student outcomes, this linear model was considered the basis of studying teaching practices and their effects (Koehler & Grouws, 1992). As the field of research in teaching practices and their effects grew, the basic model became more complex by adding factors such as teacher knowledge, attitudes, and beliefs—

which collectively describe teacher characteristics that influence teacher behavior—as well as student behavior, attitudes, and characteristics. Since this study aimed to examine teacher change, the focus of this literature review will be on the factors that influence teaching—teachers’ beliefs and knowledge.

In following sections, I will explore what teacher knowledge and belief mean according to the literature and how they are relevant in terms of teaching mathematics. I will use a framework that situates teacher belief and knowledge in classroom practice since contextualizing teacher change experience is central to this study. At the end of this section, I will discuss how the literature guides my conception of PD as a way to change teacher practice and what I intend to look for in terms of changes in teacher belief and knowledge.

Teachers’ Knowledge and Beliefs

Although research on changing teachers’ behavior, hence classroom practice, has been traditionally rooted in changing teachers’ attitudes, beliefs, and knowledge (see examples in Koehler & Grouws, 1992; Putnam & Borko, 1997; Thompson, 1992), recent changes in the field have suggested that teachers’ beliefs and knowledge are largely overlapping, and that most researchers avoid differentiating between knowledge and beliefs (Southerland, Sinatra, & Mathews, 2001). Some consider knowledge to be a type of belief, comprised of three components—a cognitive component (i.e., knowledge), an affective component (e.g., judgment, evaluation, notion), and a behavioral component (Rokeach, 1968, cited in Murphy & Mason, 2006). Some consider beliefs to be a type of knowledge and that generic knowledge is made of two components—a cognitive

component that is schematically organized and a belief component that involves evaluation and judgment (Nisbett & Ross, 1980).

Murphy and Mason (2006) distinguished the two based on research headed by Patricia Alexander and colleagues (Alexander & Dochy, 1995; Alexander, Murphy, Guan, & Murphy, 1998), in which the researchers found that across varied educational and cultural backgrounds (i.e., ranging from seventh grade students to professors of education, some in rural, southern United States to some in Singapore and the Netherlands), the respondents consistently conceptualized knowledge and belief differently. According to them, the term *knowledge* refers to “all that is accepted as true that can be externally verified and can be confirmed by others on repeated interactions with the object (i.e., factual).” The term *belief* refers to all that one accepts as or wants to be true, [that] do not require verification and often cannot be verified (e.g., opinions)” (p. 306-307). In addition, the respondents in the study, although they distinguished knowledge and belief to be separate constructs, perceived them to be also overlapping. Based on this research, Murphy and Mason posit that knowledge and belief, while separate, are overlapping constructs.

Even though knowledge and belief are separate, the two constructs are so intertwined that change in one’s beliefs can “mediate the extent to which individuals engage with the text and the subsequent knowledge gains” (Murphy & Mason, 2006, p. 320). For teachers, their knowledge and belief are mediated by experience. V. Richardson (1996) describes three categories of teacher experience that influence teacher knowledge and beliefs: personal influences, schooling, and formal knowledge. Personal influences refer to how life experiences are encoded in images or metaphors, so much that personal

experiences shape views of teaching. The experience of a teacher's schooling affects her or his beliefs about learning and teaching. Using a study by Strauss (1996), V. Richardson illustrates how prospective teachers have accumulated over 12,000 hours of schooling even before they enter college, and from this amassed experience, they infer what it means to teach, manage, and learn. However, the effect of schooling on teacher's knowledge and belief does not mean that those with similar schooling attain similar knowledge and beliefs. Even though teachers might share the same formal knowledge (i.e., both knowledge of academic subjects as well as pedagogical knowledge) due to similar education processes, their beliefs would differ since the beliefs about teaching are tied to an individual's experiences (Wideen, Mayer-Smith, & Moon, 1998).

Educational psychologists and teacher educators often find their research at odds because each field examines teacher knowledge and belief from such distinct perspectives that often the conclusions from two fields are often not miscible—generating psychological accounts of how teachers develop knowledge and beliefs and studying how to actually help teachers develop knowledge and beliefs for classroom practices can work at cross purposes (Munby, Russell, & Martin, 2001). In order to understand teacher knowledge and belief from both fields, I organized the literature review on teacher knowledge and beliefs using structures developed from those who also acknowledge the importance of bridging both fields. The context model by Fennema and Franke (1992) and the ecological model by Woolfolk Hoy, Davis, and Pape (2006) are useful to understanding teacher knowledge and belief because of each model's integration of contexts. Because Fennema and Franke's model deliberately excludes teacher beliefs as a factor that affects teacher knowledge, I will explore teacher beliefs

using the ecological model, then explore teacher knowledge using the context model to supplement aspects of teacher belief and knowledge not included in the ecological model. A section on the role of caring in teacher belief follows as the concept of care emerged from data.

Ecological model of teacher belief. The ecological model was first coined by Bronfenbrenner (1986), whose research on the structures and the influences of the external systems that affect family greatly influenced modern research on child development and family—individuals are embedded in several ecosystems and these ecosystems, nested, significantly affect individuals. Similarly, teacher beliefs are “influenced by the immediate contexts of the classroom and students, the larger contexts of the state and national policies, and the surrounding context of cultural norms and values” (Woolfolk Hoy et al., 2006, p. 717). The following sections elaborate on different levels of contexts, starting from the largest to the smallest outlined by the model.

Cultural norms and values. At the most underlying level of the model is the category of cultural norms and values. This layer refers to how the beliefs of the larger society shape teachers’ beliefs about their role as educators. It includes how the society views childhood and adolescence—the key population in K-12 education; that depending on how the teacher interprets social values of childhood and adolescence, the teacher’s beliefs about teaching children and adolescents would differ. For example, due to the stereotype of children needing more attention in relation to the stereotype of adolescents as a time of detachment, teachers would vary their emotional distance from their students, even though emotional distancing behaviors of teachers do not benefit their adolescent

students who are learning to be autonomous (Finders, 1997 cited in Wookfolk Hoy, Davis, & Pape, 2006).

Another set of values in this category is teachers' interpretation of diversity—what diversity means and what it includes. This sheds light on how teachers' subscription to the cultural norm filters into the classroom, including race, ethnicity, socioeconomic status, gender, ability, language preferences, and sexual orientation, amongst other socially constructed identity markers. While multicultural and inclusive educators¹ work toward equal and equitable education for all students because all learners are capable and can contribute to their learning because of their differences, society might not have shared their ideas. Despite all the differences that exist in any classrooms, teachers have tended to view African American and Latino students as the only “minority” students in schools and readily associated them with “at-risk” and “violent” (Gilbert, 1997; Trier, 2005). At the other end of the stereotype is colorblindness, that students' race should not be considered in teaching—this belief can result in not only teachers' rejection of their own racial and ethnic identity (e.g., Delpit, 1988; Kanpol, 1997; Mazzei, 1997; McIntosh, 1988; McIntyre, 1997; Perry, 2002), but also their rejection of cultural and racial capital that students from different backgrounds can bring into the learning environment (e.g., Calabrese Barton, 1998; Delpit, 1988; Fecho, 2004; Fine, 1986; Nieto, 2005; Olsen, 1997). Reflecting society's belief in meritocracy and naïve egalitarianism regardless of

¹ Here, I feel somewhat ambivalent about including both “multicultural” and “inclusive” to denote people who believe in human differences as a diverse representation of who we are as members of the society. Traditionally, multicultural education was concerned with education of children of different ethnicity, gender, native language, race, socioeconomic status, etc., while inclusive educators work toward the inclusion of children of varying “abilities” into the mainstream. This separation between multicultural and inclusive education does not reflect my belief, that in a truly inclusive, multicultural society, no groups of people are excluded because of their differences. However, researchers have pointed out that multicultural and inclusive educators have been mutually exclusive while they need all to embrace each other.

the institutional discrimination that benefits and hinders students differently, teachers believe that hard work and individual efforts will always triumph over any individual or social obstacles (Causey, Thomas, & Armento, 2000), and treating students equally translates to a “one pedagogy for all” orientation (Ladson-Billings, 1995; Skrtic, 2004).

State and national context. Based on this layer of cultural norms and values, educational policies reflect state and national contexts. In the age of standards, reforms, accountability systems, and high-stakes testing, teachers’ beliefs are influenced by these top-down and outside-in measures. While these policy measures can benefit teachers by allowing them to establish new teaching beliefs and practices, they can also negatively affect teachers. Manouchehri and Goodman (2000) reported that teachers needed to develop deeper mathematical content and pedagogical knowledge in order to implement standards-based mathematics textbooks because they believed in the necessity of reflecting standards in their instruction. On the other hand, standards-based textbooks and standards-based high-stakes tests led teachers to believe that they would need to standardize the curriculum regardless of the needs of their students (Robinson, 2002).

Teachers also implement policies according to their own beliefs and knowledge filtered through their experiences. In describing how one Latina teacher implemented a district-mandated scripted literacy program for English language learners, Stritikus (2003) reported that the teacher initially accepted the policy changes. However, after examining the political contexts of the mandate, her history as a learner in English immersion classrooms, her belief in maintaining primary languages, and her decreasing sense of creativity and professionalism, she reverted back to her original curriculum.

On the other hand, state-level policies may influence teachers' practices without necessarily affecting their views. Raymond (1997) studied a novice teacher who expressed the view that students should discover mathematics without being shown, and that students learn mathematics better when they solve problems; this novice teacher also believed in hands-on learning with manipulatives and teaching from multiple sources without using textbooks. Despite her beliefs, this novice teacher's actual classroom practices reflected students working from textbooks silently after they learned the procedure in teacher-directed instructions. This discrepancy between the teacher's beliefs and practices resulted from her concerns over high-stakes testing that required students to learn a set amount of information in a given time.

Immediate context. Immediate context refers to the influences the content, classrooms, and students have on teachers' beliefs and can be understood in relation to teachers (Franke, Kazemi, & Battey, 2007). Stodolsky and Grossman (1995) reported that teachers' perceptions of the subject area had consequences for their instructional choices, that depending on the perceived status of the subject (i.e., math and science were viewed as of higher status in comparison to others), teachers claimed greater privilege in terms of prerequisites and programming.

Thompson (1984) described how teachers' beliefs about mathematics influence teachers' instructional practices: instrumentalist view, Platonist view, problem-solving view. Teachers whose view of mathematics was best characterized as instrumentalist believed that mathematics is made up of an accumulation of facts, rules, and skills and students need to master these to pursue an answer. These teachers taught in a manner emphasizing demonstrations of rules and procedures. Teachers whose view of

mathematics was best characterized as Platonist believed that mathematics is a coherent subject consisting of logically interrelated topics. These teachers emphasized the mathematical meaning of concepts and the logic of mathematical procedures. Teachers whose view of mathematics was best characterized as problem solving believed that mathematics is dynamic and problem-driven and continually expands to generate patterns, which then distills into knowledge. So, according to the problem-solving view, mathematics is a process adding to the sum of knowledge—not a finished project, but open for revision. These teachers emphasized generative processes of mathematics, focusing on multiple ways to arrive at the temporary results.

While most teachers in the United States are white females from middle-class backgrounds, some view their students and curricula as “deviant” when they teach in schools that do not reflect their own background (Metz, 2002), and find it easier to teach students who come from backgrounds similar to their own (Tiezzi & Cross, 1997). Some teachers had different expectations of their students depending on students’ ethnicity and socioeconomic status (Alvidrez & Weinstein, 1993; Brice-Heath, 1982; Lareau, 2003; Noguera, 2003; Olsen, 1997). Brice-Heath (1982) found that teachers held different expectations and exhibited different behaviors towards black female students in their classrooms; white teachers have been found to expect black children in their classes to “respond to language routines and the uses of language in building knowledge, skills, and dispositions just as other children,” even though many black children acquire socialization and language skills differently. The expectation that black girls will interact differently than other students in the classroom shaped the way teachers treated black

female students, emphasizing their social rather than academic skills (Anyon, 1980; Grant, 1984).

In addition, teachers who hold similar beliefs can differ in practices depending on how they see their students' needs. Sztajn (2003) studied two teachers who held similar beliefs about mathematics, believing that both problem solving and basic skills were important, but basic skills needed to be mastered in order for students to engage in problem solving. One teacher taught in a school of students coming from lower SES (40% free or reduced-cost lunch, parents with low-income, manual-labor jobs) while the other taught in a school of students coming from higher SES (10% free or reduced-cost lunch, middle-income parents who are doctors, lawyers, and university professors). The first teacher, concerned about students' "unstable, chaotic homes" emphasized basic facts, drill, and practice while the second teacher, believing he/she did not have to worry about teaching rote basics, emphasized problem solving and projects. Sztajn concluded that what accounted for the differences in instruction was not teachers' beliefs about mathematics (content), but their beliefs about children, society, and education.

Self. Woolfolk Hoy et al. (2006) divided what teachers believe and know about themselves into two: teachers' identities and sense of efficacy. Teacher's identities, according to Woolfolk Hoy et al., is their awareness of their own beliefs and knowledge, including what motivated them to teach, what it means to be a teacher, and how their teacher identity shifts as they become more experienced (see examples in Brown & Borko, 1992; Sowder, 2007). Specifically, they refer to Danielwicz (1997) to define teacher identity as a profession rather than a simplistic job: "What makes someone a good teacher is not methodology or ideology. It requires engagement with identity, the very

way individuals conceive of themselves so that teaching is a way of being not merely ways of acting or behaving” (cited in Woolfolk Hoy et al., 2006, p. 727).

A teachers’ sense of efficacy is mediated by the individual’s belief in her or his “ability to organize and execute the courses of action required to successfully accomplish a specific task in a particular context” (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998, p. 233). This general sense about how good they are at what they do affects teachers’ motivation, effort, and resilience when faced with difficulties (Woolfolk Hoy et al., 2006). Teachers with high efficacy have shown to make a greater effort and persist in specific teaching tasks as well as engage in activities that support children’s learning (Ross, 1998).

Teachers’ confidence in mathematics knowledge has been suggested to affect teachers’ sense of efficacy in teaching mathematics (Philipp, 2007). Harper and Daane (1998), in their study conducted on prospective elementary school teachers, concluded that mathematics anxiety persisted in prospective teachers and that the anxiety often stemmed from their elementary school experiences.

The level of *Self* in the ecological model is where the model of teacher belief and model of teacher knowledge overlap. Although the model offers a framework to view belief and knowledge together, it does not provide a bridge that much mathematics education literature offers as teacher knowledge specific to teaching mathematics in elementary classrooms. I use the context model of teacher knowledge to further elaborate at the individual level.

Context model of teacher knowledge. Even though researchers converge on the dependence of a teacher’s knowledge on the context of a particular classroom, the vast

perspectives of researching teacher knowledge parallels that of researching teacher beliefs (Munby et al., 2001). Schön (1983) provided framework on teacher knowledge based on two fundamental modes of thought by Bruner (1985). What Bruner referred to as paradigmatic mode of thought was explained in terms of the “high ground” of theory, while Bruner’s narrative mode was explained in terms of the “swampy lowlands” of practice. Rather than focusing on the division between theory and practice, I explore teacher knowledge based on the model by Fennema and Franke (1992), which situates teachers’ knowledge and beliefs in a classroom setting. The classroom is where teachers’ practice is mediated by teachers’ beliefs, their knowledge of mathematics, their knowledge of students’ cognitions in mathematics, and their pedagogical knowledge.

Teachers’ knowledge of mathematics. This content knowledge includes teacher knowledge of the concepts, procedures, and problem-solving processes within mathematics, as well as in other related content areas. For example, graph skills may be taught in math, but using graphs appears in science and social studies in elementary classrooms. In this sense, concepts introduced in mathematics are not isolated in math alone—they are introduced and applied in other content areas. Teachers in self-contained classrooms, such as in elementary schools, have been shown to teach skills across subject areas. For example, reading comprehension strategies might be used while reading science literature, just as much as data organization strategies taught in math class might be used while preparing to analyze data based on questions in social studies.

Teachers’ knowledge of mathematics includes knowledge of the concepts underlying the procedures, the relationships between the concepts, and how these concepts and procedures are used in solving different types of problems. Teachers also

know to anticipate specific student understandings and misunderstandings in specific instructional contexts, and have strategies ready to help students when they demonstrate (mis)understandings. Also included is teacher's knowledge of the relationships between larger mathematical ideas.

Schoenfeld (2006) used an example from algebra to illustrate how teachers access their content knowledge to help students learn. The distributive property states that $(a+b)^2=a^2+2ab+b^2$. When students complete the expression $(x+y)^2$ by writing incorrectly, that $(x+y)^2 = x^2 + y^2$, then the teacher would lead the student to see the mistake by asking, for example, "Why don't you try your formula with $x=3$ and $y=4$?" Schoenfeld explained that this is a form of knowledge that is now understood to be a central aspect of competent teaching, a combination of subject matter knowledge and general pedagogical training. Using this knowledge, teachers transform content knowledge into representations, examples, and explanations that connect with the prior knowledge and dispositions of learners (Shulman & Quinlan, 1996)

Also related to teachers' content knowledge is the knowledge about standards and accountability. Teachers need to connect what is asked of them in terms of policy to content knowledge. Standards and policy reforms, accountability systems and high-stakes testing assessment practices influence how teachers construct their classroom instructions (see Ball & Bass, 2003, M. M. Kennedy, 1998, Manouchehri & Goodman, 2000). For example, teachers who are asked to use certain textbooks in mathematics are bound to use the math terms found in the book. However, if the math vocabulary used by the textbook adopted by the school are not the same vocabulary in the state standards, then

teachers need to access their content knowledge to make certain that their students learn the concepts using the vocabulary words aligned with the state standards.

Teachers' pedagogical knowledge. Also known as practical knowledge, this knowledge concerns teaching procedures for the day-to-day operations of teaching, such as planning, classroom routines, behavior management, classroom organization, and motivational techniques (Brown & McIntyre, 1993). This contextual, situated, and often tacit knowledge may be embodied in stories, images, routines, and rhythms of classroom life (Carter & Gonzalez, 1993; Korthagen, 2004).

An example of teachers' pedagogical knowledge applied to mathematics classroom teaching can be observed in shifting classroom discourse from the traditional teacher-to-students talk of Initiate-Respond-Evaluate (IRE) to include more of student-to-student and student-to-teacher talk (Porter, 1989; Spillane & Zeuli, 1999). In order to successfully change this form of student participation in classroom instruction, teachers need to support such opportunities using planning (ranging from long-term planning to facilitate independent group discussions to short-term planning of including enough time so students can transition to and from groups), classroom management (managing the loudness of student voices so they can hear each other), classroom organization (seats arranged so it facilitates group discussion), as well as motivation (so all students participate in the discussion rather than a few students dominating the discussion).

Another example is an effective use of revoicing. Revoicing can be re-uttering someone's speech at its simplest level, but when used effectively, revoicing can accomplish a range of goals (Franke et al., 2007). A creative use of revoicing involves repetition, expansion, rephrasing, and reporting what a student says. These forms of

revoicing can clarify an idea (a teacher can substitute mathematical vocabulary with everyday words), redirect conversation to a different topic (demonstrating the connection between ideas), and summarize multiple ideas coherently.

Teachers' knowledge of students' cognition in mathematics. It is important for teachers to know how students think and learn, specifically in mathematics content. This not only includes knowledge of how students acquire mathematical knowledge, but also understanding the processes students will use and the obstacles they might encounter while engaged in mathematics learning.

While many researchers argue that teachers' knowledge in mathematics as a content area is important, they emphasize that teachers' knowledge of their students' understanding of mathematics is also crucial, because “what matters ultimately is not only what courses teachers have taken or even what they know, but also whether and how teachers are able to *use* mathematical knowledge in the course of their work” (Ball, Lubienski, & Mewborn, 2001, p. 450). Attending to students' reasoning—what they are saying and doing, if their ideas are connected to mathematics and mathematically valid, if what they express makes sense in terms of mathematics even when they are not fully grasping the idea, and if conceptual ideas need to be addressed for their benefit—is at the core of teaching mathematics (Schifter, 2001).

The Cognitively Guided Instruction (CGI) has emerged as an example of using student thinking in professional development for teaching mathematics (see Schoenfeld, 2006, and Sowder, 2007, for examples). Using this method, teachers do not necessarily follow a prescribed curriculum or textbook pacing; rather, they follow the “gaps” in students' mathematics knowledge exhibited while students attempt solving mathematics

problems (Carpenter & Fennema, 1992). Another approach to using students' understanding to guide instruction is the Integrating Mathematics Assessment (IMA) (Gearhart & Saxe, 2004). Using IMA, teachers utilized ongoing assessment to gauge their students' content and procedural knowledge of mathematics then adjusted their instruction. In the examples, teachers use their own students' work to gain insight into their thinking and understanding about and of mathematics, and in turn, this in-depth knowledge allows teachers to reflect on the kind of instruction they need to provide for their students to improve learning.

Furthermore, teachers need to know about their students beyond how they learn and think in terms of mathematics (Franke et al., 2007). As reflected in the ecological model of teachers' beliefs, a teacher influences—and is influenced by—her or his contexts. A part of the immediate context are students and their contexts, including their identities, histories, and their cultural and school experiences in relation to mathematics. As the learning gap between middle-class white and Asian students and the students who do not belong to those groups remains, the continued exclusion of the life experiences and cultural backgrounds of certain students will only perpetuate the inequities (Gutiérrez, 2000; Gutstein, 2003; Oakes, Muir, & Joseph, 2003).

Caring. When Carol Gilligan challenged Lawrence Kohlberg's stages of moral development in the early 1980s, her intent was to expand the view of moral development to include the perspective of women. Grounded in the developmental stage models of Kohlberg and others, the generally accepted assumption of moral development at the time was that the highest moral choices were based "exclusively upon universal principles of justice and detached, objective rationality" (Eaker-Rich & Van Galen, 1996, p. 1).

Calling to include feminist voices in the patriarchal structure of moral development, Gilligan (1982) theorized that women saw themselves in relation to others rather than in relation to abstract moral principles (Owens & Ennis, 2005). Through her work, Gilligan legitimized the choices made by women to make the people and relationships in their lives more important than universal principles and regulations. In her theory of care ethics, Gilligan problematized the issues of disconnection and detachment, giving way to the feminist approach to moral development in the field of developmental psychology.

Nel Noddings actively expanded care ethics to the field of education, understanding that male as well as female teachers embraced their role in caring (1984). Furthering Gilligan's notion of relation as connectedness, Noddings defines caring as a relation, a connection or an encounter between a carer and a recipient of care (2005). As noted earlier in the conceptual framework, both the carer (one-caring) and the cared-for must contribute to the relation in order for it to be a *caring* relation (1984), and that a caring relation needs an affirmative response from the cared-for and a carer needs to respond to the cared-for's legitimate expressed needs (Noddings, 2002).

The way Noddings conceptualizes the reciprocal relationship between teachers and students is a departure from the then-held views in educational research. The 1970s gave way to a body of research that identified and verified behaviors consistently observable in "effective teachers" (Prillaman & Eaker, 1994). In it, an effective teacher was defined as the one who can "perform the behaviors that contribute to high student achievement as measured by standardized achievement tests" (p. 4). In addition, according to Prillaman and Eaker (1994), research on effective teaching produced checklists and rating scales, ranging from the time students spend on-task to teachers

making rules and guidelines clear to students. In turn, teacher training institutes were encouraged to focus their programs on helping teacher education students to develop such competencies of effective teachers. In a sense, what a teacher does rather than what a teacher is, became more important in the spirit of becoming an effective teacher (Medley, 1977).

Educational researchers have followed in Noddings' footsteps to shed light on how teachers view caring and what the implications of caring are in schooling. Studies have documented how teachers used caring in order to understand students as well as provide positive schooling experience for their students. The students' conceptions of teachers' caring were described in Rogers' 1994 study of a fourth grade classroom. The students in the study knew that teachers in general did not necessarily tell children directly that they care for them, but they let their students know indirectly through their comments. To the students, "caring talk" was reciprocal as students and their teacher engaged in open, mutual caring relations evident in everyday activities. The classroom teacher in charge created curricula based on the caring relations with her students, hoping to provide students with interesting and challenging things to do, but did not "make a conscious decision" ascribing to care ethics (p. 42). However, the study highlighted the frustrations that the teacher felt; to the teacher, caring and meeting the needs of one student might mean deliberately not meeting the needs of another student.

Jefferey, Auger, and Pepperell (2013) studied perceptions of caring in teacher-student relationships by conducting focus groups of elementary school students and teachers. Common students' and teachers' perceptions on caring emerged: that caring was demonstrated through meeting physical needs through securing physical safety and

offering food, fostering emotional well-being through providing comfort, establishing connections on a personal level, and making sure that students felt valued through positive recognition. Students and teachers also agreed that caring was shown when teachers helped students with academics as well as with personal issues. The study also offered contrasts between student and teacher responses. While students believed that teachers expressed caring by meeting students' safety needs, teachers did not perceive it as a way to express caring. Furthermore, even though students' touted teachers' caring through helping them in class with their academics, teachers viewed academic and caring relationships as being two competing areas of focus. To teachers, a strong focus on academic achievement interfered with a more developmentally appropriate focus on the whole child.

Ethics of care has also been applied at a school level. Angela Valenzuela's (1999) in-depth analysis of U.S.-Mexican students' experiences in a large urban high school unveiled how students' perception of care plays a large role in their education. In it, Valenzuela investigated what it was like for immigrant Mexican and Mexican American students to attend a large, overcrowded, and underfunded school where no adults seemed to care or sufficiently care for their students. The study revealed that the non-college track schooling for these students was a subtractive process, i.e., generational decline in academic achievement in which of students were vulnerable to academic failure in addition to having poor access to obtaining social and cultural resources.

Valenzuela's study also documented that while teachers viewed the students as anti-school or oppositional, the students were in fact not. Students voiced their frustration and anger against a schooling process that seemed to disrespect them, not education

itself. Such a clear separation of schooling and education was supported by the contradiction between their values in education and their realities when interacting with teachers and administrators. Valenzuela noted that the failure to develop meaningful connections between teachers and students, exacerbated by administrators who dismiss the needs of both the teachers and the students, created an environment that was counterproductive to learning. Valenzuela beseeched that schools need to focus more on authentic caring over aesthetic caring to forge trusting relationships, which would render positive schooling experiences for Mexican American youth.

Changing Teachers' Knowledge and Beliefs

Conceptualizing beliefs as conscious and deliberate, Peirce (1958, cited in Cunningham, Schreiber, & Moss, 2005) posited that beliefs cause people to act in a certain way because of the perceived consequences of their action. Therefore, when acting on a belief leads to unexpected consequences, doubt arises in the individual. Peirce further stated that a person is inspired to learn when he or she observes some surprising phenomenon or some event that goes against his or her present belief. Murphy and Mason (2006) claimed that this notion is fundamental to the concept of change, that many models of conceptual change propose that individuals must be presented with discrepant information or anomalous data (Chinn & Brewer, 1993) before they question their current conceptions, even though the mere presentation of contradiction may not be enough to bring about change. Peirce also suggested that doubt is an important motive for change, and that engaging and processing the doubt would lead to changes in beliefs and understanding of truth and reality (i.e., knowledge). People's beliefs or habits will persist

until they have a reason to change their beliefs or habits (i.e., doubt), and such change requires motive or intentionality.

Peirce's notion of doubt can be seen in practical application. In order for people to change their beliefs, they need to doubt their usual way of understanding, leading to seek an alternative and useful way to understand. Furthermore, people need to be able to connect their new beliefs to their earlier ideas (Prawat, 1992). In terms of changes in teaching, Wheatley (2002) suggested that having doubts about one's efficacy can have benefits when considering teacher's change in practices, even though a teacher's efficacy seems resistant to change. Also, Smylie (1988) noted that if a teacher has a strong sense of efficacy, then he or she is more willing to try new practices regardless of their beliefs or knowledge. A teacher will change if he or she sees the evidence that the new way will lead to better student learning (Berlin & Jensen, 1989).

In addition, an introduction of doubt to a person's belief can foster reflection, motivation to learn, productive collaboration, and disequilibrium in experiences that can lead to change (Chinn & Brewer, 1993; Wheatley, 2002). In addition, Philipp (2007) observed that while researchers do not necessarily agree on whether beliefs change before practice or changes in practice lead to changes in beliefs, the most meaningful changes would take place when teachers' beliefs and practices change together. Reflection upon practice is necessary in order for teachers to draw the connection between what they already believe and how their beliefs influence instruction. Furthermore, when teachers are provided with opportunities to reflect on their practice, their beliefs change (Carpenter, Fennema, Franke, Levi, & Empson, 1999).

Various types of professional development are based on the assumption that teachers' knowledge is needed for teaching well and without well-prepared teachers, students will not achieve to their capacities (Sowder, 2007). Gregoire (2003) noted that when teachers were encouraged to adopt new ways of teaching, especially if they may not have experienced the innovation as students themselves, then their beliefs became filters for interpreting the new approaches. In this sense, successful professional development efforts are "those that help teachers to acquire or develop new ways of thinking about learning, learners, and subject matter," not in the isolated sense of knowledge and beliefs, so they can serve their students better (Borko & Putnam, 1995, p. 60). In order to change practices, knowledge of teaching and beliefs about teaching need to be challenged, hence changed, as the teachers participate in activities.

These knowledge, beliefs, and practices also affect teachers' experiences of change as much as teachers' experiences mediate their knowledge, beliefs, and practices. Researchers have noted that teachers are likely to embrace change when their experience can be shared in a community of colleagues (Hargreaves, 1995). Also, teachers make meaningful changes in their practices when they become more reflective about their practices and have opportunities to do so—reflection is vital to professional growth (Walen & Williams, 2000). In this sense, a successful PD program should include opportunities for teachers to actively process and reflect on their own learning, as well as to share and challenge their experiences.

Teacher belief and knowledge, although separate, are so overlapping and intertwined that many consider using the terms together rather than using each independently. In mathematics, however, teacher knowledge plays a large part since the

content and practice knowledge in math instruction are considered distinct from teacher beliefs. Whether used separately or together, teacher knowledge and beliefs are both mediated by teacher experience; that depending on their experiences, teachers filter and access knowledge and belief differently and their differences in knowledge and belief influence their classroom practice accordingly.

In this review of literature, I have examined how PD serves as a way to change the culture of teacher learning and how teacher learning influences their classroom practices. Among various factors of effective PD, systemic support provided by school districts is linked to meaningful, long-term change in teacher learning. This support includes communicating goals and intentions of PD to teachers, offering multiple activities to support teacher learning and aligning the goals and support over an extended period of time. Through effective PD, teacher learning can lead to changes in teachers' beliefs and knowledge; however, these changes are greatly mediated by their experiences. From the evidence of literature review, I have formulated research questions to explore the perspectives of the teachers who participate in MAP2D training: how the goals of the training are perceived by the teachers and change, how teachers' experiences influence their knowledge and beliefs due to MAP2D training, and to what factors teachers attribute their change, including but not limited to the support from PD, district, school, and colleagues. Interview protocols (Appendix B) will further address these research questions in detail.

Chapter III

METHODOLOGY

The purpose of this qualitative study was to explore teachers' experiences of participating in a district-supported professional development program, Math Achievement Program Professional Development (MAP2D), in Long Beach Unified School District, California. In particular, this study focused on teachers' experiences pertinent to changes in their knowledge, belief, and practices as a result of their participation in multiple facets of MAP2D—district-wide training given to all MAP2D teachers, weekly meetings with fellow grade-level participants in the same school, and regular individual meetings with the MAP2D facilitators (“coaches” as they are called in this district) assigned to the school. These district and school support systems were provided in hopes of “changing” teachers' classroom practices, which in turn was to help students “master” the mathematics content taught in the classroom through the use of the Math Achievement Program (MAP).

Through in-depth interviews, I explored how the changes around MAP2D were conceptualized and how teachers perceive and experience the change as they reflected on their training. The research questions guiding my study were:

1. How do teachers describe changes in their knowledge and beliefs as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?

2. How do teachers describe changes in their classroom practice as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?
3. Based on teachers' experiences in participating in MAP2D training, what are the factors that contribute to teacher change?

In this chapter, I discuss the methodology used to answer these questions. It includes a description of the pilot study, context of the study, role of the researcher, an overview of the research design, selection of sites and participants, data collection, and analyses. The chapter concludes with limitations due to the methodology, which will be further discussed in the final chapter.

Pilot Study

In order to develop the research design for this study, I relied on two rounds of pilot studies. The first pilot study helped me hone research skills for working within school environments, with teachers, and establishing what would be a viable research design to address research questions. During the first pilot, I realized that while my observation skills relied on my ability to make sense out of the lesson and the notes reflected the chronological order of the classroom activities, my interview tended not to follow the order of the questions from the interview protocol since I followed where the conversation led rather than adhering to the questions. The second pilot study was focused on the instrument—an interview protocol for the teachers. Since I learned from my first pilot that I preferred to weave in and out of the questions, I decided to develop a rough outline of the questions I wanted to ask teachers rather than a strict protocol I

would follow from interview to interview. The questions were grouped thematically—teacher’s background and experience in teaching, actual implementation experience of MAP, and their experiences with participating in MAP2D, followed by connecting their experiences to changes in practice, belief, and knowledge.

The first pilot study was conducted in an inner-suburban school district outside of New York City in the state of New York. The pilot study was embedded in a larger research study, in which 15 fifth- and sixth-grade teachers from four schools in the district participated in a 2-year professional development initiative in mathematics, aimed at using teacher-initiated classroom assessments to gauge students’ mastery of the content. My role in the larger study was that of both a coach and a research assistant. As a coach, I facilitated some parts of the workshops for the teachers on how to design and use classroom assessment, and additionally gave feedback on their incorporation of informal assessment in their classrooms as per the principal investigator’s direction. As a research assistant, I observed classroom practices of both participating and non-participating teachers and compiled running records of classroom observations, as well as interviewed teachers and other personnel involved in the study.

Major aspects of the larger study in which the pilot was embedded mirrored crucial components of this research: teachers volunteered to participate over 2 years, teacher change was sought through professional development, and professional development was carried out in multiple formats including workshops and individual meetings with the coaches—both in person and via e-mails. The goals of the pilot study were to explore how teachers experienced professional development, how they perceived the utility of the program, and how they experienced the change that resulted from their

participation in the study. During the second year of the study, 12 teachers participated and I interviewed four teachers with whom I had the closest relationship.

Data analysis revealed that some teachers also found one-on-one, in-person sessions helpful because some teachers “can hog the group time” (December 2006). I also learned to distinguish in-person interactions from e-mail communications because e-mail communications lacked the immediate, spontaneous conversational quality of in-person meetings after developing rapport. In addition, the first pilot study was crucial for me in various ways—negotiating communications with different individuals (teachers, coaches, coordinators, building principals, as well as district administrators), the utility of structured protocols for interviews, individual feedback from teachers who also helped me build interview protocols that are less structured, as well as the range of insights from teachers who were kind enough to be a part of my pilot study. I also learned that I was much more comfortable with informal “conversations” rather than structured interviews.

Before the second pilot study, I had already identified the district and the program in Long Beach, California. I had left New York and worked for the Long Beach Unified School District as a research assistant. I became familiar with the district and its professional development programs and took a particular interest in MAP2D because of its similarity to the professional development program I participated in New York. After my employment as a research assistant ended, I interviewed two MAP2D teachers for the second pilot study. Because of possible interference with the teacher’s union in the district and from the central office, the interviews were conducted in a single sitting outside of school settings. These teachers were referred by some of the instructors I had come to know while working in the district, therefore it was done more as a personal

favor rather than on “official” district related matter. Since the purpose of the study was to hone the questions I would use for the interviews, I also asked for their input in the protocol, including the wording of the questions, possible answers from other teachers, and the overall structure of the interviews.

The second pilot took place in March 2008, interviewing two teachers from the same school, serving the same student population (mostly black and Latino students, on free or reduced lunch cost students, and English Language Learners). These two differed in their number of years teaching using MAP. Teacher A had just finished her first year of training and Teacher B, having completed the first “wave” of training 2 years prior, had been using MAP in her class for 4 years. Both teachers had been teaching for 5-7 years and were similar in training in that they both went to California State University Long Beach and held multiple subject credentials.

In terms of their experiences, they both liked that MAP included math facts practice, making sure that students review their facts which can help the learning of other math concepts. Since Teacher A taught fifth grade and Teacher B taught fourth grade, I was able to understand the importance of the continuity of math concepts and a standardized set of instructional language and strategies from one grade to the next. While Teacher A saw the ease in whole-group instruction that all students should be on the same page doing the same thing working toward mastery, Teacher B complained that she wanted to move away from the whole-group instruction and start differentiating instruction. According to Teacher B, it was difficult to manage pacing at first—Teacher A’s interview concurred with the compactness of the curriculum and the sheer amount of work that needed to be done in one period of math. However, once she “got the hang” of

the curriculum, she realized there was much room for improvement in the instructional aspect of MAP. She had been trying to differentiate instruction whenever possible without deviating from the MAP curriculum.

While one teacher saw the benefit of a standardized, structured instruction of MAP, the other saw possible restriction due to the structure. Pacing of the curriculum, while both lamented was too fast for teachers to plan and implement on a daily basis, had become something teachers “can get used to” by following it through the years. Both teachers appreciated that the curriculum, while not aligned with the Houghton Mifflin textbook they were using, focused more on mastering skills needed to perform better on standardized tests while deferring “non-essential” concepts and skills toward the end of the school year after state testing.

In terms of support, teachers raved about how committed and dedicated the coaches were. Their school did not have an on-site math coach, meaning a MAP coach would be the only resource from the district they would have, and for both teachers, the addition of a new source of ideas and materials was a welcomed change. Teachers, especially Teacher A, attributed demonstration lessons modeled by their coach in their own classrooms as the most important factor in the way they changed their classroom practices. One teacher noted that while she sat in the workshops watching videos, she constantly wondered how she would do the lesson with her own students. When the coach modeled the lesson using her own students on several occasions, she became convinced in being able to use the strategies from MAP in her own classroom. In addition, Teacher B commented that the trimester workshops became repetitive, especially for second-year participants, and that she would rather have had differentiated

professional development opportunities, such as sitting in the same “mini-lesson” for strategies then breaking into groups so she could talk to other teachers about how to further implement MAP in their classrooms during the second year.

Another aspect of the second pilot was fine-tuning the procedure. To accommodate teachers’ hectic lives, both interviews took place in a single sitting with each teacher for about 2.5 hours. Although lengthy, the benefit of conducting three rounds of interviews in one setting was that the contents of earlier interviews did not need to be refreshed. In light of the pilot interviews that did not require the content of the previous interviews to be reviewed to refresh memory, I became aware that, for the purpose of the actual study, it might become necessary to go over what had been said before, possibly by providing a transcript of earlier interviews before the second and third interviews take place or briefly reviewing what was previously said whenever necessary during later interviews.

Based on the experience of pilot studies, open-ended questions were designed for all three rounds of interviews, first to find out the life history of teachers focusing on their teaching and educational background pertinent to math instruction. The second round focused on their use of MAP and participating in MAP training. The third round of questions reflected more on the first and second interview responses and drew connections between changes in their practices and beliefs and their implementation of MAP. Because I used the protocol more as a guideline for essential questions to be addressed than a strict script to adhere to, I realized that the informality of the protocol allowed the flexibility to follow-up on responses to gain more in-depth details about

teachers' experiences. However, the wording and phrasing of the questions were altered so they were less formal and awkward to serve as a basis for a conversation.

Also, based on the second pilot, the protocol was further refined, combining some questions to reduce confusion and redundancy, while changing the order of some questions to make the interview flow better. I thought I could separate the general teaching experience and experience specific to using MAP, but for Teacher B, the two merged since she spent the majority of her teaching career using MAP. The pilot protocol contained separate questions about what elements of MAP teachers thought effective, what elements they found difficult to implement, and with what elements they found their students to have difficulty. However, both teachers blurred the line between the three, often converging on the effectiveness of the program because it was "working" for the students and it would be their responsibility to implement the program in a way that would make students successful.

Also combined were the questions separating knowledge and beliefs. Sometimes teachers' knowledge about teaching and learning mathematics emerged from the conversations we had previously, especially when focusing on their teaching philosophy and their thoughts on how their students learn. What teachers believed stemmed from their previous experiences working with students as well as their own learning experience; Teacher A referred to the training as when she thought she "learned something new," adding to her body of knowledge.

Due to the number of interview questions and readiness of teachers to describe their daily practices, the second interview was much lengthier than the first or third. I realized that by the time teachers moved on to Interview 3, they were tired and less

enthusiastic about these “harder” questions that forced them to delve into their experiences and thoughts and how they were related to each other. I decided to move some questions from Interview 1 and Interview 2 to Interview 3, collapsing questions in the process. Interview 2 now focused more on using MAP and MAP training, without referring much to teacher practices before MAP. This aspect was addressed in Interview 3 as a part of the change process. The question now in Interview 3 regarding the teacher’s opinion about the best instruction for struggling math learners was moved from Interview 1 because it could sum up the entire set of interviews at the very end by reflecting on their trainings and experiences using MAP and how their thinking had been influenced by those experiences. The final interview protocol is in Appendix B.

Contexts of the Study

This study was conducted in Long Beach Unified School District (LBUSD) in California. Although I never attended schools in the district, I grew up nearby and worked in the district during one summer as a graduate assistant. While assisting the district’s Office of Research, Planning, and Evaluation (“the Research office”) with student assessment data, I became impressed with the goal and daily operations of the office that supported teachers and students through different services. One of the services was research and evaluation of different programs in the district—unlike other large urban districts that I was familiar with that focused their research effort in using quantitative methodologies, LBUSD embraced qualitative data collection and analysis. The office’s concern in exploring multiple aspects of activities in the district was geared

more toward serving the community rather than the simple reporting of the test results and descriptive statistics to authorities.

As I was preparing to begin my dissertation process, I contacted the Research office hoping to conduct research in the district that would also benefit the office. Simply put, I wanted to conduct a study that would be useful for those involved in the study. After a few meetings with the Research office and the Deputy Superintendent in charge of Curriculum, Instruction, and Professional Development, I decided to design a case-study exploring teachers' change processes as they participate in the Math Achievement Program (MAP). Throughout the proposal writing stages, I had been in contact with the Research office and the coaches of MAP to ensure that my intentions and details of the research design were clearly communicated and their concerns were also reflected in the methodology. As per their concern of facilitating the implementation of the program, this study included exploring factors that influence teacher change.

Overview of Long Beach Unified School District (LBUSD)

The City of Long Beach is located in Southern California, overlooking San Pedro Bay on the south coast of Los Angeles County. Between a bustling downtown area with the Aquarium of the Pacific and tall office buildings and the busiest port on the West coast, Long Beach attracts both large businesses and residents who live and work in the area. According to Census 2010 (United States Census Bureau, n.d.), Long Beach has the fifth largest population in the state.

Serving 90,000 students in 93 public schools, LBUSD is the third largest school district in the state, embodying the characteristics of a typical large Californian urban

district. Hispanic¹ students form the majority student population by ethnicity, at 50.5%, followed by 17.9% African American, 16.6% White, and 8.9% Asian and Pacific Islander (California Department of Education [CADOE], Educational Demographics Office, n.d.). Twenty-three percent of the students are classified as English Language Learners, with Spanish as the majority language, followed by Khmer, Filipino, Vietnamese, and Samoan. Nearly 70% of the students qualify for free or reduced-price meals in the district.

Ninety-six percent of 4,270 teachers in LBUSD have permanent state teaching certifications, with an average pupil per teacher ratio of 19.4. Sixty-three percent of the teachers are white, 17.5% Hispanic, 7.8% African American, and 8.6% Asian and Pacific Islander. California Standardized Testing and Reporting (STAR) was a widely used benchmark of district performance: California Standards Test scores for English-Language Arts and Mathematics for Grades K-5 indicated that on average 45% and 60% of the students performed at a proficient or advanced level (CADOE, STAR Program, n.d.). A district-by-district comparison on the CST math scores for the school year 2006-2007 revealed that students in LBUSD outperformed students in other larger districts in the state.

Math Achievement Program (MAP)

Created by Si Swun during the school year 2003-04, a former classroom teacher in the district who also served as the coordinator of the entire MAP2D program, teaching math with MAP consisted of two main components: daily 30-minute basic computational and procedural skill building lessons (*It's All About the Facts*) and 1-hour daily

¹ Although I personally prefer the term Latino or Chicano, the Census uses the term Hispanic.

instruction based on the state-adopted text. What differentiated MAP from other K-5 math classrooms in the district at the time was the coordination of the basic skill-building portion with the state standards-based curriculum. While other teachers in the district needed to adhere to the sequence of the curriculum, MAP teachers deviated from the sequence in order to maximize the basic skills training.

As will be detailed later on, MAP had garnered interest from other school districts in the state as well as within LBUSD itself due to phenomenal student performance on state math achievement exams. In five years after Swun created the MAP curriculum for his own fifth grade classroom in one of the poorest, lowest performing schools in the district, the program had grown to include K-6th grade classrooms in over 60 schools in the district. As a result, Swun had become the MAP2D coordinator, in charge of coordinating with seven full- and part-time MAP coaches who collaborated with him in various MAP2D activities, including workshop presentations to update instructional strategies.

***It's All About the Facts* lessons.** All “units” in *It's All About the Facts* began with a pretest to determine a starting point for the unit. For example, by giving an entire class a pretest on multiplication facts, teachers determined from what number he or she needed to start the *It's All About the Facts* sequence, depending on where the class' frustration level was. The goal was for all students to master basic math skills involving four operations—addition, subtraction, multiplication, and division. There were weekly quizzes as informal assessments to guide teaching as well as trimester final exams that function as a posttest.

Each *It's All About the Facts* lesson had five parts—introduction of new facts, memorization of facts through oral and written repetition, teacher-directed oral practice of application, application of the facts by small groups, then sharing out of the application. Through discovery learning, each fact was introduced in pairs using the commutative property (e.g., $3+5=8$ is paired with $5+3=8$ and $7 \times 2=14$ is paired with $2 \times 7=14$). Later on, when students “mastered” addition, subtraction facts were introduced in pairs using addition (e.g., since $3+5=8$ and $5+3=8$, $8-5=3$ and $8-3=5$); likewise, when students mastered multiplication, division facts were introduced in pairs using multiplication (e.g., since $7 \times 2=14$ and $2 \times 7=14$, $14 \div 2=7$ and $14 \div 7=2$). The starting point of the facts depended on the teacher’s decision based on class-wide performance on the pretest.

Memorization of the facts involved rote learning—students repeated the facts over and over again through visual and tactile practices. After 5 minutes, teachers led the class through rounds of recitation to reinforce the facts verbally and aurally using commutative property (e.g., Teacher asks “2 times 3 is?” then students answer “3 times 2 equals 6.”). Teachers then presented a basic operation problem using the facts the students had studied so far—in a fifth-grade classroom, it could be a 3 by 2-digit multiplication with regrouping, including the multiplication fact pair that the students just studied. While teachers presented the problem horizontally (e.g., “ $456 \div 8 =$ ”), students copied the problem in their notebook vertically (e.g., $8 \overline{)456}$). Students solved the application problem in small groups with the goal of generating one solution. This process was designed to utilize cooperative learning and metacognition of students to verbally explain how they arrived at the solution. At the end of the half-hour block, teachers randomly

selected a student to share with the rest of the class, and the class can either agree or disagree with the student's group's solution.

60-minute math lessons. Although it did not have to precede or follow the rest of the one-hour district mandated math lessons, an *It's All About the Facts* lesson needed to be taught sequentially and consistently throughout the week. Unlike the *It's All About the Facts* lesson portion, which was taught only in the MAP classrooms, the rest of the one-hour math lesson was taught in every classroom of the district. Similar to other districts in the state, the math curriculum in LBUSD followed then-California Standards for math, and California Standardized Tests (CST) were the main accountability measure. The district standardized its math instruction for all of its grades, creating consistency between classes and schools, which was one of the changes made following the district-wide parent survey approximately 10 years prior to implementation. For elementary grades, the pacing roughly followed the chapters in Houghton-Mifflin textbooks, with each chapter aligned to state learning standards (assessed in CST) and state high school exit standards (assessed in California High School Exit Examination, CAHSEE). However, MAP did not necessarily follow the LBUSD pacing—the sequence was arranged so the Houghton-Mifflin textbooks and other district-provided materials could be used as resources, but the overall pacing was more focused on a linear, developmental progression of math skills. In this fashion, students “mastered” one skill that served as the foundation for the next skill, akin to the sequence described in *It's All About the Facts* portion of the MAP lessons.

For this math period, MAP teachers were given a lesson structure with seven-parts: Problem of the Day (POD), Lesson Opener, Comprehensible Input/Modeling and

Structured Guided Practice, Guided Practice, Presentation, Closure, and Preview. In POD, the teacher chose a word problem to model for the students. Once the modeling of the POD was done, teachers presented a similar problem for students to practice independently. Lesson Opener was a short (one minute or so) introduction to the lesson of the day that connects the previous learning to the new learning by “activating students’ prior knowledge, stating the objective, and setting the purpose for the day’s lesson” (LBUSD, Office of Research, Planning and Evaluation, March 2007, p. 5).

The next approximately ten minutes was a direct instruction of the new learning—Input/Modeling and Structured Guided Practice. Teachers usually used manipulatives to illustrate the content for the day and students often took notes. Teachers also presented an application problem using the newly introduced content, then demonstrated the process and the solution, often using the manipulatives and/or strategies that students had learned previously. During Guided Practice, teachers presented more application problems for the students to spend about twenty minutes or so working on independently. While teachers circulated around the room checking for student work and one-on-one tutoring opportunities, students first worked on all the problems then formed small groups to share their solutions and the processes. Similar to the *It’s All About the Facts* routine, each small group needed to reach consensus on the process and the solution. During this time, teachers had an opportunity for small-group instruction.

During Presentation, teachers randomly selected one student to present the process and the solution to the rest of the class. Since each student worked with a small group, if the selected student encountered difficulties during presentation, her/his small group assisted with the presentation. The last few minutes of the lesson were used for

Closure of the lesson, during which the teacher tied the new material and its application to the Lesson Opener, focusing on the objective of the lesson. The last minute of the lesson was Preview, giving students a “glimpse” of the next day’s lesson by presenting a problem that contains the new content. The Preview problem was often reused next lesson as the Lesson Opener.

Math Achievement Program Professional Development (MAP2D)

In addition to redesigned math curriculum that includes basic math facts lessons, additional district and school-supported professional development was the hallmark of MAP. While LBUSD and schools were committed to providing teachers with as many on-site and off-site professional development opportunities to all the teachers, MAP2D opportunities were unique in that the district and schools committed their annual budget to hire substitute teachers to release MAP teachers for off-site training and to hire full-time MAP coaches. MAP2D had several components—a 3-hour off-site workshop at the beginning of each trimester, scheduled weekly grade-level meetings between MAP teachers in the building and the MAP coach assigned to that building, and individual meetings that also included in-class modeling by the coach, as well as materials available to the teachers through LBUSD’s intranet and the Internet.

Each trimester workshop addressed issues that were pertinent to that particular trimester, such as pacing, assessments, and instructional strategies to be introduced during the trimester. While the district had its own curriculum, it also purchased class sets of textbooks from Houghton-Mifflin. However, the textbook sequence did not follow the sequence of the district curriculum; in addition, MAP classes did not necessarily follow the district curriculum sequence. A part of the support MAP2D availed to the teachers

was the pacing and sequence map that was completely aligned with the textbooks, district curriculum, and other resources available in the district. All the information was also accessible on the Internet, while assessments were available only on the intranet for security purposes.

While weekly quizzes in MAP classes served as informal assessments for teachers so they could adjust pacing or modify instruction to ensure student learning, standards-based assessments and trimester exams were district-based assessments for accountability purposes. Since MAP classes used different pacing from other math classes at the same grade level, the district had designed a separate set of assessments for MAP classes. Each formal assessment was directed to the district's research office, where the data was analyzed and reported to corresponding schools and teachers. The student records were accessible to teachers on their intranet so the teachers could utilize the data to meet the needs of the students. Centralized record keeping also allowed teachers' access to their new students from classes and schools within the district; this benefited teachers to know each student's MAP strengths and weaknesses even if the student transferred to other schools within the district.

Sharing of instructional strategies pertinent to that trimester often formed the largest portion of each workshop. Coaches modeled strategies; however, teachers also had access to video archives of real in-class use of the strategies on the intranet. This use of technology ensured each teacher's familiarity with the strategies while they were taught in a real classroom, often revealing student difficulties that could be anticipated in their classrooms. One request that coaches made to their teachers was the standardization of main instructional strategies—this promoted consistency of vocabulary and strategies

that students were exposed to between classes and grade levels. However, it is important to note that teachers were not restricted to using only one strategy—other strategies were encouraged for students to use. But the emphasis was given to the uniformity of strategies shared by all MAP teachers and students. Each year, strategies were to be modified based on coaches' and teachers' feedback. Consequently, modifications to strategies often formed the basis of trimester workshops.

Results of MAP Evaluation Study Conducted by the District

During the school year 2006-07, the LBUSD's Office of Research, Planning, and Evaluation conducted an initial evaluation of MAP in order to assess the impact of MAP on student achievement, based on a district-wide, multi-year inferential statistical analysis of math scores of fourth and fifth grade students on the CST. A quasi-experimental pretest-posttest design was used, with 2005 CST scores in mathematics serving as a proxy for the pretest measure of baseline performance and 2006 CST scores in mathematics as the posttest. The study incorporated three data analysis procedures—descriptive statistical analysis for program effect, inferential analyses for statistical magnitude and statistical strength of the program effect, and regression analysis for an estimate of the true district-wide effect of the MAP.

Statistical analyses indicated that, adjusting for prior achievement, students taught in MAP classes performed at higher levels on the posttest than students not taught in MAP classes. Furthermore, when all the variables associated with math performance (i.e., prior test scores, gender, ethnicity, English status, SES status based on federal lunch program qualification, parent education level, and special education placement) were held

constant, the program effect was statistically significant and robust. Based on the estimates of the average district-wide effect, the Research office concluded that MAP had a “pronounced positive effect on student achievement” (LBUSD, June 2007, p. 18). In addition, the Research office recommended further studying of the program to identify “program components that are most promising, in need of expansion, modification, or more consistent implementation” through a further evaluation “based on in-depth case studies at purposively sampled schools and/or interviews and observations conducted across a stratified random sample of MAP2D and Non- MAP2D schools and classrooms” (LBUSD, June 2007, p. 19).

Role of the Researcher

Ever since I made my initial contact with the district searching for a research site, I was welcomed by the district as a contributor, being hired later on to assist in other research projects, excluding for the MAP2D evaluation study. Although this research was a dissertation study, I viewed it more as a component of a larger evaluation study that the district office was conducting. Following a multi-method evaluation rationale, the larger study combining the district’s previous and on-going analyses of the effect of MAP on student math achievement, component analyses of MAP implementation, examination of the link between MAP2D and implementation of MAP, and this study’s exploration of teachers’ experiences of MAP2D participation were to render a fuller view of MAP and MAP2D that no single-method design studies can provide (Fitzpatrick, Sanders & Worthen, 2003).

Even though this study was to contribute to the larger study in terms of adding dimensions to the MAP2D program, I found it imperative to differentiate my perspective as a researcher rooted in an interpretivist, constructivist paradigm rather than a researcher rooted in positivism as others in the research office were. Although I value the nuances of interpretivism, hermeneutics, and social constructionism (Schwandt, 2003) and appreciate that “truth has come to be seen as a thing of many parts, and no one perspective can claim exclusive privilege in the representation thereof” (Angrosino & Mays de Pérez, 2004, p. 110), I also participated in projects that relied on positivistic qualitative methodologies. For my dissertation, I decided to expand on my identity as an interpretivist, perhaps adding yet another dimension to the district’s multi-methods study.

However, due to the budget cuts that swept the entire state of California, I left the research office as the research assistant and became a part-time student evaluation technician. In the new role, I continued traveling to different schools, administering the California English Language Development Test to students who were considered English Language Learners. I became more knowledgeable of daily schedules of schools in the district as well as interacted with students as I administered state tests rather than simply observe them in a classroom setting. As I talked to individual students ranging from kindergarten to high school seniors, I got to know how they viewed their schools as well as the district. In addition, I began to understand the role of high stakes state tests in school funding and how the administration prioritized the testing over what went on in the teachers’ classrooms. It was in this role that I met with teachers in the study. Because of my continuing ties with the department, teachers viewed me as a hybrid between district researcher and a doctoral student. And the complete separation from the larger

MAP2D study staff enabled me to ask more probing questions to gain insight into teachers' perspectives on MAP implementation. Once I completed data collection, I decided to stay in California to support my family. And once that decision was made, I returned to classroom teaching as a secondary level special education teacher in Long Beach.

Regardless of my epistemology, I am wary of my position as a former teacher going back into the field as a researcher, and then returning to classroom teaching during data analysis. Even though I have tried to remain engaged in classroom and school cultures by creating opportunities to be back in the classrooms through student teaching supervision, staff development, and field research projects, I realized that I had in essence moved through the oft-denied divide between theory and practice (DiPardo, 1993). It pained me to realize that I could only refer to my past experience as a teacher to relate to participating teachers because I was essentially removed from everyday classroom teaching. Furthermore, I had become comfortable thinking of education in terms of theory only—the crucial aspect of teaching experience has taken a backseat to theories. Going back to the field, working with teachers and coaches everyday was a reminder that the classrooms and schools are where educational jargon does not serve the same function as it does in the “Ivory Tower” (Metz, 2002). In schools, my identity as a former teacher and spouse of a teacher were what made me “legitimate” (Dipardo, 1993). Disclosing these revelations and identities surprisingly garnered sympathy from participants in this study and allowed them to be more open about their experiences.

I was also cautious of my position as a former research assistant working for the Research office. From the pilot studies, I learned that some teachers misconstrued the

power hierarchy, that because the district sanctioned the research, the researcher was given the authority to make decisions, and this perception persisted in the beginning despite my effort to create open, collaborative relationships. For example, teachers in both of my pilot studies thought it was odd that I was sharing the interview data with them and invited them for feedback. Even after I explained that I wanted their input in interpreting data, some of them commented that my analysis would be more “accurate” since I was the “researcher” and they were just the “subjects” of the study.

Although my context differs from hers, I related to the colonizer-colonized relationship that Villenas (1996) described in her study with Chicana participants as a Chicana ethnographer. Even though I was and once again am a native to the culture of teachers, my position as a researcher at the time of data collection made me privileged; I expected initial disconnect from the participants until I could build trust, but realized it would be my responsibility to constantly be reflective of my own subjectivity (Peshkin, 1988), be vigilant about reflecting on participants’ ideas (Robson, 2002), and communicate my commitment to the culture of teachers and schools (Siddle Walker, 1999) during the entire time I was at the sites. I expected and found myself changed because of this study as much as the changes I hoped to document through the study (Delgado-Gaitan, 1993).

Research Design

I interviewed 12 teachers from five different sites in the district. The data collection period was over 3 months, at the end of the school year into the summer to facilitate teachers’ reflection on the past year’s experience. Using multiple rounds of

interviews, I first built relationships with teachers after the first round of interviews then explored their changes in subsequent rounds of interviews.

For this study, I chose qualitative research methods because they are “more faithful to the social world,” respecting each individual’s experience (Gergen & Gergen, 2003, p. 577). The emphases of qualitative methods are on natural settings and contexts, using different strategies to generate rich and descriptive data throughout the process, all leading to making meaning of the phenomena as perceived and experienced by the participants (Wiersma, 2000, p. 198). Using qualitative research methods, I aimed to capture the individual’s point of view, while exploring the everyday life, and produce “thick description” of the phenomena around MAP2D (Denzin & Lincoln, 2003, p. 16).

I was interested in understanding multiple perspectives of the participants in the study (Robson, 2002), documenting experiences and changes according to teachers from different school sites and from different points in training in the professional development program. I was in essence constructing teacher change through different perspectives highlighted by first-hand teacher experiences, contextualized by MAP2D manifested in classrooms nested in schools. Furthermore, by sampling participant teachers to include multiple school sites and amounts of time utilizing MAP2D training, I hoped to illustrate the “range” of teacher change experiences due to their professional development participation (Bogdan & Biklen, 2007, p. 70).

I need to acknowledge that the research design evolved over time. While I first started out with a data collection plan that was more inline with traditional change research, following a group of individuals and exploring their experiences over a longer period of time, I needed to change the data collection design due to changing structures in

the district. However, this change in methodology opened up additional possibilities in terms of adding to the landscape of teacher change literature, that I have reconceptualized the change as a portrait, a composite of different individuals' experiences and changes, rather than a rigid timeline of individuals' progressions from one point to the next. With this particular design, I was allowed to collect data from different teachers, ranging from those new to MAP as well as those who have already ended their MAP training, in one relatively brief period of time. As a result, I built a composite of these teachers' experiences, rather than a linear, chronological arrangement of their experiences.

Site and Participants

I selected participants based on two primary criteria: school site and time spent using MAP in classroom teaching. Both site and participant selections needed to be coordinated so that the range in both site and participant were represented in a minimum number of schools—the number of schools selected for the study also accommodated the range of the number of years using MAP by the teachers. In each site, teachers taught a different number of years using MAP in their classrooms.

Site Selection

For this study, I tried to capture multiple dimensions of teacher change and teacher experiences contextualized in various environments in the district. In order to do so, I selected five sites to represent the district, including schools serving different populations of students, especially in terms of socioeconomic status (some parts of the district serve students from affluent communities, defined by home values), linguistic

backgrounds, and race. This information was obtained by consulting district data, which is available to the public.

Because I planned to explore the range of perspectives and experiences around MAP2D in the district, I combined maximum variation and snowball sampling (Miles & Huberman, 1994). Maximum variation sampling is a type of purposeful sampling that has been useful to examine “widely varying instances of the phenomenon”, while snowball sampling involves “asking each participant or group of participants to refer you to other participants” (Merriam, 1998, pp. 62-63). Once I organized a list of possible schools, in the descending order of the number of participating teachers, I approached district administrators and building administrators to gain permission to enter the site. Out of total 60 participating schools at the time, I secured five sites to begin data collection.

Participant Selection

Concurrently, I used maximum variation sampling and snowball sampling to approach potential teacher participants. The range varied depending on each teacher’s degree of implementation of MAP in the classroom per coaches’ input, years of experience classroom teaching, and the number of years using MAP. Since MAP2D was a multi-year teacher-training program and had been implemented in the district over 5 years, there were teachers who had completed their MAP2D training more than 2 years ago. In this sense, I interviewed teachers who were in the “first” wave of MAP2D training as well as those who completed their first-year training as of June of that school year.

All participants were volunteers—they did not need to participate in the study if they chose not to. However, I had learned from the pilot studies that many participants

were eager to share their experiences but were hesitant because of possible political retribution from disclosing their displeasure about district mandated curricula, lack of structural support for program implementation, and group dynamics arising from diverse teacher backgrounds. I was able to address their concerns by using pseudonyms, deleting any identifying information, and giving participants multiple opportunities to delete any parts of the data they deemed necessary to protect their anonymity. I did the same for participants in this study; in addition, since there were multiple sites, involving multiple sets of participants, I was able to guarantee a greater degree of anonymity.

Data Collection

Qualitative studies are characterized by evolving design, using the researcher as an instrument of data collection, focusing on participants' views and presentation of multiple realities (Robson, 2002). Likewise, methodologies used in this study are evolving and interpretive in nature, intentionally utilized in order to shed light on multiple perspectives and experiences of participants. And as issues in qualitative studies are complex and situated, research methodologies are chosen to highlight the complexities and natural settings (Stake, 2003). All the interview and document analysis techniques were informal and unstructured, leaving room to change protocols to reflect changing contexts of schools, classrooms, meetings, and conversations that grow out of interviews and observations—this required data collection and analysis to inform each other by becoming a singular reiterative process rather than separate, linear entities. However, the main structure of the interview protocols was kept consistent across interviews to secure data saturation. Although data analysis was solely based on the

teacher interviews, I conducted a short observation as a way to familiarize myself with the context of the teacher as well as kept a researcher's journal to track my thoughts and ideas.

Interview

Although interview methodology is mainly used for its utility in getting a “large amount of data quickly” (Marshall & Rossman, 1999, p. 108), I would argue that the strength of interviewing lies in its design of gathering descriptive data using participants' own words (Bogdan & Biklen, 2007). Hoping to gain insight into their perspectives and experiences in their own words, I relied on the interviews conducted with the participants (see Appendix B for protocols). Conducted in 2008, there were a number of rounds of individual interviews, depending on the participants' preferences and availability. It was my own preference to conduct multiple interviews so that I could first build familiarity with the participants; however, if the participant was not available for multiple dates, a single interview was conducted for a longer duration of time. By remaining flexible in scheduling and duration, I hoped to be as least intrusive as possible to each participant's life.

I used semi-structured interviews to find out how the participants perceived and experienced the training; in line with my paradigm, I agree with the postmodern view of interviewing that the researcher influences the study, perhaps leading to interactional moments in participants' lives (Fontana & Frey, 2003). Furthermore, I would argue that these interactional moments created during interviews transform both the interviewer as well as the interviewee, blurring the line between “us” and “them” (Delgado-Gaitan, 1993). This brings us back to the point of constructivism and its application in this

study—since the interpretivist and constructionist paradigm consider the presence and effect of researcher, it is not important to devise a way to control or manage researcher influence. However, what becomes important is the active part the researcher assumes (Holstein & Gubrium, 1995) in the interview process and hence the joint construction of meaning by and through interviewer and respondent (Mishler, 1986). I kept a record of the evolving process of methodology, including interview questions and participant constraints, and my researcher subjectivities and reflections to later review during data analysis.

The purpose of interviews was to gain insight into a particular person's world. Although it might have been possible to conduct a fewer number of interviews if I only relied on group interviews with all participants at each site, I was concerned about possible silencing inherent in large group interviews (Marshall & Rossman, 1999). In addition, I was also interested in the contextualization of the change, which would emerge from in-depth one-on-one interviews—there was more room for individual interaction and more attention to the participant in one-on-one interviews in comparison to group interviews.

At the start of each initial interview, teachers were given choices to select their alternate names for confidentiality. When a teacher declined to choose, a random name was selected from the ten most popular names given at birth between 1908 and 2007, according to the United States Social Security Administration. Such initial steps, in conjunction with referring to brief observations I conducted in their classrooms earlier, helped break the ice and let the teachers know that I was putting an effort into becoming familiar with their contexts (Bogdan & Biklen, 2007).

I relied on Seidman's notion of in-depth interviewing to understand their experiences (1998). The first interview established a "focused life history" while the second interview detailed teachers' experiences of teaching in the district, in the school, using the curriculum and trying to meet the needs of their students (Seidman, 1998). Third interviews involved teachers making meaning of their experiences based on what they had described—it was important to note that meaning-making occurred starting from the first interview, but what differentiated the third interview from the previous two was its central focus on making meaning of teachers' experiences described in the previous two interviews and delving deeper into those accounts.

The goal of the first two interviews was to establish rapport and get a general idea of who the participants were as teachers and as the "implementers" of MAP, while the goal of the third interview revolved around revisiting teachers' experiences and reflecting on those experiences. The changes in teachers' knowledge and beliefs as well as their experiences in participating in MAP2D were probed throughout three interviews whenever good opportunities to probe into those aspects presented themselves. I was cognizant that there was an inherent danger in lacking specific interview questions—I had placed questions at the end of the third interview so these aspects were not overlooked in case they were not addressed previously. In addition, placing these reminder questions at the end of the third interview proved to be helpful in case a participating teacher opted for a lengthier single-sitting interview.

The first interview centered around teachers' focused life history and their experience of classroom teaching up to that point—their teaching experience, their work in the district, their view on mathematics education in general as well as for students who

are perceived as “low-achieving” or “at-risk” by standardized tests since the original intention of the MAP was to increase the performance of students who do not traditionally score high on standardized math tests. The second interview focused on teachers’ experiences participating in MAP2D and using MAP in their classrooms, focusing on how teachers became involved in MAP2D and how they viewed the goals and expectations of MAP and MAP2D for themselves as well as their students (Seidman, 1998). Teachers were further asked to reflect on the change in their participation in MAP2D, in particular exploring changes in their knowledge, beliefs, and practices, and factors that played a role in the changes in their own words. The mapping of interview questions to research questions can be found in Appendix A.

Although I did not insist on a fixed number or length of interviews, when added up, each interview was designed to be about 60 minutes, totaling up between two to three hours per participant. In lieu of fixed length of three 60-minute interviews, I followed teachers’ leads to be flexible, ranging from half-hour sessions to 1.5 hour sessions. I tried to set up interviews around participants’ schedules—this meant that I had to “sneak in” interviews between breaks, or while the participants were engaged in other light activities, such as eating or cleaning up their classrooms. I am aware that this method of conducting interviews might be criticized for appearing haphazard and not in-depth; however, I do believe that such an openness to interview scheduling allowed for more openness from teachers (Bogdan & Biklen, 2007). In addition, some teachers were not available for three separate dates, so interviews were broken into two sessions or combined into one long session. Some parts of the interviews needed to be done over the

phone. Such flexibility was appreciated by teachers and became an added incentive for teachers to participate in the study.

Observations

Even though humans engage in observations in everyday activities, what separates observations of researchers from those of “everyday-life actors” is the “systematic and purposive nature” of the researchers (Adler & Adler, 1994, p. 377). Furthermore, observations framed by the qualitative paradigm, such as in this study, are “fundamentally naturalistic in essence”; observations occur in the natural context, “among the actors who would naturally be participating in the interaction, and follows the natural stream of everyday life” (Adler & Adler, 1994, p. 378). Since the primary goal of observation in this study is for me to become familiar with each participant teacher’s classroom and students, the naturalistic context for participants and activities becomes crucial.

I observed one math class taught by each participant teacher. I need to note that the data from observation were not analyzed—it was merely for my own benefit to become familiar with each teacher’s context and be able to refer to activities during the interview (Bogdan & Biklen, 2007). I socialized with the participants freely before and after the observation and interacted with students with teacher’s permission. Since observation was not necessary for data analysis, I offered the opportunity to teachers when I made the first contact and all twelve teachers enthusiastically accepted the offer once they found out I was a former teacher. They asked me to work with students and I obliged, getting to know each teacher’s students, later being able to refer to the students by their names. However, I did not interrupt the flow of the class, abiding by the

“researcher in peripheral membership role,” observing and interacting “closely enough with members [students and teachers] to establish an insider’s identity without participating in those activities constituting the core of group membership” (Adler & Adler, 1994, p. 380). Here, the “activities constituting the core of group membership” would be active teaching in the classroom—hence, my role was akin to a classroom aide, helping students from time to time.

I took short field notes after observation/playing an instructional aide in each classroom, focusing on MAP elements and student characteristics as they engaged in classroom activities. I did not use any recording equipment to supplement field notes since the data from observation were not a crucial part of the study, but rather a contextual aspect of teachers’ lives. I shared completed field notes with teachers to reflect on their teaching; however, it remained an informal debriefing of that particular class. I also used this opportunity to construct the meaning of their actions during classroom teaching through informal conversations. The content of observations and informal conversations gave me opportunities to learn more about the context, and also provided reference points for subsequent conversations and interviews with the teachers (Merriam, 1998).

Researcher’s Journal

I maintained a journal in which I commented on every aspect of data collection and analysis, reflected on my own thoughts and feelings, and documented my interactions with the sites and participants. The paradigm I chose for this study was strongly rooted in the subjectivity of the researcher, and it was important to document and reflect upon my own subjectivity, because it is essentially the lens through which I function as the

researcher-as-instrument (Peshkin, 1988). The documentation of my own subjectivity added yet another dimension to the interviews and observations. In addition, it was through this documentation that I was able to abandon two conceptual frameworks that I had proposed. Although frustrating at the time, the adoption of care theory proved to be much more impactful.

Because of the long duration of the pilot study, I kept a researcher's journal. What started out as a way to remember teachers' and their students' names soon became a source of information on which I could reflect even after a significant amount of time elapsed. Through reading my earlier entries, I learned that my initial impressions of the teachers were greatly influenced by my interpretation of the relationships they had with previous coaches and other members of the research team. Other entries focused on my frustration with fixed methods and protocols, eventually shaping the design and methods for this study. The processes of evolving design and the rationale for the design were also included, documenting the process of the data collection as well as the interpretation itself. What began as a catch-all tool for the parts that did not fit the methodology became an important source of information when the time came for analysis.

Data Analysis

Because data analysis involves looking at the data both holistically and categorically, it can be described as a both top-down/bottom-up and inside-out/outside-in process. I subscribe to the notion that every aspect of data analysis is interpreted through my understanding of the participants' experiences and perspectives, as much as the words and actions of the participants themselves. Underpinning the subjectivity of data analysis

is the importance of the researcher journal that facilitates self-reflection of the subjectivities that I would project on the analysis process. The reflection places responsibility of the practice of attaching meaning to participants' words and actions on the researcher; it is the responsibility of the researcher to strive to capture the meaning as close as possible to the participants' intention (Luttrell, 2000).

Each interview was initially transcribed to include utterances and pauses. Such detailed transcription allowed hesitations by participants to emerge when they encountered difficulty while discussing their experiences with MAP2D. After each initial transcription was completed, the transcription was sent to the corresponding teacher via e-mail in order for each teacher to review and agree to the content. All interview transcripts were approved by the teachers, as a part of "member checking" (Richards, 2005). In some cases, teachers asked me to withhold some identifying information in fear of retribution from the administration. These requests were honored and only general information about teachers' backgrounds (e.g., years served in the school and district, the number of principals assigned to the school, the number of teachers at the grade level, former career path, etc.) were reported for all teachers.

Often, each interview session took on a unique tone based on teachers' responses. While diversions from research questions lengthened the interviews, this naturalistic interview style allowed the interviewer-participant relationship to deepen and allowed me to have more interactional moments with participants (Fontana & Fey, 2003). In addition to transcription, I drafted context memos immediately following each interview. Serving as important additional data sources, these context memos detailed my observations of

where the interview took place and the participating teacher's demeanor, as well as reflections of my own role in our interviews.

The initial transcripts were marked and labeled based on the interview questions and the corresponding ideas related to each research question. A shorter transcription of each participant was built from the marked passages and merged into a single transcript whenever there was more than one interview session or extraneous information that was not related to the research in any capacity, such as bantering and sharing of personal stories. Although unrelated to the research, such disclosure of personal stories and engagement in inconsequential conversations were meaningful and purposeful in establishing the interviewer-interviewee relationship (Seidman, 1998). This organization of interview data rendered a more streamlined and manageable documentation of each participant's experiences that was used for further analysis.

The shorter transcripts were then coded using the Atlas.ti program, which generated a variety of categories and codes based on teachers' beliefs, perceptions, and experiences around students' math learning and implementing MAP2D. Using the coded files, I identified three central themes that emerged from the data: How each teacher views student learning and achievement in elementary school math; MAP2D as a professional development experience; and support they seek in MAP2D that would translate into student success. I chose to be specific to the subject and experiences that are close to the teachers, instead of using general terms, to reflect the naturalistic situatedness of the process (Adler & Adler, 1994).

Although Robson (2002) described *thinking* as a way to knowing the data well, I interpreted it more as being immersed in the data, and I did so by reading the transcripts

repeatedly as suggested by Luttrell (2000). I relied on a grounded theory approach for coding, deriving categories, and finding relationships between categories. When they formulated the framework, Glaser and Strauss (1969) relied on positivism and objectivist underpinnings of a singular truth. However, I agree with the constructivist approach to grounded theory that benefits interpretive understanding by using informal, unstructured data collection and analysis (Charmaz, 2003). For the purpose of the study, I drew from ground theory analysis to interpret a possible theory to explain what emerged as the central theme from the data (Glaser & Strauss, 1969).

I also relied on open coding to find and interconnect categories within and across cases as the categories were derived from the codes as the data collection began. I used open coding in order to accommodate possible multiple interpretations of a piece of data; this also allowed simultaneous use of codes in different categories. Throughout the process, akin to the process of constant submersion in data and the funneling of research, the constant comparative method of joint coding and analysis (Glaser & Strauss, 1969) resulted in comparisons between and within sets of data collected. It was through open coding that I realized that ethics of caring was more appropriate as a conceptual framework of the study than complexity theory. Each teacher interview data set yielded coding such as “changes to practices because of caring,” “FoI due to caring,” “return to previous method due to caring,” “what caring teachers do” and I sought a different conceptual framework to explain the data.

Although I abandoned the idea of using complex theory after the first interview, I had collected all the interview data and started data analysis when I encountered impracticality of using the theory of Community of Practice (CoP). While CoP informed

me about each participant's levels of activity in relation to others involved in MAP implementation, e.g., colleagues, coaches, and principals, care theory was used to analyze teacher experiences that emerged from data analysis.

Validity

Qualitative studies such as this research cannot inherently offer reliability, because research findings simply cannot be replicated. Considering qualitative studies are based on human behavior, contextualized in history and physical space, replication of the findings would be impossible because human behavior is never static and the time cannot be rewound. However, internal and external validities can be explored in the context of qualitative studies. In fact, validity issues need to be discussed in detail in order for a study to be trustworthy. Maxwell (1996) outlines threats to validity that need to be addressed in qualitative studies: *interpretation, research bias, reactivity, description, and theory*.

A study rooted in positivism needs “something to do with it being accurate, or correct, or true” to be valid (Robson, 2002, p. 170). In this sense, validity comes from the existence of a single truth, which can be located through triangulation. Bogdan and Biklen (2007) borrow from the analogy of establishing a fact through multiple sources of information.

...to be confident that a train arrived in a certain station on a certain day you need more than the entry from the diary of a person who was on the train. (The person might have been inaccurate.) If you had the train schedule plus the diary, you could be more confident. Still better would be the train schedule plus the diary, plus a report in a newspaper covering the arrival. (p. 115)

Because constructivism essentially conveys multiple realities from multiple perspectives of the participants, this notion of single truth, which is located using fixed, two-dimensional triangulation, then becomes problematic. Rather, I rely on L. Richardson's (2003) notion of crystallization, which "recognizes the many facets of any given approach to the social world as a fact of life" (Janesick, 2003). According to Richardson, "crystals are prisms that reflect externalities *and* refract within themselves," generating multiple stories from multiple realities (2003, p. 517).

I am not completely denying the utility of triangulation—physical acts and utterances can be triangulated. In fact, postpositivistic approach to triangulation seeks "counterpatterns as well as convergences" for data to be credible (Lather, 1986). However, what I argue here is that the meanings of the acts and utterances may not be triangulated, but perhaps better illuminated through a multi-dimensional prism. Hence, I, as the researcher, served as the crystal through which acts and utterances were refracted, creating multiple layers of realities. Rather than attaching my own meaning to the participants' actions and utterances without any participant input, as in interpretation frequently done in traditional positivistic research, I chose to attach my meaning to the participants' acts and utterances as close to their intention as possible, approximated by participants' input. This negotiation of meaning between me, the researcher, and my teacher participants created construction of meaning.

Since the study explored multiple realities and points-of-view from participants' perspectives, and since I, as the "researcher-as-instrument" (Robson, 2002, p. 167), filtered their words and actions, it was inevitable that meanings of the participants' words were interpreted differently than what they had intended. A solution was to

systematically attempt to learn how the participants made sense of what is going on through member checks and eliciting feedback on the data throughout the collection and initial analysis. If there was a disagreement between my interpretation and that of a participant's, I discussed our differences and reached a consensus. When a participant requested that crucial data be excluded, I first discussed the reason for the request to exclude data and generated mutually acceptable data.

Related to the threat of interpretation were *research bias* and *reactivity* (i.e., the influence of the researcher on the setting or the individuals studied). Research bias and reactivity were actually a part of the study design because as the experiences and perspectives of the participants were viewed through my lens, it was impossible to be a neutral researcher in this sense. In response, I analyzed data using conceptual frameworks, and am fully disclosing what my subjectivities and influences on the setting and participants are, and how they affected iterations of data collection and analysis. I kept a detailed researcher journal for this purpose, and also disclosed how I arrived at the conclusions that I draw at the end (Wiersma, 2000).

What Maxwell (1996) refers to as *description* threat to validity concerns inaccuracy or incompleteness of the data. In search of securing "thick description" (Geertz, 1973), I drew from interviews and feedback to ensure that the descriptions were accurate and complete. Maxwell's threat of validity from *theory* is related to *description*, that qualitative research (in fact, any research) can exclude discrepant data and/or disregard alternative explanations or understandings of the phenomena studied. By incorporating settings and participants to reflect the range in schools as well as teacher experience, I instituted a design that inherently procured discrepant data. In addition,

including as much data as possible and keeping copious notes helped in search of alternative understandings of the phenomena. This also circled back to the study's premise on multiple realities and interpretations.

Limitations

The most glaring limitations for this study come from the fact that I changed the conceptual framework after data collection. Although care theory, as described in the introduction, seemed like a natural fit to view teachers' experiences, I had not considered care theory when the protocol was piloted and shaped for this study. Had I known the relevance of care theory, I would have embedded more questions to further unearth teachers' assumptions about their own beliefs about students and practices reaching those students. In addition, interview protocols would have included more pointed questions about their "caring teacher" identity, to shed light on their formation/re-formation process of professional identity.

Furthermore, the use of care theory would have included the voice of students. As Noddings (1984) suggests, a caring relation needs expressions from both teachers as well as students who are receiving the care. I established this relationship based on teacher accounts, i.e., teachers were responding to students' needs and that students were acknowledging such care. However, if I had included direct observation of such relations or interview with students to ascertain their response to the care they received, the relationship would have included multiple voices for affirmation.

This research does not enter the classroom to observe the changes teachers claim take place in their classroom. Instead, it relies on teachers' representations of their own

practice (Little, 2003). Likewise, teachers' perception of students' acknowledgement of the care is a mere representation through their respective teachers, not as a result of a direct participation in this study. Therefore, their practice, as well as their claim to care relations, are represented through a double lens—my representation of the teachers' representation—and can therefore be somewhat clouded.

In line with most interpretivist and constructivist qualitative studies that do not aim at generalizing their findings, this study attempted to apply its findings only within its local context by including sites and participants to reflect the range. The accounts of the participants' perspectives and experiences were mediated through my experience. In addition, each participant's perspectives and experiences were not necessarily what the positivist would call "authentic" and "true," since I only tried to capture the portrait of their lives in one particular context of location and time, not their life stories.

Chapter IV

FINDINGS

This phenomenological study focused on the experiences of teachers participating and implementing a program to ultimately support student achievement in math. The purpose of this study was to document teachers' changes in their knowledge, beliefs, and classroom practices as a result of PD participation and factors leading to teacher change as they implemented the Math Achievement Program (MAP). MAP was unique in that it started from a teacher's classroom as an innovative way to teach students math skills, then scaled up to the district level. The district developed MAP Professional Development (MAP2D) as a collection of PD resources to support MAP implementation at the classroom level.

The study consisted of interviews with 12 teachers from seven different school sites in a single school district. I relied on Seidman's (1988) in-depth interviewing and conducted up to three interviews with each teacher. Interview 1 focused on the background information of their teaching practices and philosophy as well as the context of their teaching, including descriptions of their school, students, and relevant information that might influence the way they teach. Interview 2 revolved around teacher experience implementing MAP2D ("the program") in the classroom, including the support teachers received from the school and district. Interview 3 was designed to make meaning of the experience of implementing the program, specifically around the changes

to instructors' teaching practices and philosophies (see Appendix B for interview protocols).

I first transcribed interviews and shared the transcription with corresponding teacher of that interview for member check and feedback (Richards, 2005). Once the feedback cycles were completed, I constructed a profile of each participant (Seidman, 1998). Profiles were crafted to be first persona narratives using the voices of the participant. The organization of a profile was influenced by the connection between the interview questions with the ideas embedded in the three research questions in this study.

This chapter begins with highlights from each participants' file. Each profile is meant to provide some insight about the teacher's unique situation—her/his experience teaching the subject and grade level, her/his experience implementing new math curriculum using MAP, and her/his experience being involved in MAP2D. Some teachers referred to the program they were implementing as MAP while some others referred to it as MAP2D. For the sake of consistency and readability, I designated the term MAP to be the sole name for the program, even in the direct quotes.

Profile from In-Depth Interviews

The study took place in Long Beach Unified School District. The participants included six 2nd-grade, two 3rd-grade, three 4th-grade, and one 5th-grade level teacher. Their years of experience teaching their grade level ranged from 1 to 12 years, while the years of experience teaching ranged from 5 to 20 years.¹ Some started their teaching career as a college aide and stayed in the district as they went through undergraduate and

¹These figures were accurate at the time data were collected.

graduate programs, as well as certification processes with the district’s support. The district touts its teachers’ loyalty as one of their greatest assets and promotes the “Long Beach Way.”

Table 1: Overview of the Participants in the Study and Their Years of Teaching

Name	Current Grade level	Years teaching that grade level	Years Experience	Year with MAP2D (finishing up the school year at the time of the interview)
Barbara	2	More than 10	Less than 10	3rd year
Charles	2	Less than 10	Less than 15	3rd year
Elizabeth	4	Less than 5	Less than 10	4th year
James	3	Less than 10	Less than 10	2nd year
Jennifer	2	Less than 10	Less than 10	2nd year
Jessica	4	Less than 10	More than 20	1st year
Margaret	5	Less than 10	Less than 15	2nd year
Mary	2	Less than 5	Less than 15	2nd year
Michael	4	Less than 5	Less than 10	3rd year
Patricia	2	Less than 5	Less than 10	4th year
Sarah	3	Less than 10	Less than 10	1st year
Susan	3	Less than 5	Less than 10	4th year

Barbara

On student learning and achievement in elementary school math. Barbara has been teaching second grade for more than 10 years at two different sites. She believed that “you need good classroom management to make anything work,” and that her students needed the mastery of the basics such as vocabulary and math facts in order to

be successful in the subject. She liked the way information was presented in MAP and diligently followed it. Barbara gauged her students' success based on their higher scores on the California state standardized test (CST) and attributed their scores to the lesson design that "gives kids the ownership of their learning." She viewed the end-of-unit tests as designed to assess her students' achievement based on what they had learned and was "parallel" to CST. This particular view of the end-of-unit tests was divisive among teacher participants in this study: while some teachers saw the unit test as beneficial and precursory to student success on CST, some denounced it as a preview of the state standardized test that promoted "teaching to the test," which invariably translated into higher student scores on CST.

On MAP2D as a professional development experience. Overall, Barbara's experience with the professional development part of MAP2D was positive. She enjoyed working with coaches and with her grade level colleagues. Barbara had worked with two coaches, the first of whom "was very meticulous, so it burned [her] out." She described her current coach as "more laid back" and "sharing a similar personality and views on teaching," which fostered a positive relationship. However, in Barbara's view, the coach was more like an inspector to make sure she followed everything in the program, rather than an aide to give her feedback and support.

On MAP2D support that helped student success. Barbara counted the structure and activities that come packaged with MAP as key to student success. She held fast to the format and pacing guide set forth by the program, including her basic math facts time as "non-negotiables" daily practice for her students. Barbara stated that she usually consulted her colleagues for advice and that she could always turn to her principal if she

needed support. However, she had her doubts about the availability of her principal as a resource for support: “I would like some feedback [from her principal], but I’m not convinced, I don’t know if she has been trained, so I don’t know if she has the ability to give us accurate feedback on the program.” In addition to the collaboration time with her grade level colleagues, Barbara attributed her success implementing MAP to released time so she could observe other teachers in her school, as well as other schools in the district who were teaching at the same grade level.

Charles

On student learning and achievement in elementary school math. Charles had experience as an educator in different contexts—ranging from teaching science and math at different grade levels in rural as well as urban parts of the state. Teaching elementary and middle school students in different geographic locations over 15 years gave Charles “different perspectives from other Long Beach teachers—most of whom are born and raised and have gone through the Long Beach schools.” Charles’ perspective on learning math differed sharply from Barbara’s. Although Charles spearheaded the adoption of MAP2D, he quickly found that he did not agree with many parts of MAP2D, especially the way it taught math facts, which was “basically a 1950s-style rote memorization with no brain-based recognition or no strategies” and “not aligned with the latest research on how students learn math.” Charles’ goal for his second graders was to “know and understand numbers” and the “relationship between numbers” so when problems arose, they could “figure out what to do on their own, even if they’re using their fingers and toes,” instead of rote memorization.

On MAP2D as a professional development experience. Like Barbara, who taught in the same school, Charles viewed the principal's lack of training and experience with MAP a hindrance to getting additional support. However, Charles was more proactive on selecting parts of the MAP that worked for him while discarding the parts that did not fit his students' needs, based on his own assessment—not based on assessment data. Furthermore, Charles indicated that he did not feel obliged to maintain the lessons as prescribed by MAP because there was no accountability measure instituted for implementation fidelity.

Coaches come, we do it their way, coaches leave, we do it our way. They don't know about it. The principal comes in and she'll say, it's not supposed to be that way. She wanted to know if it works, too, but she retired that next year. We got a new principal now who just sits back and lets us do what we need as long as it works.

On MAP2D support that helped student success. Charles had a genuine appreciation for the pacing chart that MAP2D reorganized from the standard district pacing chart. On the MAP2D pacing chart, all the lessons on adding digits were taught to mastery before subtraction was introduced. However, unlike Barbara, who fully appreciated the added time for math in a daily routine, Charles found it problematic on a larger scale. He asserted that

The success of MAP2D is, you have a half hour for math facts and 1 hour for math. Before, you spent one hour for math. Basically, you spend more time doing math and that's why the test scores are going up. An extra two and half hours [each week] is a lot. What are we leaving out instead? If you take more time to do math, where do you take that time from?

Elizabeth

Having taught fourth graders at the same site, Elizabeth has been teaching for 5 years. She was one of the first teachers who signed up to pilot MAP2D, and therefore has

been using the program for the past 4 years. She still considered herself a “newbie” teacher who was constantly evolving to meet students’ needs.

Prior to joining MAP2D, Elizabeth felt inadequate as a new teacher because she could not keep up with the pacing chart and saw that her students were not prepared for state testing as a result. The MAP was a relief because it offered an alternate pacing guide that allowed her to cover all the standards in a timely manner and prepared students for testing.

Throughout the interviews, Elizabeth emphasized the benefits of the entire school implementing the program together:

One of the benefits of using that school-wide is that throughout the grades, students are exposed to it. We use the same procedures, the same everything. So, they're familiar with it. It's not different teachers at different grades using the same thing, because there are some overlaps, so it's not we're all teaching different things and confusing and reteaching them using different things. It's consistent. Kids go, “oh, I remember that and they can just take a step further.”

On student learning and achievement in elementary school math. Elizabeth believed that students learned math by “connecting it to their real, everyday lives.” Elizabeth believed that students needed to experience success and support from peers, and that MAP provided both as part of its structure as a vehicle to master the content. Reflecting on implementing MAP, Elizabeth stated that her philosophy in elementary math teaching did not differ that much from the practice of MAP, and the alignment of the goals of the two facilitated her change in practice.

On MAP2D as a professional development experience. Elizabeth credited her participation in BTSA coaching and the district’s own induction program for new teachers in preparing her to implement MAP with ease. Overall, the PD experience for Elizabeth was overwhelmingly positive. She commended the accessibility of the coaches

in the beginning stage of the program and how the entire community of teachers was involved in shaping MAP at its pilot stage. Elizabeth also pointed out that MAP2D changed over time by adding or removing components based on teacher feedback as well as assessment data:

We hear every year, “we're adding this”, “we're taking away things from the program”.... It's a constant improvement. They're keeping ahead of things instead of [settling on] what works. If you don't evolve, then you're going to fall behind eventually.

Elizabeth also highlighted the MAP2D as an opportunity to build community. She credited her colleagues for being “in the same boat” as everyone else when they piloted the program, i.e., they struggled together through the initial stages of the program implementation and participated in the growth of the program to become a district-wide PD opportunity. She also noted that since the school was considered an established site for MAP where most of the teachers have been using MAP for 4 years, coaches were no longer visiting the school as frequently. This would have created a vacuum of PD through coaching when a teacher who was not familiar with MAP would join the school; however, the veteran teachers had stepped up to fill in the coaching role:

We were all helping each other with the parts that, “okay, I forgot how to do this” or “what's going on here?” Minor things, but it kind of brought us together. And then whenever we have somebody new, it's like we're already together, we know what's going on, and we're gonna be together and help this new person. We had two new teachers this year, and it was a pretty smooth process.

One of the positive aspects of MAP2D, according to Elizabeth, was the ability of MAP2D to accommodate the changing PD needs of participating teachers over the years. In the beginning, PD was “more direct input on how to build the structure—lesson plans, daily presentations, how to model.” But as she participated in the PD over 4 years, the PD changed from direct input to more of a “refresher” to keep everyone on the same page.

The implied message underlying diminished numbers of PD opportunities for “veteran” MAP teachers was that “you’ve been using the program for so many years, you can add this to your piece. You guys are essentially the professionals at what you do with this program, so you're comfortable enough so you can add this component.” Elizabeth appreciated the perceived confidence in teachers’ capacities.

On MAP2D support that helped student success. Like Barbara and Charles, Elizabeth credited the revised pacing guide for student success. She simply put, “the pacing guide helped me to literally pace myself so I can cover all the materials that would be required and not run out of time at the end.” She also attributed student achievement to the flexibility of MAP over the years. Teacher input would be reflected in the following year’s MAP, ranging from the pacing guide to the Problem of the Day item bank; Elizabeth appreciated the small-community feel of a district-based program that could reflect individual teacher input. She had reached out to the textbook publishers previously, but communications were rarely returned, and she “would never get to see where I made a difference.”

Also like Barbara, Elizabeth emphasized the support of her colleagues as important in student success since she would turn to her colleagues for immediate feedback. The community of teachers at the entire school site would mean that teachers within the grade level could ask each other for support regarding the grade level curriculum. By the same token, teachers across grade levels were knowledgeable about their students’ expected prior knowledge and the prerequisite skills for their students to succeed in the following school year.

James

James has been teaching third grade for 6 years and has completed a Year 2 of participating in MAP2D. He has been asked to serve as a model classroom teacher for MAP2D for the district as well as for the expansion to another large school district in central California. James' primary concern with the MAP2D was that, due to rapid expansion, the PD team "was getting spread thin" and there would be "less and less people buying into the program when the program itself is so diluted." James also coached others for Baldrige, another district-wide PD program which employed the trainer of the trainers model.² Like several other teachers who had been participating in the program, James had recently been asked to step in as a site coach for the program as the original site coaches could not continue and no other coaches from the district were available to help struggling teachers due to the scaling up of the PD.

On student learning and achievement in elementary school math. Like Barbara and Elizabeth, James believed that students' success in elementary math depended on the students' mastery of basic skills and concepts; their success boosted their confidence to tackle the next set of skills and concepts and allowed them to "reach out even to what they don't already know." James' prior experience instituting the Baldrige method in his classroom aided his implementation of MAP in his classroom as both programs emphasized ongoing assessment and data analysis by teachers and students to guide classroom practices.

² Short for Baldrige System for Performance Excellence, the Baldrige system aims to provide a systems perspective for understanding performance management. Applied in education, Baldrige process uses data to examine the current state of performance, what is helping to increase performance and what needs to change to increase the performance. Long Beach instituted Baldrige system in 2005 with a facilitator on a loan from Boeing and grants from the Broad Foundation.

On MAP2D as a professional development experience. James had a set of expectations from PD opportunities in general: that the opportunities provided teachers with the general structure of what the district expects from you and with the latest innovations in classroom teaching. In the same spirit, James offered some criticism of professional development in general. According to James, most professional development was “just scraping the surface” and gave teachers “one or two days of training and expects [teachers] to implement.” James further critiqued that “sometimes they don’t give you the assistance and if you don’t have a buy-in, then you definitely would not implement it without assistance.”

On that note, James already had a buy-in. Unsatisfied with the math curriculum and the textbook that the district provided, James had already begun to work with other teachers at his site to modify the sequence of information presented to the students. When MAP2D team presented their own pacing guide, James realized the majority of the MAP sequence aligned with the pacing guide that he was designing. James admitted that, due to the fact that he and MAP were “in sync,” the “buy-in and transition were easy.”

Although he had criticized diminishing support by the MAP2D team due to rapid expansion within the district as well as into another district, James recognized MAP2D as a developing program. According to James, MAP2D was “evolving into a solid program that can benefit all teachers and students.” James contented that, like other established professional development programs in his experience, “there will be changes to the program as the program matures” and hinted that MAP2D would slowly change away from its current model of insisting fidelity.

No single program is perfect. If you're given an opportunity, might as well embrace the opportunity and use it as best as you can. Even if you don't like it or does not work for your students, you can take part of it as a part of your toolbelt.

On MAP2D support that helped student success. Like other teachers, James credited MAP's modified pacing guide for his students' success. While he viewed success as their increasing independence when solving application problems based on newly learned math concepts shown in classroom, James took pride in his students' high scores on district unit tests as well as on the CST. James liked MAP2D as "a unifying concept" for the district that would also benefit students as they moved through the grades. According to James, students would benefit by attending Long Beach schools where MAP2D would "unify the school and unify the district by using the same vocabulary across the district and by using it consistently over the years."

James problematized the lack of administrative support. The principal would need to serve as the resource person since the principal is the direct supervisor at smaller sites, including elementary schools and some smaller middle schools in the district. While MAP2D designed professional development sessions for principals, it was unclear to teachers, including James, of the effectiveness of their site principals as an MAP2D resource. In particular, James would like to have seen his principal to ask participating teachers what they needed instead of delegating the task to coaches. However, James stated that his principal provided support by taking over teaching duty so MAP teachers could be released to observe other participating teachers' classes. This sentiment of ineffective roles that principals play as MAP2D resources was echoed by other teachers in the study.

Jennifer

Interviewing Jennifer was unique in that I needed to share so much of my own teaching and life experiences to foster interviewer-interviewee trust (Fontana & Fay, 2003). In the beginning, she was very guarded about her opinions about MAP and MAP2D. She was not willing to share details about her daily teaching practices and insistent on disclosing only the facts about the daily activities involving students. When I asked her about the activities she used to fill in the gaps between MAP components, she glossed it over with such comments as “oh, just some things from previous trainings” or “they are all MAP-related, anyway.”

It was not until about half way through the first session when she relaxed after learning that she and I had something in common—training in the Teachers College Reading and Writing Project. She had worked with her previous principal, before the principal’s retirement, for MAP adoption. The previous principal was a former math teacher and personally coached all of her elementary school teachers, giving them strategies for certain math concepts. While Jennifer was serving on her school’s adoption committee for the Teachers College Reading and Writing Project, the principal retired and the next, current principal promoted for a full adoption of MAP. (Although the Reading and Writing Project is from Teachers College, many teachers in the district who were using the project referred to it as the “Columbia method,” which I will use following Jennifer’s usage.)

Once she realized that I had used the Columbia method while teaching in New York City, and that I was familiar with it, which came after sharing my struggle as an English learner in American schools with Korean-only speaking parents, Jennifer opened

up to share more about herself and her teaching. Jennifer felt free to be able to compare the workshop model and MAP model; she was happy the way she was teaching before and had not realized the way she was teaching math, taught by her previous principal, was the one she preferred until she needed to implement MAP. Jennifer also shared that she thought MAP2D was very rigid—that “there was no way to add in what you thought was a better way to teach” for her students.

Jennifer had spent time in her current site as a classroom aide while she attended a local university. She became a classroom teacher in the same school when she cleared her credentials, a career route commonly found in the district. She had spent 11 years at the same school, while teaching second grade for 7 years. Throughout her teaching career, including as a classroom aide, she only had two site administrators. The new principal had joined the school 2 years ago and let MAP2D take over the math training sessions that the previous principal had personally conducted. More than half of Jennifer’s students were recent immigrants and spoke little or no English. Some were from Spanish-speaking countries and some from Cambodia, so even though she was fluent in spoken and written Spanish, Jennifer refrained from resorting to Spanish in order to not isolate students who only spoke Khmer.

On student learning and achievement in elementary school math. The first thing Jennifer noticed about MAP when she started implementing it, was its formality. In the Columbia method, the students would “huddle around the rug” for the modeling and “go into different parts of the room and get comfortable” for the rest of the workshop. However, with MAP, most of the teaching was done from the board and students moved their desks around to form groups. Jennifer reminded me that most of her students were 7

and 8 years old, at which age, they needed to be “running around.” Jennifer believed that at her students’ age, learning and school should be fun and that their learning should improve their lives outside of school. She believed that school and real life should have a “direct cause and effect relationship”; what her students learned in class should improve their lives when they went home and “even maybe help out their families who probably do not speak much more English than they do.”

Jennifer saw the limits of MAP as imposing formal schooling skills to her students that directly contradicted her teaching style. Jennifer believed that if students had fun learning and realized how school can benefit their lives in such a short amount of time, then her students would form a positive attitude toward schooling that would last a lifetime. Jennifer emphasized the importance of fun to keep students coming back to her classroom everyday, while MAP was “not helpful in making [her] classroom fun.”

And we expect them to have this and this and this [academic and behavior skills]. I have mixed feelings. Sometimes, you think that’s just the way we live and that’s just how society is today and if they want to be successful then this is where they have to be. But, then sometimes I think, you know, when you’re 7 and 8, go and be merry and have fun with your learning.

In contrast to previous teachers, Jennifer was not in favor of the pacing guide. She viewed the pacing guide as a way to control what is taught in the classroom regardless of students’ needs. Her biggest concern was the alignment of the program to state testing. Jennifer mentioned that there were a couple of instances where her MAP2D coach directly told her to not teach certain concepts (e.g., reading calendars, understanding money and value, counting and reading numbers in English) because they were not on the state testing, even though Jennifer saw the need for those skills in students’ everyday lives. Jennifer felt that the goal, and the only goal, of the program was to do well on the state testing.

On MAP2D as a professional development experience. Jennifer's biggest concern was that MAP2D was rigid and did not allow for any other teaching tools, as well as not considering the student population of her classroom and school. Some of Jennifer's students with limited English skills struggled with the program due to language issues. However, the coach would still expect her to meet the performance goal based on the state testing scores obtained by her last year's students, who, "as a whole class, spoke much more and better English" than her current students.

What the coaches give you are what you can use and they tended to be facts and problems of the day. My coach, in particular, spoke no other languages than English and she had never taught students who were English learners. She kept saying that this is what they need to know and they need to learn it so they can be better students. But I had a hard time understanding that. They're 7 and 8. They don't see their future that way. They live in the now.

Although she greatly appreciated certain aspects of the program, such as modeling by coaches earlier on, the opportunity to observe other teachers, and the use of vocabulary and numerical operations that are consistent across grades, Jennifer was wary of using tests as a guide for teaching. In addition, Jennifer saw the program's touted pacing guide as an infringement upon her ability to make professional judgement when it came to providing education for her students.

It could be the answer for some kids, but give me some choice, give me some freedom to make my professional judgment. Going back to a reading and writing workshop. I determine my mini lessons based on the needs of my kids. I have that professional authority. I went to college. I have a job. I hope I can make those decisions. If I can't, then why am I here?

On MAP2D support that helped student success. Again, Jennifer's concern about MAP in general—the emphasis of student achievement as shown on standardized state testing—surfaced while we discussed student success. According to Jennifer, her students' limited English skills prevented them from doing well on the state tests as they

are currently administered. But when she had a coach who did not have the shared experience with her student population, Jennifer had difficulty agreeing with her coach. Jennifer explicitly stated that MAP would raise her students' test scores; however, she could not agree that students' test scores reflected their learning.

Because of their test scores they look like they're learning. I have a problem with that. Sending a message to a parent that your child is a 4 that means advanced proficient in math [on the CST], that's nothing to take lightly. Sometimes, I feel like I'm sending the wrong message. Yes, your kid did score high on this, but that doesn't mean there is not any more room to grow.

Jessica

Having been teaching for 20 years, Jessica had the most teaching experience out of all the participants. While she was teaching third grade at the time of data collection, Jessica had taught every elementary grade in those 20 years. She viewed teaching as an academic year-long arc spent with one group of students. Based on this view, Jessica tended to dedicate more time in the beginning to classroom management and routines so she can allocate less energy on the structures and more time on content delivery later in the school year. Jessica stated that because her site was a Program Improvement school³, teachers were prioritizing more time for English Language Arts and math, hoping for better student performance on state tests. Similarly to Jennifer, Jessica became more eager to share her realities of teaching in a Program Improvement school when I revealed to her that all of my teaching career had also been in similar schools serving students with diminished social capital.

³ Under the Elementary and Secondary Education Act, the schools receiving the Title I funding and not making the Adequate Yearly Progress become identified for Program Improvement.

Jessica called herself a “connoisseur of PD” because she likes trainings and attends as many as possible. She recognized that there were PD offerings that were “one shot deals” where attending teachers extract whatever information or techniques were pertinent to their particular settings and try to implement them on their own. Jessica stated that after participating in MAP2D for the first year in a series, MAP changed the way she viewed and taught math for her students. According to Jessica, she did not like teaching math before MAP because she did not like the way the district devised the pacing guide.

On student learning and achievement in elementary school math. During the first year of MAP2D, Jessica realized that after nearly 20 years of teaching elementary level math, she found a curriculum that she liked in MAP. She believed that students needed to master basic math concepts and that the mastery would benefit their learning of subsequent grade level math. Jessica viewed the entire elementary school experience as a foundation for secondary education. She stated that kindergarten was a preparation for the first grade, first grade was a preparation for the second grade, and so forth. So, the function of third grade math was to prepare students for fourth grade level math. Aligned with her perspective of elementary school math as a whole, Jessica utilized the third-grade level as a transition period in elementary school when teaching math needed to help students transition from hands-on only math to the pencil-and-paper math of upper grades. As a result, Jessica was decreasing her use of three-dimensional manipulatives in favor of figures and drawings on paper.

Jessica stated that she became enthusiastic of MAP once she saw how her students processed the state testing questions. Jessica insisted that she cared more about

the way her students attempted and worked through the problems than her students' scores. Jessica admitted that both she and her students were frustrated with MAP because there were so many parts to the program and a lot of writing was involved. However, after the first unit test, her students experienced success. The presentation piece had become their favorite part of the day and students were asking for math time even when did not have time for it after a field trip or lengthy assembly. This conversion to MAP because of student success echoed the sentiment shared by Barbara and Elizabeth.

Jessica also asserted that not all students learned the same way and there needed to be differentiated teaching to reach all of her students. She conceded that MAP as a whole left no room for differentiated instruction the way she saw would fit her students' needs. In order to accommodate differentiation without losing fidelity to the program, Jessica added extra time to her math block for this school year. She intended to modify MAP next school year so she can "add differentiation piece to add depth and breadth" to her math.

On MAP2D as a professional development experience. As a self-proclaimed "connoisseur of PD," Jessica attended numerous professional development opportunities over the 20 years of her career. She found MAP2D exceptional because of its "total package" of resources, ranging from pacing guide that "groups one concept with similar concepts instead of spreading them out like the previous one," structured daily and weekly routines, trainings and coaching, as well as community building with other teachers through collaboration. As she was nearing her first year of MAP2D participation, Jessica had learned that there would be less contact time with her coach next school year because the district was sending some of its coaches to another school

district to share resources. Although Jessica was weary of the resources being “thinned out,” she was looking forward to relying more on her colleagues at her site as “replacement coaches.”

In addition, Jessica cited that her principal had been instrumental in faithfully implementing MAP2D across the grade levels at her school. Although she was not trained in MAP, the principal heeded teachers’ suggestions and provided substitute teachers so participating teachers were able to visit another classroom. In addition, her principal moved all the assemblies and extra activities to the afternoon so teachers would have protected math time in the morning. Jessica credited their site MAP2D coach for initiating the conversation with the principal to bring that school-wide change.

On MAP2D support that helped student success. Jessica conceded that both she and her students were discouraged by the complexity and tedium of MAP2D. Students complained about the amount of writing they needed for journal writing and they preferred to socialize instead of collaborating at the table prior to the presentation. Jessica took pride in her classroom management skills and her ability to motivate students, so her students’ complaints dampened the enthusiasm she built during training. When Jessica consulted her coach, the coach offered to modify the curriculum to ease her students into the program. Temporary modification worked and Jessica credited her coach for being flexible so she could eventually implement the program as intended. Without the coach’s allowance for modification, Jessica stated that she would have either given up on implementing the program entirely or forged on despite students’ resistance, then abandon the program for the second year.

Jessica also noted that the consistency between coaches at different sites and the standardized use of vocabulary, techniques, and structures benefited everyone involved in MAP2D. She was enthusiastic about incoming students who were already accustomed to the structure of MAP2D and prior knowledge of “MAP2D-specific language.” Jessica already knew that this year’s second-grade students were taught by MAP2D teachers and was looking forward to having a smoother transition time for math when they joined her class as third graders.

Margaret

Although she had a “late start into the teaching game” after raising her children, Margaret was recognized early on in her teaching career as a model teacher and a teacher educator. She has led many district-sponsored workshops for new teachers as well as served as a BTSA coach. In addition, Margaret held National Board Certification and served as a mentor for other teachers who were in the process of obtaining their National Board Certification. Other participating teachers and coaches, as well as district office personnel, referred to Margaret as one of the best teacher educators in the district, partly due to her ability to connect and inspire new teachers and her students alike.

At the time of the data collection, Margaret had been teaching for over 14 years, all of which were spent in one school serving the most impoverished students in the district. Margaret had been teaching younger elementary students, but, recognizing her strengths and weaknesses, one of her previous principals had suggested she teach upper grades. She had been teaching fifth graders for 11 years. She was just wrapping up the first year of MAP2D and had a lot of ideas to share.

On student learning and achievement in elementary school math. With a background in math and science, Margaret emphasized the importance of real world connection for her students to succeed in math. “There is that sense also of no world application. Kids need to understand why it’s important for them to be doing these abstract things now and how it is gonna affect their future.” For Margaret, student success in math was not dependent on their scores, but their preparedness for the math they will need later on in their schooling. “[W]hat you are doing in fifth grade matters because if you don’t get into the right sixth grade math you are not gonna get into algebra. If you don’t get into algebra you’re gonna have to take it in high school.”

At the fifth-grade level, Margaret stated, learning the language of discipline becomes important because the vocabulary becomes the foundation of your math, and “if you don’t understand what you’re being asked, you’re not gonna be able to answer the questions.” Margaret also emphasized that her students were just kids.

Math has to be taught so that kids can understand it and that takes time. That doesn’t just happen. You have to build synapses....They have to be able to build a wiring to understand the information that is up here that they are using from back here. You can’t do that in a day. If you go on a field trip the next day they forget. They are kids. They are ten.

And she added that all kids needed to feel their achievement to become successful learners.

For Margaret, the goal of math, in general, was in application.

An application is a word problem that they have to translate into math and then devise the steps to solve. That’s the top of the line engineering skill. You are gonna have to take a word problem and devise a way to solve that problem through the use of mathematics and science and so forth. This isn’t gearing the kids up to do that. In fifth grade they should absolutely be able to do that.

Margaret's philosophy in teaching math was providing with opportunities for students to master skills so they can apply the skills while planning and solving a real-world problem.

On MAP2D as a professional development experience. Margaret conceded that MAP2D is a solid program for new teachers. As a veteran teacher who creates her own curriculum and finds thematic units more satisfying than teaching standards in isolation, Margaret saw the value of MAP2D as “professional crutches” for beginning teachers and teachers with weaker backgrounds in math. Margaret found forming a positive relationship with her coach immensely helpful; her coach saw that Margaret did not need much assistance in implementing MAP, so the extent of her coaching was delivering supplemental materials.

In addition to having a coach who let her have her professional freedom, Margaret credited her coach for building a positive relationship between participating teachers and the site administrator. An example was the administration date for unit assessment.

[The assessment protocol would state] “November 20th. Administer trimester one exam.” [Our coach] is really good about saying, “You know what, that is a window. I’ll talk to your administrator. Let her know it’s a window.” Because teachers freak out. “Well, it’s November 20th, and I have to give the test now.” We have administrators who are, “On this day, you have to have it.” Then that means that everything that falls behind. It has to be at a certain pace because if you fall behind, you are not gonna make that mark. (Margaret)

However, as a master teacher for National Board certification program and BTSA coach, Margaret viewed MAP2D as a “professional downgrade,” problematizing the strict structure. Before MAP, Margaret was able to create interdisciplinary units based on student interest. And using her background in math and science, Margaret embedded math and science wherever she could. But with MAP, Margaret was no longer able to practice what she called her “passion.” With coach and administrator support for

allowing flexibility, Margaret managed to merge MAP with other activities to avoid “professional restriction.”

On MAP2D support that helped student success. Like most of the previous teachers, Margaret attributed students’ success to MAP2D’s pacing guide. But Margaret stated it in a different way—she was used to designing her own curriculum and creating her own pacing guide, but was always limited by the items presented on the semester test. Even though she had modified her curriculum to meet her students’ needs (e.g., introduce addition, adding decimals, adding ratios, adding angles, addition word problems), the items on the assessment would not reflect her curriculum. The new pacing guide allowed concepts to be linked together for student mastery and the assessment reflected the curriculum, which aligned with what Margaret wanted to do for her students in the first place.

However, Margaret problematized the key aspect of the program: assessment that is aligned with the pacing guide. She stated that each student would see the same type of items on the assessment three times—as a pre-assessment before the unit is introduced, as a practice test, and then as a test itself. Margaret considered this a learning effect from test-retest and could not help but wonder if the test showed that the students were “true thinkers.” In addition, Margaret has gathered from other teachers that “it feels like you are teaching to the tests rather than teaching the standard. That’s not a good thing.” She further explained that the difference between teaching to the test and teaching the concepts based on standards came down to the words used on the application problems.

You had to [learn] these words because they are gonna show up on the test and when the words [do not show up], they don’t do well on the test. And see, for me, it’s like they should understand the concepts so well that if the word changes they should know. It should be intuitive. They should know that if I say some versus

all or whatever, you know some of the words that we have. Altogether, the sum of, or the difference, it should not matter.

Margaret's critique of structured program like MAP in general was that there was no room for meeting individual student's needs.

There is no wiggle room. If you have to do this on this day at this time on this page then there is wiggle room. How about the kid over there who already has that and is reading three years beyond where you are teaching? There has to be differentiation.

But as for MAP, Margaret put the site administrator as the decider of implementation fidelity.

Well, it depends on how extreme the administrator is being with the program. In some schools it was being used in such an extreme manner there was no wiggle room at all, the cases where you have to be on this lesson at this time on this day. In other cases, the interpretation is a little more, you know, this is what you need to do, this is the assessment that you have to give, these are the logs you have to keep, but you can adjust to the needs of your students.

Mary

For the past 15 years, Mary has been at the same site, teaching fourth graders for 14 years and wrapping up her Year 1 teaching second graders. Mary actually started participating in MAP2D 2 years before she moved over to teaching second grade, so this was her Year 3 implementing MAP2D, but Year 1 using MAP with second graders. Mary said that she "always loved math and loved teaching math" and her previous years' students scored high on the district tests. However, since adopting MAP, her students' scores increased even higher and she became convinced that MAP structured helped her students achieve.

On student learning and achievement in elementary school math. Mary stated that the goal of elementary school math was to prepare students for middle school math

by learning the concepts and mastering the skills to show that they had learned the concepts. Ultimately, all lower grade math would be in preparation for algebra, which was becoming a high school graduation requirement. Mary stated that transitioning to implement MAP was not difficult since she was doing many elements of MAP before through district training; however, she began to see the details of the program when she started full implementation. Mary saw her students score higher on the district assessments and began to realize that the missing pieces in her instructions were students' understanding of the learning objectives, journal entry and problem of the day. Mary believed that confirming with students of what their learning objectives are and holding them accountable for the roles they play in their own learning were crucial in student achievement in general.

On MAP2D as a professional development experience. Mary counted her coach's support as the prime reason for her student's success. The first year Mary was participating in MAP2D, her site administrator was only able to retain paper resources—pacing guide and math facts books. When the second year of MAP2D started with workshop attendance and on-site coaching, Mary saw the drastic difference in her ability to implement the program as well as the way she could teach her students using MAP the way it was designed. “Yes, that's why having the support last year, that really, really helped. I realized I wasn't doing it. I was doing it partially correctly but not completely.”

On MAP2D support that helped student success. Like many participating teachers in this study, Mary attributed her students' success to the pacing guide. According to Mary, she was able to teach more concepts without feeling overwhelmed,

especially since this was her first-year teaching second grade. She had realized from previously using MAP for her fourth-grade students that if she relied on the MAP pacing guide, she would be able to introduce all the standards as well as be able to give her students enough practice time they needed to be successful on the state tests.

In addition, Mary counted her coach's support as the prime reason for her student's success. She had previously worked with the coach when she taught fourth grade; however, Mary requested her coach to model more lessons for her second graders so she could see how she might reach second graders better.

Every time I observe [the coach], she starts out with the lesson objectives, then "I want your pencils down and I want your eyes up here. This is what we're going to do. Do you see how we're in the ones?"

Mary's example illustrated how, in addition to relying on the coach to deliver math-specific instructions, Mary learned a different way of classroom management by watching her coach model teaching using Mary's students. Mary stated that transitioning from teaching fourth grade to second grade involved more explicit modeling for the very basics, such as how to pay attention to the instruction as well as how to work in small groups.

Michael

Michael taught for 8 years in a different district in California before he started teaching in Long Beach. He has been teaching in Long Beach for 4 years, all of which were in an elementary school. He was completing his third year of implementing MAP. As a former English Language Learner teaching students who are mostly English Language Learners themselves, Michael viewed MAP as a resource for students whose schooling was being challenged due to linguistic differences. As a product of bilingual

education in California, Michael lamented the lack of unique classroom and school experiences that could have enriched his students. However, Michael saw MAP as a positive force in his students' lives by giving concrete routines and structures that can bolster their academic as well as social growth.

Michael's view offered a distinct vantage point on implementing MAP in a classroom. During the second year of the past 3 years of MAP2D participation, Michael's school did not have an on-site coach due to the loss of funding. He was elected by his colleagues as a teacher coach since he successfully implemented the program during their first year with MAP2D. The role allowed Michael to observe other teachers and provide them with feedback as well as lead collaborative teacher meetings at his school site. Michael's perspective was based on his experience as a teacher as well as a site teacher-coach.

On student learning and achievement in elementary school math. Michael often included himself when he spoke of his students. He stated that the emphasis of visual presentation in the program was helpful since his students needed to rely more on visual information. In addition, Michael commented that although many teachers would critique MAP as not language-rich, the same element was beneficial for his students who were struggling to learn both at the same time. Michael said that for his students, it was critical that he modulates "what information gets to my students and how that information gets to my students" to lessen the stress in school and at home. "When a student needs to take something home, it's too wordy. The new books? Too wordy. They give you almost a half a page of explanation and examples. The parents can't help. The students can't get it."

Like Margaret, Michael emphasized the role of language of the discipline in math, especially for upper elementary school students. In addition to language of math, Michael noted that learning math facts was crucial to most of his students to be successful in math. Michael approached math as he would approach learning a different language, incorporating visuals and hands-on activities to learn different aspects of math concepts and vocabulary, as well as math facts, since they were building blocks of math proficiency. In addition, Michael successfully found room for differentiation in MAP as he was able to spend less time on classroom management as his students became familiar with the MAP routines and more independent.

Michael often referred to his graduate school work in the theory of multiple intelligences when describing his students' talents and how they learn. He acknowledged that MAP might look like it does not give room for differentiation. However, Michael emphasized that each teacher can create learning opportunities for students who might need a different approach than what MAP uses—he used the example of how he would take his students on a walk around campus to supplement lessons on perimeter in addition to the classroom work of MAP. Michael conceded that strict pacing can limit students' learning because some students do need more time to learn concepts; however, as an experienced teacher using MAP, Michael knew that he could use the third trimester as a time when he could reach those students who might have not gained the solid grasp of the concepts previously taught.

On MAP2D as a professional development experience. Since Michael served as a teacher-coach, he was privy to the frustrations that other teachers at his site shared with him. Michael stated that MAP provided so much structure that new teachers were

able to follow the pacing guide successfully. He conceded that some teachers complained about the strict structure of the program; however, he valued consistency that students would experience advancing from one grade level to another over standardization of instruction. Michael added that teaching skills can be acquired over time with practice like math skills. He asserted that by implementing MAP over multiple years, a teacher can develop a sense of where the room for differentiation can be.

Michael also shared his effort to build the culture of collaboration at his school while he served as a teacher-coach. Michael's initial need for collaboration came due to his own lack of time to juggle teaching and coaching other teachers; however, his effort grew into a school-wide culture where teachers from different grades would visit other classrooms to see the complete continuum of MAP implementation across grade levels as well as hold on-site resource sharing meetings. Michael credited the core teachers' openness to changes and sharing that promoted collaborative working relationships among teachers at his site.

On MAP2D support that helped student success. Michael valued the consistency within and between grade levels that came with implementing MAP. He had observed that this year's incoming fourth graders already knew the MAP structure, so there was less need to dedicate a bulk of September and October to classroom management involving different components of MAP. This economy of classroom time translated into more time spent on direct instruction and small group peer-tutoring sessions. Although some teachers had called MAP "standardization of teaching," Michael pointed out that there was no need to focus on reteaching many of the vocabulary and concepts, as well as daily routines, when most of the incoming fourth graders were from

his own school or transferring from another MAP2D school in Long Beach. Michael's classroom alone saw about two to three students per trimester who would transfer to and from another school in the district, serving a similar student population. If the students were already familiar with MAP, those students were able to transition easily to Michael's classroom.

Michael also praised principal trainings that came with MAP2D. Although principals were not required to attend MAP2D trainings, his current principal had attended. Michael stated that a teacher can ask for support from the principal, not necessarily for day-to-day advice on how to implement the program, but for additional resources. The current principal, who attended principal training sessions, was more understanding of the need for additional resources, such as release time for teachers so they can observe other teachers' classrooms.

Patricia

On student learning and achievement in elementary school math. Patricia had taught second and third grade before teaching fourth grade throughout her 8-year career in the same school. Her philosophy on teaching and learning elementary school math was based on her experience since she had not gone through a formal teacher training other than the district's new teacher induction program. Patricia believed that students learned 4th grade math by practicing to achieve mastery and by collaborating with other students, which were tenets of MAP. Patricia emphasized the mastery of math facts because she "saw how [her] students struggled with concepts if they had not memorized the facts."

On MAP2D as a professional development experience. Patricia had difficulty calling MAP2D professional development because for her, "when you say, like,

professional development, to me, I don't see the trimester meetings as professional development, because that's what you do in the beginning.” She compared the multi-year aspect of MAP2D to “review sessions” to keep everyone “on the same track.” This sentiment was echoed by Elizabeth, who called the Year 3 workshops “repetition of information” and approached them as “refreshers.”

Like Elizabeth, Patricia pointed out that MAP2D was constantly changing to accommodate the changes in teacher needs that reflects the changes in student as well as curricular needs. As the pilot school, most teachers in Patricia’s school were becoming very proficient in delivering MAP as designed. As the years passed, the veteran MAP teachers were receiving less and less coaching as they needed less. When a new teacher joined the school, a veteran teacher stepped up to serve as a coach without any directives or compensation. Patricia noted the community building of MAP2D as a key for positive working relationships among her colleagues through administration changes.

On MAP2D support that helped student success. Similarly to the majority of the teachers in the study, Patricia credited the rearranged pacing guide of MAP as the prime reason for successful buy-in and student success. Patricia struggled with the traditional district math pacing guide and had never fully taught all the materials presented in the pacing guide to her satisfaction. When she received the MAP pacing guide, Patricia was relieved and became excited about the concepts being grouped together.

Patricia added that students benefited from the consistency of MAP across the grade levels.

You do math facts so the kids can do commutative property. You teach them in a certain way. And it's so nice to see when you get third graders [who were taught

using MAP]. “That's the way you learned rounding and that's the exact way I'm gonna teach it to you.” It just works together so they remember.

Patricia saw the standardization MAP structures through the elementary school years as a positive feature for many of her students who often transfer to different schools in the district due to a variety of reasons. “Everyone is learning the same way—less for kids to get used to.”

Sarah

Sarah was hired by the district when there was a teacher shortage. She was changing her career and started teaching with no teacher preparation program with the exception of the district training for new teachers. At the time of the data collecting, Sarah was earning her master's degree in elementary education, and continually participated in a nearby university's teachers summer institutes for primary grades where the focus was learning math through manipulatives and literature.

On student learning and achievement in elementary school math. Sarah preferred to use hands-on materials and visual presentation to make concrete examples out of abstract concepts in third grade math. While she appreciated the motivating factor behind abstract projects using math (e.g., making a mask out of geometric shapes), she emphasized the need for basic skills such as learning math facts. However, she shied away from rote memorization of math facts that MAP mandated, much preferring to use manipulatives until students mastered the concept. Even though she initially experienced difficulty with the presentation component of MAP, Sarah grew to appreciate it as she watched her students flourish in their communication and collaboration skills, as well as the role of “teaching someone else to show that you really learned it.”

If they can't get it from me, and if I can have them teach each other, and they're gonna get it in kid language, then that is the key. So, I think that's where the consensus comes into play, because that is sort of rough, too, but if they don't get it, then I need to show him why he doesn't get it. So, it's funny when you hear “ooh.”

On MAP2D as a professional development experience. Sarah conceded that she would not have been successful as a student if she needed to learn math with MAP. She attributed the mismatch to her learning preference (visual) and the way MAP presented math without manipulatives or visual aids but through repetition. Sarah admitted that MAP2D would benefit new teachers who would appreciate the structure and prescribed lesson plans with suggested number of minutes allocated to each component. However, she disagreed that MAP was adequate for all students, and that she had been instructed by the administration to stay aligned to the program even when she saw the need to modify the program and the data to prove the need.

On MAP2D support that helped student success. While Sarah disagreed with the majority of the design of MAP, she acknowledged the key features of MAP2D—the availability of coaches and the pacing guide. Sarah obtained most of her support from her master’s program cohort as well as other elementary school teachers who participated in math institutes. Sarah’s participation in other cohorts gave her a set of different needs that did not correspond to other teachers’ needs, such as collaborative culture or immediate feedback on her classroom teaching. To Sarah, the most valuable part of MAP2D was the availability of a coach to come into her classroom and model-teach her students. Because Sarah was a visual learner, Sarah admitted that none of the MAP made sense to her until she saw it presented to her class.

Regarding the pacing guide, Sarah saw it as a restriction that would force her to move onto the next unit of instruction even though not all students had mastered the

materials, having to adhere to a short window of assessment administration at the end of each unit. On the other hand, the pacing guide provided Sarah with a general timeline of what concepts should be introduced by the end of May before the state testing. Since Sarah taught at a year-around school with extended breaks between trimesters, she always faced difficulty introducing all the concepts in time for state tests. With the modified pacing guide that was specifically designed for year-around schools, Sarah felt more at ease about whether she would be able to cover all the materials before the state testing. This sentiment was mirrored by other teachers who taught at year-round schools, including Barbara, Jennifer, and Michael.

Susan

Like Sarah, Susan was near completion of a master's degree in elementary education at the time of data collection. As a fifth-year teacher who had spent all 5 years with third graders, teaching was Susan's second career—something she deliberately chose while she was trying to find the answer to, "What am I supposed to do with my life?" Susan started her career in education as a long-term substitute teacher for a year before beginning a full-time position and a master's program. Based on her substituting experience in different settings, Susan knew that she wanted to teach in elementary schools.

Susan admitted that managing children was much more difficult than managing adults, yet found that "getting 20 of them to sit and listen to you all day long and actually learn the curriculum and content and to excel at it...the whole thing coming together is magnificent." Susan fully appreciated having her own classroom and being able to teach what she thought was important to her students for the entire school year. This notion of

being able to witness children grow throughout the academic year was important to Susan.

On student learning and achievement in elementary school math. Susan was a proponent of students using multiple modalities—seeing, hearing, writing, and speaking, in her case—to master math facts, which, according to Susan, were a part of foundational skills in elementary school. Susan also recognized that, compared to when she was in elementary school, third grade math contained a lot of language, troubling most of her English Language Learners. She protested the wording of some of the problems on state tests, believing it unnecessarily set her English Language Learners up to fail math. Susan believed that all students should experience success in order to maintain their enthusiasm about schooling, and problematized language-laden practices of math as one of the reasons that some students became disaffected with schooling.

On MAP2D as a professional development experience. Because she was struggling with teaching math, Susan was open to changes. She was particularly passionate about MAP2D for changing her teaching.

[The MAP coach] saved my life. I had no idea how to teach math, and that was the one I hated the most. It's the one I love the most now. I love teaching math. I love teaching the math facts component. I love teaching the 1 hour math lesson.

Susan credited her coach's dedication to the teachers for consistent loyalty to the program. Susan sought support from her cohort in her master's program, but realized that she had more in common with her colleagues who had gone through "the painful process of giving birth to MAP during piloting." The shared experience of piloting MAP had built a lasting community in Susan's view.

Susan called the old pacing guide a "chasing guide," as she always chased the pace presented, yet "never caught it." She expressed her frustration over the old pacing

guide that did not allow student mastery of concepts that would be assessed in state testing. In addition, the curriculum resources and textbooks that were adopted by the district did not fully align with the standards. “There’s a disconnect between people who write the standards, people who write the state tests, people who write the adopted series, the textbooks we’re supposed to use, and the classroom teacher. There’s a big disconnect [amongst] all those.”

What Susan described as the disconnect among educators in varying capacities was rectified in MAP2D. During the pilot year, Susan collaborated with another teacher who later became an MAP2D coach. Much of their collaboration involved assigning work that was accessible for students, as well as families, who did not speak much English. They created assignments through which students could reinforce the newly acquired learning at home by teaching whoever was at home. They deliberately used age-appropriate language to help students understand the material as well as successfully teach the materials when they went home. Such practice of teachers being the center of what they instruct and being a part of creating materials for classroom and student consumption forged a bond that went beyond the initial buy-in of the program.

On MAP2D support that helped student success. Prior to teaching, Susan firmly believed it required a teacher with strong math skills to nurture students to build strong math skills. Being a former accountant who trained other adults in her company, in addition to having strong math skills throughout her student career, Susan knew that she had the capability. Then, a teacher preparation program as well as the experience as a beginning teacher changed her belief. Susan’s frustration with the teacher preparation program and initial teacher experience was alleviated when she joined MAP2D.

Actually, [in] my math credential program, the math methods class was terrible. I learned nothing about math. I was very weak in [teaching] math when I started here. When I was doing my student teaching with my own class, that was one thing I said I needed help with. Then the first year I had no idea how to teach math. You're trying to read the math book and the teacher's guide, and they have three different things crammed into one lesson. How are you supposed to teach place value, expanded form, standard form, and word form in one lesson to the 10th, 100th, and 1000th place? I mean you can't do that in one lesson. That's what the textbook had us doing. It's no wonder I couldn't teach math. So, the second year when I was here when [MAP] came in, I embraced it and ran with it. Whatever I had to do to learn how to be a better math teacher, I just absorbed like a sponge. I wasn't afraid to try. I wasn't afraid to retry, refine, redo, learn more.

While she credited MAP2D for transforming her into a better math teacher, Susan also credited the resources available through MAP2D, including MAP-specific worksheets and the language of the discipline, for strengthening her students' math skills. She noted that over the past four years teaching 3rd grade math using MAP, students' overall confidence as mathematicians grew. Susan's personal philosophy in education—that students who experienced early success in schooling become stronger, more confident later on—manifested in her third graders. As MAP took root in her school, more and more incoming students were already trained in MAP routines and its language, which made content delivery more efficient through consistency.

[My] kids now have had it a couple of years. So, when they get to me, they're ready to go. They have the background knowledge whereas before, it used to be one teacher teaches subtraction, the other teaches it this way, and then you get to third and then your teacher has something silly, and then you get to fourth grade and you're going to get something different. Now it's consistent. I can see it. My guys are able to apply it to fourth grade level math, so if I taught them to round it to the 100s place, they're now able to round it to the 10,000th or 100,000th place. I can give them any number with a place to round, and they can actually do it because they know the process. They know how to do it.

Discussion of Findings in Relation to Research Questions

I had originally set out to study teacher changes through MAP2D participation using the following research questions.

1. How do teachers describe changes as a result of MAP2D participation?
 - a. Changes in their knowledge?
 - b. Changes in their beliefs?
 - c. Changes in classroom practice?
2. What role do their experiences in MAP2D participation play as they affect teachers?
 - a. Learning as change in their knowledge?
 - b. Learning as change in their beliefs?
 - c. Changes in classroom practice as a result of learning?
3. Based on teachers' experiences in participating in MAP2D training, what are the factors that contribute to teacher change?

However, while conducting the interviews, it became clear that the research questions needed revision. It was difficult to separate participating teachers' learning from changes in their knowledge, to changes in their beliefs as a result of MAP2D participation. It appeared that most teachers held fast to their beliefs of how their students learned math unless they saw drastic changes in their student performances—whether the performances manifested as classroom behavior or in their assessment scores. Furthermore, teachers did not view the goal of MAP2D to change their content knowledge as elementary math teachers; the goal was to change their teaching practice of elementary math, regardless of their knowledge or beliefs.

Some teachers reported that their university teacher preparation programs were responsible in shaping their knowledge in terms of math learning through research-based literature and in-depth group discussions. Meanwhile, teachers critiqued that MAP2D was more of a top-down model of changing teacher practices, noting the absence of, and in some cases the contradiction to, the latest cognitive sciences and child development.

[MAP] math facts component is so weak, it made me realize how important it is to teach it differently so kids can understand it. I just think that if you talk to any math researcher right now and show them how MAP does math facts, they would just laugh at it because it's just rote and we don't do math like that anymore.
(Charles)

On the other hand, some teachers thought that MAP was in line with cognitive research.

The MAP pacing for me is very condensed and very logical so it kind of helps the pathways in students' brains, they figure out a way to do this and this and it's grouped together so we take care of a couple of things together and tie to the district pacing. (Elizabeth)

You know that one times two is therefore two times one is helping you to develop your mind in a more, you know, analytical way. You're not thinking so straight linear. You are actually using both sides of your brain to flip the problems. That's why it works so well. Repetition is absolutely key. Repetition is key because you are strengthening that neuropath continuously. (Margaret)

Teachers changed their practices based on the evidence they saw in everyday interactions with students: observing students' performance scores on unit tests, taking in students' comments and reactions while implementing the program, and witnessing students' growth in their use of math language and presentation skills. Teachers were swayed to use or abandon MAP based on the feedback from their students, rather than changes to their knowledge and beliefs. In the interviews, teachers often talked in terms of their position—their stance on such issues as the goal of MAP, the predicted benefits of MAP for their students, the possible fallacy of the foundation behind MAP implementations. Their stances represented their beliefs based on the body of knowledge

they have amassed throughout their lives, beyond their teaching careers and MAP2D. Their knowledge and beliefs were so intertwined that I was unable to differentiate them, even through further probing past the interview protocol.

In the proposal, I had explored the possibility of teacher knowledge and belief overlapping to the point where researchers avoided using them separately, citing Murphy & Mason (2006), Richardson (1996), and Southerland et al. (2001). Teacher interview data confirmed the possibility, and as a result, I found it necessary to refine the research questions. In addition, since teachers knew that the study was around MAP2D, they embedded all of their changes—knowledge, beliefs, and practices—in MAP implementation. For the purpose of clarity and flow, I revised the research questions as:

1. How do teachers describe changes in their knowledge and beliefs as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?
2. How do teachers describe changes in classroom practice as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?
3. Based on teachers' experiences in participating in MAP2D training, what are the factors that contribute to teacher change?

Research Question One:

How do teachers describe changes in their knowledge and beliefs as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?

For this research question, I focused on the changes in teacher belief as a result of teachers participating in MAP2D. I found that teachers had different ideas on what the

goal of MAP was even when the program specified it. Although all teachers agreed on the goal of MAP2D as implementation fidelity, some of the teachers did not follow the program faithfully. In addition, teachers modified the MAP as they saw fit in their classrooms. These findings for the first research question are described in detail.

Teachers' beliefs of MAP's goal. Teachers were asked to describe the goals of using MAP in the classroom, and even though MAP specifically states its goal “to increase student math achievement,” teachers had different ideas about what that goal intended. Some teachers reported that the goal of MAP in their classroom was for students to obtain mastery of basic math skills appropriate at their grade level. Skills ranged from mastering single digit addition facts through commutative properties (e.g., $3+4=4+3$, Mary) at the second-grade level, to learning the language of math (e.g., “greater than” rather than “bigger than,” inequality signs using concepts rather than Margaret’s alligator analogy), in addition to single digit multiplication facts through commutative properties (e.g., $3 \times 4 = 4 \times 3$) at the fourth-grade level.

In addition to the mastery of basic math skills and language of the discipline, teachers remarked that, through multiple components of MAP, including Problem of the Day and small group presentation, students learned the language skills needed to solve word problems *and* communication skills simultaneously. Citing the old adage, “seeing is believing,” teachers valued the first-hand evidence they witnessed through their classroom teaching more so than the reasoning they were given through mandated strategy changes.

Michael, who started participating during the pilot year, stated that “when people saw the results, data speaks for itself. So, we said, ‘okay this is working.’ I saw it my first

year. I was second to the excel class as far as scores.” Michael was particularly proud that his students’ scores rose sharply and attributed the rise as a reason for continued participation in MAP2D. Barbara shared that students “kind of get overwhelmed at first. Then once they get into it, they really like the program.”

Teachers like Mary saw the changes in their students’ behavior. “I know my kids last year just loved it. My kids this year, it really helps them focus. It gives them a purpose. They love math.” Jessica added that seeing their students being able to work through high stakes tests gave her incentives to continue implementing MAP in her classroom.

I think [MAP] gave them so much confidence. And I think that's what they needed. I mean, when they were taking their state tests, they looked at those problems and they knew what to do. And I was really happy. I mean, sure, they missed some. Some did better than others. But the majority of the kids, they looked at a problem, even a word problem and they knew what to do, and they went, “oh, this one you multiply” and they knew how to multiply, and they knew how to divide, and they knew it was a word problem, and they needed to find out something, and they knew different strategies and that was like... Just to be able to walk around and see the kids doing that was... this was worth the whole year (Jessica)

Teachers believed that students who were taught using MAP would be better prepared when they advanced to the next grade level because they were already exposed to the structure of MAP. Michael broke down the role of MAP as standardization:

They try to stick to the program because they want to have a universal thing throughout the grade. They don’t want a lot of differentiation. They want it all to be the same. Since upper grades started it, they are going more with what we say.

Other teachers referred to it as the consistency of teaching across classrooms, grade levels, and schools using MAP. The benefits included mastery of math facts and language of the discipline, as well as familiarity with small group activities including presentation. Even Sarah, who generally disapproved of MAP, “grew to appreciate the consistency.”

Teachers like Michael, Jessica, and Susan stated that students learned different components of the program (e.g., closure, presentation, group talk) in addition to the language of the discipline that would stay consistent through the years. They viewed the “predictability” would be “easier” for students and they hoped the expansion would reach down to the kindergarten level.

Contrary to some of the teachers’ appreciation of consistently using MAP across grade levels and at different sites, Jennifer dissented. Jennifer was concerned that standardizing strategies would benefit only a fraction of students, leaving behind those for whom the strategy did not work in the first place.

If I am teaching rounding, if that rounding way didn’t work for some kids, then why not do it a different way if you have a different way?...What about the kids that are not? We had, like, a bunch of strategies and we have strategies for pretty much addition and subtraction facts and even for multiplication facts, and that’s the way our principal wanted to do it. But pretty much when [MAP] came it was like, “okay, that’s no more.”

To Jennifer, it was more important to expose students to a variety of strategies to make sure every student found at least one way that worked for that student.

Teachers’ beliefs that the goal of MAP was to raise scores. Whether the participating teachers viewed the role of state testing as positive or negative, the impact of state testing loomed large for all teachers. Some conceded that MAP was in place in order to raise student scores:

I think it’s been very beneficial. My scores have been higher. The last three years have been higher than they ever have been. Our grade level has done well in math before, but since [MAP], it’s consistently raised it. I think that’s one of the goals. (Barbara)

Although teachers understood the role of state testing as an assessment tool to gauge student achievement, Jessica encapsulated the role it plays in their everyday teaching practices.

We are a PI [Program Improvement] school; we've gotta get out of PI. We can't spend all our time at assemblies when we have to do all of these other...I finally explained to my principal we can't do this other stuff. We have to have time to do math and reading. We have to have time to do that. That's what's on their test: reading, language, and math. We have to have time to do it because they have to know how to do it. Who cares whether we have a cow? I really don't think we have to have that, it's fun for them, but if they can't read about a cow.

Some teachers brought up the issue of teaching to the test. Elizabeth believed that rising student scores on state testing was a result of using MAP.

I think it's just a byproduct that we do well on the CST. I think that's just a kind of extra added benefit; I don't think it's geared towards raising the test scores. Just because it's so aligned with the content standards, they just end up doing well. Because they had so much success, they just continue on doing the same thing on the CST when the time comes to CST.

However, some teachers specifically stated that MAP, through using its multiple assessments and Problem of the Day routines, was taught to simply raise test scores.

Sarah claimed that MAP is “taking exactly the same questions off of the state test examples and just plugging in different numbers and somebody else's name. So, instead of James, now you have Jason.” Jennifer echoed that students learned the format of the test so much that their scores were bound to increase. Margaret added that “I feel that we are teaching to the tests...some of the kids missed [some of the questions] because one of the words changed. They didn't see the word so they didn't understand the concept so much as they recognized the question.”

Teachers' beliefs of the goal of MAP2D as to ensure implementation fidelity.

While teachers' perceived goal of MAP implementation varied based on their belief in teaching elementary math, their view of the goal of MAP2D was singular—a way to keep MAP as close to the way it was designed across classrooms. They understood that all the resources that the district provided through MAP2D was to implement MAP as designed. The intention of fidelity to the program was generally accepted by teachers, whether they

adhered to MAP entirely or not. Teachers, like Jessica, for example, decided to follow through with the program because they saw the need to try it and see for themselves if MAP delivered what it promised.

[Some teachers] just felt like they were spending too much time in math and it was just too tedious.... I felt like that sometimes too, but I made this commitment and I'm going to do it because I want to see if it works. Why put all this time and at the beginning and then not do it? I'm going to finish the whole year and see if I like it and see what happens. I wanted to be consistent all the way throughout and I really wanted to do a good job with it and not just say it doesn't work. (Jessica)

Michael and Sarah concurred with Jessica. Michael stated that he was “the type of person [to] try something. If it works, it works. If it doesn't, at least I tried it. I'm not going to say no just for the sake of saying no. It's not my style.” Sarah added that while she did not care for the format, she was committed to implementing it faithfully to make sure that she had the reasons for making changes to the program later on.

And if it backfires, then you have the evidence to show why it backfires. And you can go in and say, okay, this didn't work, maybe we need to look at it again or can I do this to it and tweak it or make a hybrid of it or whatever and go from there. But you can't complain about it until you try it. Even if you cringe inside sometimes. (Sarah)

As they gained more experience implementing MAP, professional development shifted to meet the changing needs of teachers, as well as the curriculum, to maintain adherence to the program. This was a view embraced by the program's creator: “If you don't evolve, then you're going to fall behind eventually” (quoted by Patricia). Sarah commented that MAP2D information changed to reflect teacher feedback, such as including manipulatives which was not done so before.

In addition to informing teachers of updates to the program, Elizabeth added that PD served as an ongoing effort to maintain fidelity over multiple years.

I guess the purpose of professional development at this point is, it's just a kind of refresh our memory and make sure that everyone is on the same page. As how

we're gonna teach these certain concepts. And with rounding, we're gonna underline these, and circle this. Everybody is consistent and onboard and they get that reminder. Because it's hard to remember everything. And just little kind of guidelines, and they add things to the program, and because we've been at it so many years, so, okay, add this to your piece. You guys are essentially the professionals at what you do with this program, so you're comfortable enough so you can add this component. (Elizabeth)

Teachers' beliefs in modifying MAP. Although they understood the role of MAP2D to ascertain fidelity of program implementation, teachers saw it as an opportunity to acquire new strategies to help their students learn, rather than to implement the program as a whole. Charles stated that although he does not like the math facts and changed the math facts teaching during given time, he kept the pacing and demonstration pieces from MAP.

Even the modeling by the coach was utilized as a way to develop strategies to use with students. Margaret, whose experience with teacher training far exceeded that of any of the coaches, used the model teaching to add to her classroom practices.

[I keep thinking to myself that if] we have a coach I am gonna use her [time] to the best of my ability. She is gonna come in and on this day, she is gonna do this lesson and I'm gonna sit back and I'm gonna watch and then they would kind of glean information from that and then adjust where they needed to adjust. (Margaret)

Some teachers conceded that after one year of full implementation, they felt ready to select parts of MAP for their practices. Mary stated that she was “taking some things out” because she was “getting comfortable” with the program. According to Mary, her second graders found writing all the journal entries difficult, so she was planning on abandoning journaling for the upcoming school year. Sarah said she was doing a “hybrid” model; she was modifying the math facts because “the repetition and so forth wasn't doing it for kids, so for a handful of them and I had to get those memory jogger cards, where it has little stories that go with it.” Michael summed up the teachers' sentiments

toward PD in general: “I say I’ll try whatever. Give me something, I’ll try it. If it works, it works, if not, it goes to the recycle pile. I’ll try something.”

Teachers’ implementation of MAP varied in terms of program fidelity. In line with their perceived goal of MAP2D, teachers strove to follow the script faithfully in the beginning stage of MAP adoption. However, only a few teachers actually implemented MAP adhering to every element of the program. Fidelity to program implementation was the accepted norm amongst the participant teachers, and those who deviated from the program found ways to conceal the modification. Yet some teachers noted that alterations to the program were sanctioned by their coaches.

Once I was given that freedom to modify and adjust based on my knowledge of education and my children and their skill level and what they’re getting and that, it’s just like, okay I get it. I was trying to fit everything into this rigid little one-hour framework. (Susan)

Margaret further added that she had her administrator’s support to modify the program as she saw fit. She hesitated to buy into the program at the initial stage and her administrator wanted Margaret to participate in MAP2D as a part of the sitewide effort.

So, in a way I found [MAP] a little confining because I could only do these things. Then having to do the math facts on the side after the first term and [students] are all getting everything correct. You know from the beginning, [my principal and I] talked about it and she said, “well, then don’t use that. Don’t tell everybody else you are not doing it, but use that time for something else. Use your word problems. Focus a half hour on word problems or whatever.”

While teachers like Margaret and Susan found coach and administrator support to alter MAP to fit their students’ needs, some veered off from the program on their own. Nonetheless, they needed to meet the expectation of program implementation. Some chose more discreet ways so coaches and principals would *see* the program being implemented as intended, while teachers were changing it to meet their needs behind closed doors.

Coaches come, we do it their way, coaches leave, we do it our way. They don't know about it. Principal would come in and she'd say, "it's not supposed to be that way." She wanted to know if it works, too, but she retired... We got a new principal now who just sits back and lets us do what we need as long as it works.... They give us a training, and then they expect us to change, make the changes that are needed in our classrooms and that's what we do. We do a lot of things they don't want us to do, but we don't tell them. We shut the door, and we'll do our thing, and when they come in, we'll do their thing, and when they leave, we'll do it the way it works. (Charles)

Whether coaches or site administrators condoned or knew about changes being made to the program, teachers adjusted it in different ways. Some teachers stated that MAP was restrictive and did not allow room for differentiation, so they supplemented instruction with strategies from other trainings offered by the district.

I have kids who love to draw pictures or love to create with their hands. That's not part of MAP. We tend to lose those strategies that work. That's the only piece I would like to add to MAP, it's more hands-on, or a supplementary. Okay, this didn't work. Let's reteach it. Okay, this is working fine. Okay, fine, but if it doesn't work, try this. (Michael)

You can teach math facts a lot better than the way MAP does. Which we do. We do it differently. We use that half hour and teach math facts, just differently and that's why my kids are doing much better. If you give them what [the former principal] did, then kids can figure things out. $2+2$ is double. $2+3$ is double plus one. You teach the relationships between the numbers, instead of rote. (Charles)

On the other hand, some teachers asserted that MAP allowed room for differentiation within its structure. Teachers conceded that what MAP allocated for differentiation might not be enough to reach all students, but the opportunity definitely existed.

What I'm getting at is one size does not fit all. That's true, but there is room for you to modify a little bit here and there, although it's a very small amount of time that you could do during independent practice. Is that enough for you to get across what the kids need to learn? The ones that are struggling? Yeah, it's hard. So, the ones that just don't have their facts,... they are what I focus on. (Mary)

We're all going to be doing certain things the same way, to maintain the consistency, but the way you present it or the way you have them take notes on it can differ. And the weekly quizzes are different, depending on your class and

where they're at with the understanding and what they need help with. So, I guess those things are the areas where you can see differences. (Elizabeth)

Somewhere in between, teachers found room for meeting their students' needs while being faithful to the MAP program by adding differentiation after state testing.

Teachers have to be more creative, and if you're allowed flexibility with MAP, it does give it to you. The pacing itself sometimes gets in the way. That's the pressure teachers have. But, not all kids will get it, they need more time. I think the only thing that helps with MAP is the backend of it, third trimester there is more flexibility during the review. (Michael)

You have to do the hybrid. And MAP also has that math facts component to it. I'm now tweaking it at the end because the repetition and so forth wasn't doing it for kids. So, for a handful of them and I had to get those memory jogger cards, where it has little stories that go with it. (Sarah)

It was evident that teachers with more years of teaching experience tended to modify MAP to tailor it to their teaching. Some of them spent just enough time to learn the program and implement it, becoming familiar with the program for the purpose of dismantling it. As a BTSA coach and a National Board certification master teacher, Margaret understood the difference between the needs of teachers who are new or have a weaker grasp of teaching math and the needs of teachers who are veteran or have a stronger grasp of teaching math. As she saw herself as a veteran teacher who excelled at teaching math, she never implemented MAP the way it was designed. Both her administrator and coach allowed her to deviate from the program from the onset. As she was nearing the end of the first year of MAP implementation, Margaret drew parallels between MAP and Open Court series, which was adopted by the district as the English Language Arts textbook for elementary school.

The unfortunate thing right now is the math program. That's what kind of scares me a little about it, is *this* [MAP] is the math program. It's not like the supplement and teachers are being taught to teach this way and it is the math program. The textbook that was just newly adopted was adopted because it aligned with this program. So, *this* is the math program.... (emphasis in the original)

Margaret described how certain teachers, new ones to the profession among them, would lean on MAP as “crutches” in their first years of teaching.

The new teachers feel that way. The ones who are fresh off the mill, they feel that way about Open Court⁴ because it is there. You don’t have to think. You just say it. They glom onto that. The pacing chart, they don’t know what to do without a pacing chart, which kind of is degrading about teachers. You should be able to know what to do without a pacing chart.

Margaret also added that veteran teachers “do a lot of sneaking in on the side. Like any teacher with lots of years of experience would.”

Teacher’s belief in modifying MAP is directly related to the way they see themselves as caring teachers. Throughout the interviews, all teachers mentioned that they carried out their practices out of their belief that they needed to do what was “best” for their students. Based on their students’ responses, some teachers continued MAP implementation as a whole. Michael saw the increase in his students’ test scores while Mary stated that her students now “loved” math because MAP “helped them focus” and gave them a “purpose.” Jessica justified the struggle of closely implementing MAP based on the way her students tackled “difficult” questions on the state tests.

By the same token, “caring” teacher identity urged teachers to modify MAP. Charles saw his students reverting back to counting with their fingers after he implemented *It’s All About Facts* portion of MAP. So, he quickly abandoned that method and went back to the way he was teaching math facts. Mary saw her second graders struggle with all the different parts of journal entries and decided to eliminate writing down objective and purpose or journaling problems of the day. Teachers approached

⁴ A former district-mandated English Language Arts textbook for elementary schools. The publisher had trained the district ELA coaches, who in turn provided PD for all the teachers for textbook adoption.

MAP implementation differently, all because of their seemingly singular identity as caring teachers.

Research Question Two

How do teachers describe changes in classroom practice as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?

Although MAP2D was initially offered by the district as a voluntary PD opportunity for teachers, all of the teachers acknowledged that their participation became mandatory once the site administrator chose to participate in MAP2D. Some teachers chose to implement parts of MAP while some chose to implement MAP in its entirety. Some chose to modify MAP while some chose to carry out MAP faithfully to its design. In any case, teachers' classroom practices changed due to their participation in MAP2D. This section explores two main changes to classroom practices that teachers instituted due to MAP implementation—following the MAP pacing guide and using multimodality in their math instruction.

Changing practices to follow MAP pacing guide. All of the participating teachers had experienced difficulty with the district's standard pacing guide that all teachers in the district were expected to follow. Adherence to the pacing guide was enforced through district-designed unit assessments that were given during a set opening of time. Answers to the assessments were in multiple choice format since all the scantrons were sent to the district office, where the research office collected and analyzed the data. The analyses were then sent back to the teachers, site administrators, and appropriate district administrators.

Teachers found that the traditional pacing guide and the grade level textbook were not aligned, resulting in difficulty navigating the materials, sometimes necessitating the creation of an entire set of resources for the unit. In addition, teachers lamented that they struggled to meet the pacing guide.

It was always hard for me to keep up with pacing because there was just so much that we were required to teach by the end of the year. By the third grade, students are required to do multiplication but by the end of the year, we still hadn't taught multiplication or division. So, on the CST, I mean they miss all those questions, so I think the district pacing was just too much, and I couldn't keep up with it. (Patricia)

The pacing guide was terrible. It was a chasing guide. I never caught up to it. Then the last month of school is when you finally taught long division and multiplication, like multidigit, like 12.75×4 , but that was on the state test two months before. It made no sense. You didn't teach it till the end. I didn't teach multiplication and division facts until the last couple of months of school. I started cramming on the multiplication facts right before the state test. I was a first-year teacher. I didn't know what to do. I just did what everybody else told me to do and what the chasing chart said. I was chasing it all year. I never caught it. (Susan)

Implementing MAP granted teachers with a new pacing guide and its own set of resources which followed the order of concepts presented in the MAP pacing guide.

Teachers no longer needed to consult textbooks. Margaret noted that “the pacing of it has evolved into a more logical progression that makes more sense. Not only to the teacher, but to the students. It makes sense that you do these things.” Elizabeth commented that

when things fit together in a logical way, it's a more of an extension of what you're learning, so for instance, rounding, if you're doing rounding to the 100,000th place, and you're gonna be doing the rounding to the millionth in the later part of the year, then why not just kind of put them together?

Elizabeth also added that the new pacing guide was designed to allow student mastery, rather than covering all the materials before state testing. “The reorganization of pacing, it's, you know, we can teach them the mastery now, that's the idea. Here, it's just,

I've got a solid understanding of this, and now we can move on and do something else.” Furthermore, Elizabeth attributed the boost in student confidence to the new pacing guide. “It really helps for pacing to keep things together, it really helps with their understanding and their confidence. They feel better about... okay, I learned this, I'm solid with this and I can move on.”

On the contrary, some teachers critiqued that the new pacing guide, while ensuring that all concepts were covered before state testing, did not offer enough time for students to master a concept.

So, I understand the purpose of trying to get all the information in before the state testing. I think there are some subjects that we do not spend enough time on for them to grasp the concept of it, because you have to rush through it and meet the deadline and get your trimester tests done and your practice test done and your analysis and so forth. So, there are certain subjects that you know you have to go back and reteach after the state test, so that they have a better understanding of it. (Sarah)

Sarah's critique is more in line with critiques of pacing guides in general. The importance of a pacing guide is two-fold. Firstly, students are assessed by state tests toward the end of the traditional school calendar. Before the testing date, students need to learn concepts laid out in the state standards. A pacing guide offers how much time can be allocated to concepts in order for students to be exposed to all of them before testing. The general function of a pacing guide is to proffer teachers how much time is spent on a particular unit.

Secondly, the pacing guide's role as merely an informative resource changed into a mandate when the district assigned unit and semester/trimester assessment. Districts suggested a window of time in which the assessment, in multiple choice format, should be administered to students. The data collected through the assessment was tabulated and analyzed by the district research office, and the results were sent to site administrators

and individual teachers. Teachers then engaged in data analysis based on the assessment results—sometimes as a grade-level unit, sometimes as an entire site, or as one-on-one meetings with the site principal. Although there were no certain consequences set by the district, teachers perceived pressure to meet the assessment administration deadline and to show their students' mastery of the concepts through test scores. In addition, teachers detested the interaction with their site administrator in the event that they did not meet the deadline.

[The assessment protocol would state] “November 20th. Administer trimester one exam.” [Our coach] is really good about saying, “You know what, that is a window. I’ll talk to your administrator. Let her know it’s a window.” Because teachers freak out. “Well, it’s November 20th, and I have to give the test now.” We have administrators who are, “On this day, you have to have it.” Then that means that everything that falls behind. It has to be at a certain pace because if you fall behind, you are not gonna make that mark. And some principals say certain things that make you regret ever getting into this profession. (Margaret)

Due to its link between district assessment and ultimately state testing, some teachers viewed the pacing guide as restrictive when considering meeting their students' needs. “You’re on a paced timeline, and even in here it will tell you, like, when you go in here” (Margaret). Even though some teachers commented that differentiated instruction could be woven into different components of the program, some teachers contradicted the notion. “It has changed my teaching to where I feel a little more restricted in my ability as a professional to make the appropriate decisions for my students and to meet each kid’s needs.” (Margaret)

Michael and Mary both added that even though the MAP pacing guide was far more forgiving than the traditional pacing guide, it still did not allow them to meet the needs of all students. Michael lamented that even with his classroom management skills, it was difficult to have all of his students on task while he was working with the

“neediest” students during independent work time. Mary questioned the time given within MAP to differentiate for students.

One size does not fit all... But there is room for you to modify a little bit here and there, although it’s a very small amount of time that you could do during independent practice. Is that enough for you to get across what the kids need to learn? (Mary)

However, some teachers discovered ways to meet both needs—to adhere to the pacing guide and to help students who did not learn the concept when it was first introduced within the guide’s confinements. Teachers discovered that the pacing guide gave them latitude after state testing in May, free of unit assessment. Some teachers only had a month, while teachers in year-round schools had until the end of July, of elbow room to teach what they saw was necessary to reach all of their students.

I have kids who love to draw pictures or artists who love to create with their hands. I can do things like that. We use a lot of Kagan strategies⁵ so that kind of helps some of those kids.... We tend to lose those strategies that work. I think MAP2D, since Long Beach is so well trained in Kagan strategies, incorporate that a little bit. See what works. That’s the only piece I would like to add to MAP2D, it’s more hands-on, or supplementary [activities]. (Michael)

...You have to rush through [the pacing guide] and meet the deadline and get your trimester tests done and your practice test done and your analysis and so forth. So, there are certain subjects that you know you have to go back and reteach after the state test, so that they have a better understanding of it.... This is where I go off a little bit, when I do have some free time, you know, like a half hour or something, I have made up math games that review the concepts that are difficult. I have rounding games. You know, it’s ridiculously difficult for the third graders to come in and start rounding to the thousandth. I have games that I've taken that are set up like the state test questions and stuff and they make cards, all different things and games that reinforce what they do...They are educational games. They think they're games and they're actually learning. (Sarah)

Changing practices to include multiple modalities. Teachers noted that MAP2D transformed their classroom practices to include multiple modalities of student

⁵ Kagan Structures is another professional development program provided by the district to all of the teachers. Kagan Structures aim to engage every student through different participation activities and cooperative learning groups.

learning. The program enforced multiple parts in one to one and a half hour lessons each day, and each lesson was designed to include listening, reading, writing, and speaking. When a teacher closely followed the guidelines of the lesson plan, students used all of their modalities to learn and practice math skills.

The first time I will write it on the board. I know we have three facts for the day, but I'm only going to introduce... one at a time because it's just too much to put three facts on the board. So, I'll have my students stare at me and watch, and I'll say, "okay, class, I'm going to introduce the first fact to you. Our first fact is $2 \times 3 = 6$." So, using the commutative property, and I've already taught them that word, "I know that $3 \times 2 = 6$." I have them read it both ways – since $2 \times 3 = 6$, then $3 \times 2 = 6$. We read it a few more times. Then I have them close their eyes and visualize it in their heads, and we say it some more. Then we open our eyes, and we go ahead and write it in our journals or write it and say it using the commutative property. Write it and say it, write it and say it, and I watch. Once they have it about 12 times—some of them get a lot more because they're really serious about that writing—I have them draw a line and put their pencil down. Then I do the next fact, and we do the whole thing. (Susan)

Teachers credited the use of multiple modalities for cementing student learning.

Many teachers saw the value of students keeping journals and small group discussion that would amount to a class presentation. Even those who ended up not adhering to the entire program chose to keep the presentation portion of the program intact because it held students accountable for their learning.

It just solidified the idea that if you have enough understanding to teach it to somebody else then you've got it, you've mastered it. I've also a kind of picked up on the fact that, and we've talked about this before, that when students explain to each other, sometimes it's easier for them to understand than it is to internalize it from a teacher's presentation. (Elizabeth)

Teachers stated that presentation, although difficult to implement at first, provided unexpected benefits for students to engage with their peers and solidify learning.

There are a lot of kids who are scared to death to go up and talk in front of the rest of the class. Culturally, there are a lot of kids who are taught to be quiet and you don't brag about what you do. It's a different thing. So those are the parts of MAP, that whenever it works, I use it, and whatever doesn't work, I set it aside and I try it again next year, and if it works, it works, and if it doesn't, then it

doesn't. Certain things always work and I like those [presentation parts of MAP].
(Charles)

Jessica even cited a way her colleague, another MAP2D participant outside of this study, made modifications to accommodate his students:

Somebody I just saw last week; he has a cue card of all presentation so when kids get stuck then they would look at the card and he has five or six steps. They would say "I agree, because..." and the other was "I disagree, because..." and the third one said "I don't think it's right." It was like a prompter. He had a part so they could just look at it if they got stuck, and I told him I was going to steal his idea for my class.

Jennifer countered that even though the element of small group work was beneficial, it was difficult for her second graders.

That has not worked for me. It hasn't, to be honest. I noticed that either there are some kids that finish really early and are done in a flash and they're supposed to do their math book, but that's even easy for them. And there are some that are really struggling. I don't know how to juggle both without running out of time and not moving on with the day. That is something I'd have to be shown how to do that. I don't find that successful. Talking to other colleagues, they struggle with that, too.

Although some teachers touted the benefits of multi-part lessons that ensured multi-modality, some commented that most of what the MAP lesson format presented was what good teaching looked like to begin with; the MAP lesson outline was suited for an inexperienced teacher, or someone who needed improvement teaching elementary math. Barbara touted the MAP lesson design as "awesome" that after teacher modeling, students try to solve problems independently before meeting in their small group to discuss with other students. She cherished those "teaching moments" where she could lead students to ask "How do you teach the person in your [group] the answer?" rather than "Tell them the answer." However, Margaret and Charles countered that such strategies are part of "just plain ol' good teaching," not an exclusive portion of MAP design.

It is important to note that all teachers reported changes in their classroom practices. Some decided to follow MAP format after witnessing their students achieve, whether in the classroom during lessons or on the district assessments or state tests. Some changed classroom practices because of the mandate set by the sites.

Research Question Three

Based on teachers' experiences in participating in MAP2D training, what are the factors that contribute to teacher change?

While teachers attributed many factors to changing their classroom practices and their knowledge and belief in elementary math education, interview data revealed that these factors fell into broader categories. The pacing guide played a central role in changing teachers—as teachers taught according to a different sequence, their stance on how students learned math skills and concepts changed. While the pacing guide led to changes at the classroom level, teachers' situatedness in their environment led to changes as well. As teachers interacted with site administration, coaches, and their colleagues, their experiences contributed to changes. This section discusses factors in addition to the MAP pacing guide that affected teacher change: school leadership, collaboration with colleagues, site-dedicated coaches, and establishing relationships with coaches.

School leadership. In Long Beach elementary schools, principals are in charge of approving site-based professional development. Principals have the latitude to mandate programs such as MAP for a grade level or for the entire school, while most choose to ask teachers to volunteer for piloting such a large-scale PD as in the case of Barbara, Charles, Elizabeth, Jennifer, Jessica, and Patricia. Teachers reported that MAP2D training specifically targeting principals benefitted their MAP implementation.

Most of [the principals] had training. Most, not all. The principal last year had training. It helped. If I need help I can go see her. I can say I'm not sure how to do this lesson. So, that helps.... Principals being trained helps because they know what they're doing. Support is there. The phone call and email way, it's there. (Michael)

When the principal was not trained, teachers noted the lack of it.

Our principal is really nice—if you ask her if she can do something for us, she would do it. I don't think she even knows that much about what MAP is. I would have loved if she would've come to the whole training and came and taught a few lessons. Not because she didn't know how to do anything. I'm sure she knows how to do everything, but I think it would have been really good for her to just see how the structure goes so she would know when she came and saw what people were doing, what they really were doing. (Jessica)

Sometimes, as in the cases of a few schools in this study, administration turnover affected MAP implementation. Some teachers had principal turnovers while MAP2D was in its beginning stage at their sites. Charles remembered that his old principal, a former math teacher and district coach, was a hands-on administrator who extensively worked with new teachers. She had secured everyone's commitment before bringing MAP to the school. Being known as a cheerleader for teachers, the principal was very visible in the school, making classroom visits and leading teacher focus groups to improve classroom practices.

When she retired, we got another principal who comes in at 7, leaves at 5, and doesn't do half as much as our old principal. At first, we were like, great, because our old principal, whenever she saw something new...she'd always be throwing new things at us. So, when our new principal came, she sat back and said, "I'm gonna see what's going on." We were very happy about it and we realized, she doesn't do anything. She collects data, that's what she does. We went from one extreme to another. We were forced and encouraged to teach in a certain way and now we're assessed by data. (Charles)

[The old principal] was really into math, like, she was just a math person and she even taught us how to do—like, she had a very strategic way of teaching math facts.... She had a very specific thing that she was looking for when she came in to observe and she always wanted to see math, so that also helped it to grow. The new one, not so much. Principal checks our schedule and comes in and sees if the

schedule matches up with what's on the board. Second time she's been in my classroom for the past 3 years. (Jennifer)

Barbara echoed Charles's and Jennifer's concerns that the lack of active roles her principal took affected MAP implementation at her site.

Regarding MAP, we're pretty much absolutely left alone. I would like some feedback, but I'm not convinced if she, I don't know if she has been trained, so I don't know if she has the ability to give us accurate feedback on the program.

However, even with supportive principals who were trained in MAP, teachers deferred to the site MAP2D coach for assistance. Mary shared that even though her principal is very familiar with MAP, she would first reach out to the coach, because her "principal is not the coach."

Whether they sought support from the administration or not, teachers were more at ease implementing MAP when principals allowed flexibility. Margaret stated that the flexibility from her site administrator allowed her to implement the program as she saw fit, as she was initially hesitant to adopt MAP.

Well, it depends on how extreme the administrator is being with the program. In some schools it was being used in such an extreme manner there was no wiggle room at all, the cases where you have to be on this lesson at this time on this day. In other cases, the interpretation is a little more, you know, this is what you need to do, this is the assessment that you have to give, these are the [journals] you have to keep, but you can adjust to the needs of your students.

The degree to which teachers sought principal support varied even within a site regardless of the principal's competency with MAP. In general, participating teachers preferred their principals be trained in MAP so they could seek help from their administrators, while some noted that since MAP2D coaches were available, the direct support from principals was not necessary. However, teachers identified the importance of site administrators' familiarity with MAP2D, from its induction to maintenance, as principals managed resources and supported changing classroom practices.

Collaboration with colleagues. Most teachers shared that the first point of contact for MAP implementation was neither their site administrator nor the coach assigned to the school; it was their colleagues. Mainly left to each school's discretion, Long Beach elementary schools created master schedules to allow common planning periods specific to the grade level, which were well utilized by teachers as part of MAP2D support. Most teachers reported having professional working relationships with their grade level colleagues. Jennifer described a strong bond among the grade level teachers, stating, "[we are] very lucky we have a really great grade level and, you know, we put stuff in each other's boxes and 'here, do this,' and 'here, do that.'" At the same time, some teachers admitted that the presence of a dissenting voice in such a small group was difficult.

Some of us, a lot of colleagues are so self-centered, it's one way and their way. I've worked with a couple that say "I don't think that way," "I can't teach that way." They don't give it the opportunity.... We may not get along personally, but professionally they are there for each other. (Michael)

I definitely think discussing it together is really helpful, but I think in our grade level there are people who have such strong ideas about how they think things should be done that I think it would be really hard because they would say, "I'm not going to do it that way; I'm going to do it the way, I already did it." (Jessica)

Some teachers noted the benefit of cohesion amongst teaching staff during MAP implementation.

If you had somebody struggling, it would help to have everyone in the entire school doing the same thing and so they can go to anybody.... You can go to anybody and say, "How did you do this," or "how am I supposed to do this," or "my kids bombed this test and I don't know what to do about it." So, there's a lot of support. That really helps. (Elizabeth)

Elizabeth's comment illustrated that the collaboration went beyond the grade level and spread through the site when the entire site carried out a single PD program.

Leaning on each other for support functioned as a supplement to coaching when the coach assigned to the site was not meeting the teachers' needs. Some sites experienced a coaching staff shortage due to MAP2D's rapid expansion within Long Beach and into a partnering district. When a new teaching staff joined the school and there was no site-specific MAP2D coach, colleagues lent support. Teachers described how colleagues stepped up to help a new inductee when the coach at their sites abruptly left to support other schools with brand new MAP2D teachers. Jennifer stated that new teachers at her site relied on the collaboration of the team, which was echoed by Elizabeth.

A lot of us started together, and it was kind of like we'd come together and figure this out, because the first year was a little bit...difficult... It kind of brought us together. And then whenever we have somebody new, it's like we're already together, we know what's going on, and we're gonna be together and help this new person. We had two new teachers this year, and it was a pretty smooth process.

Elizabeth further illustrated formation of community in the school via MAP implementation and how the veteran MAP teachers bridged the needs between coaches and new teachers, helping them establish MAP in their classrooms.

If there is a new teacher coming in, then it's up to you to train and accommodate them...So we give them information, we let them know, "okay, there's a training for teachers doing MAP2D on this date" and we're in contact with [the former onsite coach] all the time, so they provide us with anything we need. Pacing charts are online.

Having a MAP2D coach dedicated to the site. Although most were internally motivated to follow the curriculum, some teachers credited coaching, in general, as the most important asset in MAP2D. Coaches functioned as a bridge, connecting the teachers to the mission of the district to implement MAP as designed, because they disseminated information, led workshops, designed assessments, and collaborated with teachers to plan lessons in addition to modeling lessons in each teacher's classroom per request. In any

case, teachers noted that the community-building aspect of MAP2D, while not a specific goal of PD, affected their perspective as being part of a community of learners. Although all teachers were already a part of the grade level cohort at their site, MAP2D sometimes transformed their grade level teacher group into a support group as they exchanged MAP-specific materials. In addition, some teachers shared resources outside of the grade level MAP2D meetings because they wanted to keep consistency across the grade levels at their site (Barbara, Elizabeth, Patricia). Some teachers shared their materials with colleagues at other MAP2D-participating schools in the district (Jessica, James). Michael, in particular, was vocal about how observing teachers at the next grade level, even sixth grade at middle schools, helped him see what he needed to do so his students were prepared for the next level.

Another aspect of the community-building experience through MAP2D participation stemmed from shared experiences of being in a pilot program.

I do remember it was hard, for some people, the first year. But it's just, like with any kind of change, it's just kind of, do your best with it and try to accept and embrace and change with it, instead of fighting it. But you see the results and you see how students respond to it and how the other people and staff respond to it. And it kind of created a culture here, positivity towards MAP2D, and I think it's very rare for that to come out. (Elizabeth)

In some schools, a lack of coaching made room for increased teacher involvement. Pilot schools were weaned off coaching as they were considered “veteran MAP2D” schools (Patricia). MAP2D teachers would then help colleagues new to the site or new to teaching. Elizabeth shared that new teachers at her schools were taken in by experienced MAP teachers so they could implement MAP with relative ease. James had experience being a model MAP teacher and training new teachers at his site. James stated that those experiences made him a “stronger MAP teacher.”

As MAP expanded to a collaborating district in central California, teachers began to notice diminishing resources, including the number of hours a coach was dedicated to their sites (Jennifer, Susan). Some teachers attributed commiserating as a way of building community.

So, we were used to making things up on our own and creating our own work and working as a team and helping each other. Sitting down and complaining when things weren't going right and solving problems together. So, the MAP thing just fit right in with what was going on in our school. (Susan)

In certain cases, instructors were asked to serve as teacher-coaches when the coach assigned to their site became unavailable. (James, Michael)

Positive relationships with coaches. As noted earlier, MAP was broadening its reach within the district, as well as into a different district, at the time of data collection. In the meantime, California was experiencing a budget crisis, which impacted schools with funding cuts. Caught between an expansion and a hiring freeze, MAP teachers faced coach shortages in addition to the elimination of MAP2D resources, such as a paid release time to visit other MAP teachers and schools, compensated workshop attendance, and summer refresher courses. Schools new to MAP were given priorities in terms of coaching hours, and when a school managed to retain a coach, the hours were spread thin across the teachers. Some became concerned that diminished resources would hinder MAP implementation.

From my understanding, [our coach] is not going to come back or anybody because our school does not have the funding for it... If it's going to stay. Not just for me, but for others. I think if we don't have a coach, it's not the focus of our school. People are going to do whatever they feel. (James)

Jennifer reported that when an existing coach became absent for an extended period of time, there was no permanent replacement dedicated to the site. Instead, a coach who was already at a different site was dispatched and visited her irregularly.

We didn't have very consistent coaching. She did kind of pop in and out. At the end I felt like she wanted us to still have really good results, but I am kind of like, you weren't really here. You weren't really here, so we are kind of figuring things out on our own. You're juggling everything else on top of that.

In some cases, the district relied on a few MAP teachers to act as part classroom teacher and part coach. These teachers were often lower on the seniority list and had less classroom teaching experience in the district compared to some of the participants in this study. Coaching offered by these part-time coaches was deemed lacking in quality. The reason for such discontent was not due to these part-time coaches' relative inexperience teaching, but due to their inexperience implementing MAP in the classroom.

What doesn't make necessarily sense is that at first, we had all of these coaches who really knew what they were doing, and then later on the coaches that started to be hired were people who did the program for a couple years, and then they come in and then they're going in and telling experienced teachers what to do? (Margaret)

Furthermore, teachers found some interactions with coaches demoralizing due to the disagreement between their view on meeting the students' needs vs. improving their performance on state tests. Jennifer specifically pointed this out using a sample of her students' assessments. Most of them were second grade English language learners and struggled to read calendars on the unit assessment. Only 2 out of 16 students had chosen the correct answer in a multiple choice test. When Jennifer consulted her coach, she was told not to reteach the concept because "it's not on the test." Jennifer shared that she found the interaction "disheartening" and became a skeptic of the entire program.

Despite occasional negative interactions with coaches, teachers found coaching overall to be a crucial part of MAP implementation.

It's a hard program to learn. It's tedious. There are a lot of details with this. With the whole district doing that, I don't know if they are even going to have coaches. I don't know if they can afford to have the coaches. Hope they do,

because I know some people don't like coaches, but I love coaches. You have to have somebody where you can ask some things. (Jessica)

On the other hand, some teachers found coaches who were compatible with their needs, whether that meant getting more support to implement the program as written (Barbara, Elizabeth, James, Mary, Patricia) or to adjust for their students' needs (Margaret, Susan).

I really didn't understand any of what I was doing. I was just doing it to try it. There were days where that one-hour lesson structure really would drive me crazy. [My coach said], "you have to go with the flow sometimes. It's going to take a little more here and a little less here." Once I was given that freedom to modify and adjust based on my knowledge of education and my children and their skill level and what they're getting, it was like, "okay, I get it." I was trying to fit everything into this rigid little one-hour framework. Once I learned it was a guideline, and this is how you work with it and incorporate it and do it, it made my life so much easier. (Susan)

Some participating teachers expressed that having a perspective in common with the coaches acted as an incentive to change. They emphasized that even though implementing MAP in the classroom was sometimes frustrating, especially in the beginning when they were just introduced to the program, or in the beginning of the year when they and their students were new to the program, their coaches helped them stay the course.

My first year, I was a little more apprehensive—there were some things I didn't know how to go by. I emailed her and she came in and taught the lesson for me. I learned. Next time she came, we did the reviews and built on that lesson and so forth. I feel comfortable that I can just ask her and she'll come in. (Michael)

In some cases, coaches earned teachers' buy-in by allowing modification to the program. Most teachers had stated that "no one program fits all students" and made changes to MAP when they saw fit. Even the ones who adhered to the program faithfully admitted that they planned on modifying it, now that they had neared the end of the first year of implementation and felt "comfortable" with the program (Jessica). Some coaches were praised as they supported teachers to meet their students' needs rather than strictly

conform to MAP. Since her principal gave Margaret permission to modify MAP however she wanted, the coach assigned to Margaret's school did not come into her classroom after the initial month of implementation. Instead, the coach just left supplemental materials in Margaret's mailbox whenever at the site.

Considering that a coach served a school for multiple years once the site adopted and funded MAP, it was critical for coaches and teachers to develop rapport. The studies show that while coaching is an effective part of PD that would lead to the change in practices, building positive relationships between teachers and coaches is a vital part of that success (Aguilar 2013; Batt, 2009; Cheliotis & Reilly, 2010). Participating teachers indicated that such compatibility was a bolstering factor in changing their classroom practices.

Common Themes

Common themes emerged from the teacher interviews. All the teachers credited the switch from the traditional pacing guide to the modified MAP pacing guide as the most important factor for buying into the program and continuing implementation. Switching the pacing guide itself was a program-wide change in classroom practices, regardless of the degree of modification to MAP teachers enacted. As noted earlier in Research Question Two (How do teachers describe changes in their knowledge and beliefs as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?), almost all the participating teachers cited the MAP pacing guide to be pivotal in meeting both student needs and state standards. They stated that the way MAP sequenced concepts decluttered the pacing because it reduced the need to spiral back to the previously taught materials. MAP pacing arranged units linearly so each skill,

whether it was adding fractions or finding the surface area of a circle, could be mastered before introducing the next skill. Spiraling, in their view, necessitated a substantial amount of time to review or reteach subsequent skills (e.g., reviewing fractions and addition prior to teaching fraction addition). Teachers reported that this spiraling often exhausted a bulk of their math time and found the MAP pacing guide useful since it removed spiraling.

Discussed in Research Question 1 (How do teachers describe changes in their knowledge and beliefs as a result of MAP2D participation, and what role do their experiences in MAP2D participation play?), teachers altered MAP even though they understood the main objective of MAP2D was to maintain program fidelity. Whether to improve student performance on state testing or to ascertain students' mastery of skills, teachers were cognizant that a single method or program could not meet the needs of all students. Teachers necessitated modification to *any* program in order to differentiate instruction, therefore altering MAP to fit their students' needs in different ways. Some utilized the time after state tests to revisit and reteach the concepts that many students had not mastered earlier, while some used the time for different strategies other than what MAP prescribed. Some participants embedded differentiation within the structure of the MAP routine to address different student learning preferences. Teachers like Elizabeth rotated different items from the item banks to diversify daily practices and assessments.

Most teachers utilized strategies from other training and programs to modify MAP. Long Beach had invested in numerous PD programs, some short-term and some long-term like MAP2D, and teachers had been trained in diverse strategies over the years. Throughout the interviews, it was apparent that even with MAP2D, teachers blended

various strategies to tailor MAP for their students. Jennifer used a different math program to supplement what she thought was lacking in MAP. She lamented that single method programs like MAP stripped her of her professional judgment. Margaret echoed that using such a program was a “professional downgrade.” To many teachers, the analogy of professional development as adding tools to their toolbelt was appropriate.

I’m just gathering my tools for my toolbelt. I’m not going to change my whole toolbelt. It took me years to make that toolbelt to be mine and for it to fit me. I can’t change that overnight or even over a year. (Charles)

Teachers viewed MAP as a conglomerate of strategies that they could take apart and use separately as they saw fit. Charles added that he approached PD so he could pick “what works the best, like the nugget, and get rid of things that are silly or redundant or too time consuming.” This sentiment was echoed by Jessica. Having the most years of experience, yet being the most novice at implementing MAP, Jessica stated that she followed the program as closely as she could. As the first year was coming to an end, she was looking for ways she could modify the program to fit her students’ needs for the upcoming school year.

Veteran teachers like Margaret pointed out that programs like MAP tended to be too confining for teachers who had many years of experience in “gathering tools,” as Charles put it, and was better suited for teachers “having something that is tangible to teach.” Sarah and Charles added that their lives as teachers were inundated with changes that might not be mandated for more than a few years at a time. This added to their argument that every PD was a mere opportunity to gather tools and strategies as components.

I’m an old enough teacher to know that whatever is coming in this week, it’s gonna go out in the next couple of weeks. So, you take from it what you like and because everything that comes up, there’s always a little nugget and you go, wow,

that's a good idea, and you deal with the rest or you ignore or do whatever.
(Charles)

All teachers stated that they taught the way they did, anywhere on the spectrum between closely following the program to completely abandoning the entire program, because they deemed it the best way to teach their students. Among those who deviated from the program, some mentioned that the way MAP facilitated learning did not prepare students to be successful mathematicians later in their school career (Charles, Margaret), while some plainly said that a higher test score attributed to the program was misleading students and parents to think that students actually knew math concepts even though they only knew how to test well (Jennifer). The same facets of MAP curriculum and its direct result were touted by those teachers who faithfully implemented the program. Some viewed that the program was setting up a solid foundation for students to become proficient in math (James, Mary), while some appreciated how students felt confident about math after receiving high scores on various assessments (Elizabeth, Mary).

A part of the reason why I was so onboard with the program, because I saw it was an opportunity for students to learn more and take pride in their work and set goals for themselves and just understand. I think they want the best for their students, I want the best for our students and I was ready to go forward with that.
(Elizabeth)

Elizabeth represented why teachers agreed to participate in MAP2D. Even though some teachers bemoaned that MAP2D was mandated at their sites (Margaret, Sarah), most were open to the change. Elizabeth further explained the role of teachers' concerns for their students as the reason they continued following MAP, which, in her opinion, gave teachers room to be "creative, yet structured" while helping students to "maximize their learning and their understanding."

Even those teachers, who volunteered, exercised their professional judgment to decide whether to discontinue implementation or to implement the program as a whole or in pieces, because it was “best” for their students. In certain cases, teachers trudged through program implementation and waited for the end of the school year to make a decision. They wanted to implement MAP the way it was designed to explore the benefits of the program and its suitability as a part of their teaching toolbelt. When they saw the need to modify MAP to meet their students’ needs, they followed their professional judgment as teachers rather than the recommendation of their administrators or coaches. Jessica stated that because she and her colleagues adhered so closely to MAP, they were able to judge the program as is and select parts of the program for use next year.

Charles summarized the discrepancy between how MAP, or any other curricula that dictates implementation fidelity, views student learning and the reality of teaching to meet students’ needs.

[Teaching] with one methodology, everything you get from the district and everything you get from your coaches, is just a... kind of in an ideal world. It’s a theory. And you gotta just take what you can and work with what you can and bring on what you can later and throw away what doesn’t work. They should tell you that right from the get go. It’s just a theory and isn’t necessarily written in stone that it’s the best thing in the world. If you’re not teaching with the interest of your children in your mind, then you shouldn’t really be in the classroom in the first place. And you won’t be in the classroom very long because [your students] will figure it out and your life will be very miserable after that.

Based on individual teacher interviews and clarified research questions, common themes emerged, as well as factors that facilitated teachers’ implementation of MAP in their classrooms. At the core of all professional development goals is the alteration of teacher practices, whether the change takes place immediately or in the future. Different themes explained some teachers’ willingness to change their practices, as well as other teachers’ hesitation to fully or faithfully implement MAP. The reason for the degree of

compliance varied. However, the degree to which teachers changed their practices was rooted in the commonality shared by all the teachers who participated in the study: They all cared about their students.

Chapter V

CONCLUSION

This study highlighted the experiences of a group of teachers who implemented the Math Achievement Program (MAP) in Long Beach Unified School District through participation in MAP Professional Development (MAP2D). Specifically, the purpose of this study was to document changes in teachers' knowledge, beliefs, and classroom practices as a result of MAP2D participation. In addition, I aimed to explore factors leading to teacher change as they implemented MAP—a district mandated math program.

The design of this qualitative study involved a series of in-depth interviews as 12 participants were implementing MAP in their classrooms. A profile of each participant was constructed using transcribed interviews. Profiles served as rough sketches of the teachers, giving a glimpse into the world of their teaching, all revolving around their participation in MAP2D. This process can be analogous to filtering the experiences of these teachers through the lens of their MAP2D participation. Profiles were crafted using the voices of the participants. Based on the categories and codes which emerged from the interviews, I organized themes to represent the data: what teachers had to say about student learning and achievement in elementary school math, how they experienced MAP2D as professional development, and their accounts of MAP implementation related to student success. These themes helped identify, based on teachers' experiences, the conditions for supporting teacher learning and professional development. In addition, these themes provided insight into teachers' beliefs and perceptions about implementing

a program that was developed to support learning and retainment of elementary-level math concepts and skills.

This chapter discusses three findings about teacher changes interpreted through the concept of caring by Nel Noddings. Based on the interview data in this study, teachers reported changes in their knowledge and beliefs, as well as classroom practices, as a result of implementation of MAP through MAP2D participation. The first finding shows that fidelity of program implementation does not correlate to teachers' caring about their students. A second finding is that teachers rely on the district's pacing guide to navigate the state math standards, even if they knew the pacing guide would not resolve the issues of meeting students' needs. A third finding is that teachers' professional identity played a significant role in program implementation. Implications for teacher learning and professional development draw from the conclusion that, despite following all the indicators of effective PD design, MAP2D was not generating the fidelity of implementation as expected. A lack of consideration for the role that a teacher's professional identity plays in PD and program implementation, and the relationship between a teacher's identity and PD were explored. A critique of this study and a discussion of the implications for research conclude this chapter.

Finding One: The Role of Caring in Program Implementation

In Noddings's conceptualization of caring, "caring-for" students significantly differs from "caring-about" students because of its situatedness in everyday interaction with students (2003). While federal and local governments shape and mandate certain policies because they care *about* students, teachers execute those policies in their

classrooms as they care *for* students (Noddings, 2005, 2015). In this view, responding to students' needs is caring, performed by each "one-caring" teacher for her or his "cared-for" students, a conscious act for the sake of their students situated in a relationship between the teacher and themselves (e.g., Danielewicz, 2001; Friedman, 1993; Noddings, 2005, 2015; Owens & Ennis, 2005; Strike & Soltis, 2009).

In this study, every teacher expressed caring for his or her students. Their caring propelled them to participate in MAP2D, initiate changes in their teaching practices, and alter the program. As Noddings pointed out, the virtue of caring differs from caring as defined in care ethics, in which caring is described as a relation. Without a response to that caring from the one who is cared for—in this case, students—a caring relation does not exist. Caring that participating teachers revealed was reciprocated by their students' feedback—verbal approval of the program, high achievement scores, increased independence with MAP elements, and visible struggles with learning concepts due to lack of time or visual representation of information. None of the teachers could completely abandon the program in its entirety because MAP was mandated in their schools. The obligatory implementation of MAP, when conflicting with teachers' prerogative to meet student needs, resulted in teachers modifying the program to fit their individual classroom requirements. All of the teachers acknowledged the benefits of using MAP to varying degrees, but their commitment to caring for students took precedence over the mandate of program implementation.

This underlying role of caring in teachers' decision-making has been at the core of Noddings's writings about caring. According to Noddings,

all teachers to do their best work according to their own legitimate philosophy. I emphasize *legitimate* philosophy to acknowledge the fact that reasonable people

can differ on important elements of educational philosophy but that any *legitimate* philosophy is well-considered, guided by a justifiable conception of the good educationally defensible, and compatible with the principles of liberal democracy. (2005, p. xvii, emphasis in original)

In this vein, those teachers seeking to change MAP with or without consent from the administration and coaches would be considered “doing their best work according to their own legitimate philosophy.” Teachers found diverse ways of implementing MAP in their classrooms, reconciling the legitimacy of the basis of MAP2D while carrying out their responsibility as one-caring teachers. As caring teachers, participating teachers’ classroom practices were informed by their understanding of what must be done (i.e., making sure students learn the math they need) and by a sense of what ought to be done (i.e., faithfully implementing MAP) (Goldstein, 1999).

Noddings also stated that school reforms often fail not because teachers do not care for the well-being of their students in a holistic way, but because of bureaucratic hurdles (2007). Problematizing the underlying assumption that “the use of federal money is justified only by raised achievement scores” (2007, p. 2), Noddings argued that federal policies such as the Elementary and Secondary Education Act (ESEA) and No Child Left Behind (NCLB) are

at least in part an attempt to distract citizens from the social problems that plague our cities and some depressed rural areas. Never mind that children are housed badly, that they need medical and dental attention, that they may live in fear of violence, that a parent may be imprisoned or abused. Never mind. No excuses. Just raise the test scores. (p. 4)

What Noddings described was echoed by all the participating teachers in this study: the impossibility of meeting policies written by people who are nowhere near the daily bustle of classrooms, while battling social problems in their students’ realities that are under-addressed by the same policy makers. When decisions are made by policy makers, “we

hear policies and practices instituted and defended because ‘we care about the kids,’” even though “neither those in daily contact with the kids nor the kids themselves are in any way involved in the decisions.” (Noddings, 2015, p. 60)

Margaret and Jennifer shared students’ stories including their parents’ struggle with addiction, threat of imminent deportation, medical issues, abuse from adults, etc. Throughout the years, they witnessed social injustices that their students endured, and Jennifer and Margaret, like other teachers, were pained by what their students had to withstand as children. They chose to tend to their students’ human needs (authentic caring) before addressing the demands to meet the standards and show student achievement which were set forth by policy makers (aesthetic caring). It is imperative to point out that these teachers did care *about* meeting the standards and student achievement. However, they prioritized addressing their students’ distress because they cared *for* their students. True to her identity as a math teacher, Margaret pointed out that “the distance between a person and his daily interaction with students is inversely related to the amount of urgency he feels about their dire situations.” These mixed feelings while striving to meet the needs of all parties is an extension of what Valenzuela described (1999).

It is no wonder, then, that some of the teachers held MAP2D in the same contempt they held for policies that fund state tests, Adequate Yearly Progress (AYP), and penalties schools face for not meeting the AYP. These teachers considered MAP2D a proxy for the policies that do not address the underlying problems impeding their students’ education. “‘All children can learn’? Maybe—if they are not sick, suffering toothache, squinting to see the chalkboard, abused at home, breathing air contaminated

with lead, worried about a parent in prison, or serving as a caretaker for younger children” (Noddings, 2007, p. 36). When the goal of MAP2D is viewed as a way to standardize instruction using MAP, and the goal of MAP is a way to increase “student achievement” and prepare students for following years, teachers sensed the federal policies infringing on their everyday caring for their students. Their commitment to caring for, not caring about, the holistic child, as Noddings noted, took precedence over their commitment to public policy (2003, 2007; Strike & Soltis, 2009).

Even among the teachers who disagreed with MAP implementation followed through with the program because they saw the positive changes in their students. Five participating teachers, even though they acknowledged the goal of MAP to raise test scores, followed the program after seeing their students responding positively to it. Three of the teachers praised their students’ abilities to recite math facts as well as work in small groups, chanting “I agree!” when they reached consensus. Two teachers even commented that their students felt at ease navigating standardized tests because of MAP. Instituting MAP in their classrooms made their students *feel* better and affirmed their decision to continue implementation. Teachers utilized MAP out of caring.

On the other hand, caring for students thwarted MAP implementation. Four of the teachers commented on how students experienced difficulty learning the components of MAP. Five teachers saw that students reverted to counting with their fingers while learning math facts and how English learners struggled with the verbosity of the program. They reported that in order to reach all students, differentiated instruction was necessary, but MAP did not provide opportunities for meaningful differentiation. Half of the teachers criticized MAP for teaching to the test rather than standards, and protested that

students did not master concepts that would enrich their lives. Teachers did *not* fully implement MAP due to their caring relation with students.

As illustrated, the same notion of caring for students drove or hindered MAP implementation depending on the teacher. Noddings would consider this divergence a feature found in liberal democracy, since teachers are working per their own legitimate philosophy of caring. How they conceptualize caring might differ—some might define caring for their students in terms of pride in their high test scores, while some might define caring for their students in terms of readying them for real life application of math concepts. Some teachers sought proof in immediate results, while some teachers gauged how the program might affect their students in the future. This difference in caring, all justifiable, generated varying degrees of teachers' fidelity to MAP implementation.

Finding Two: MAP Pacing Guide as a Compromise between Policy and Student Needs

As Noddings has posited, teachers navigate the worlds between their students' realities and policies' demands. One of the policies that directly affects the curricula are the state standards, and in all teachers' cases in this study, MAP was no exception in trickling those standards into the daily routine. Through numerous publications, Noddings has argued that the consistent use of the term "standards," including the ones in the Common Core, does not denote its usual sense of "established measures of acceptability in a product or performance," but rather is referred to as "lists of contents and skills to be taught by teachers and learned by students" (2007, p. 5; 2015, p. 87). Even in this post-NCLB era, teachers still need to abide by this list of what students need

to accomplish by the end of the school year, regardless of what they think their students need to know.

A statement alone—that standards instruct teachers about what needs to be covered during the school year—is unremarkable. The dilemma arises because this notion of “the school year” does not extend to the last day of instruction on the school calendar, but to the last day of instruction before state testing. Teachers need to “cover” all the standards *before* state testing if they want to ascertain that students have learned all the concepts and skills stipulated by the standards. And most teachers strive to review all the concepts and materials before testing. So, teachers need to teach all the concepts and skills listed in the state standards *well before* state testing, not before the end of the school year. Many schools and districts devise pacing guides to help teachers plan their school year, and the pressure to keep up with the pacing guide has been shared by the participants in this study and elsewhere (David & Green, 2007; Louis, Febey, & Schroeder, 2005).

The need to meet the timeline—to teach *and* review all the materials before state testing in order to adequately prepare students—is what prompts teachers to follow the pacing guide. The guide was designed without any regard for the relationship between teacher and students as carer and cared-for. In fact, teachers understood that the pacing guide needed to be met regardless of the real-life problems students face. Even Margaret, who was most vocal about the discrepancies between the district pacing guide and state standards, acknowledged that the MAP pacing guide was useful since it provided her with unit assessments that were better aligned with her sequence of concept introduction than the traditional pacing guide.

Margaret elaborated that even though she usually designed thematic units to cover all the state standards, she was always restricted by the district's pacing guide because all the students needed to take the district assessments—unit tests, semester/trimester tests (depending on whether the school was on a traditional or year-round school calendar), and end-of-course exams that came after annual California state testing. So, in a way, the modified MAP pacing guide was a relief to teachers like Margaret, who, despite their creativity and expertise, felt stalled by the assessments mandated by the traditional pacing guide. As a resolution, teachers preferred the MAP pacing guide, and this was reflected as a motivation for buy-in and continued implementation in the interviews.

As Elizabeth noted, unit assessments were holding teachers accountable for teaching concepts and skills. Assessments were aligned with the district pacing guide, and the pacing guide was aligned with the state standards. State tests held teachers and students accountable for teaching and learning the state standards. As Noddings has argued, the threads of alignment between state testing and the standards pose a threat to teacher creativity (2007). Furthermore, Noddings suggested that “trivial” exercises and tests undermine intellectual growth (2007, p. 71), leading to overemphasis on testing (Nichols & Berliner, 2007; Popham, 2001; Valli & Buese, 2007). Teachers like Margaret and Mary attested—due to an overabundance of tests—they frequently lost teaching time as well as teachable moments.

One of the naysayers of MAP2D and state testing, Sarah, even conceded that using the MAP unit exams as formative assessments would be a good teaching practice because it will point out the concepts and skills that need to be revisited. However, Sarah protested the realistic function of unit tests as a summative assessment since there was no

room left on the pacing guide to return to the material immediately after the unit test. Even with the touted feature of data-driven instruction, the pacing guide was restrictive. Teachers feeling pressured to adhere to the pacing guide resulted in less student-driven, cognitively challenging tasks (David & Green, 2007), and teachers resorted to more traditional, teacher-centric instruction (Au, 2007; Cobb, McClain, de Silva Lamberg, & Dean, 2003; Wills & Sandholtz, 2009). The teachers in this study were compelled to give into the demands of the pacing guide over their personal conviction to meet the students' needs, despite their caring for the students.

Charles further problematized the use of the pacing guide to align with state standards. His initial resistance, although he was first to volunteer to adopt MAP in his school, was the time allocation. He knew that he needed to reduce the number of minutes of instruction in other “non-essential” subjects because MAP required an hour and a half of math time instead of the hour he was previously dedicating to it. And since he was teaching in a Program Improvement (PI) school, he needed to keep the hour and a half for English Language Arts. He had justified the reduced time he spent on social studies since he embedded parts of reading and writing for social studies into Language Arts. Faced with fully implementing MAP using 90 minutes, Charles chose to modify MAP rather than reduce the time spent on science instruction. Datnow and Castellano (2000) concurred with Charles's choice that teachers responded to the time pressure of meeting the pacing guide by altering programs. Charles cared for his students and settled to keep his core subjects intact rather than further reducing social studies and science. To him, showing student success on the district and state tests directly opposed his caring for his

students. Charles asked, “if students do well on these tests, then what are we leaving off?”

Finding Three: Teacher Professional Identity and Its Role in Professional Development

Throughout the interviews, all of the teachers asserted that changing their practices to meet students’ needs was “what good teachers do.” Five fully implemented MAP down to minor details, while the rest pared down the entire program into a few elements inserted into pre-existing daily routines. All teachers described themselves as open-minded individuals, who cared about *and* cared for their students’ academic and holistic well-being (Valenzuela, 1999). Explained by Beijaard, Meijer, and Verloop (2004), teachers’ professional identity “is not something teachers have, but something they use in order to make sense of themselves as teachers” (p. 123). Participants’ identity as caring teachers mediated their degree of implementation, as MAP became a de facto math program at the site level.

Teachers’ need to negotiate between the nature of the mandate, be it MAP or the state standards, and how they view their purpose and role in the teaching profession often shapes the way they respond to a particular mandate (Montgomery, 2012). Solbrekke and Englund (2011) described that the negotiation between professional responsibility and accountability created tension that resulted in teachers’ stress and resentment. In this study, the imposition of MAP needed to be addressed by each teacher, as teachers reconciled their role as carers for students while being held accountable by the district through various assessments and ultimately state tests.

Most teachers considered implementation of MAP not in terms of fidelity, but in terms of gaining more strategies to improve their practices. Teachers began MAP2D as participants willing to change their practices, whether they enthusiastically volunteered or found themselves needing to meet the new mandate. However, as they participated in MAP2D, teachers formed their own opinions about the program—some informed by their students’ reactions to the program, and some by growing to disagree with MAP as a teaching method. The degree of difficulty implementing MAP was not considered to be a major roadblock by the participants.

Fidelity of Implementation (FOI) has been widely discussed as a critical element of PD, as it connects the intended design of the intervention to the actual delivery of that intervention (e.g., Aladjem & Borman, 2006; Huntley, 2009). High FOI is often suggested as a way to ensure positive outcome, yet studies have suggested that FOI is difficult to obtain due to the lack of teacher compliance (e.g., Ottmar, Rimm-Kaufman, Berry, & Larsen, 2013). Specifically, Jacobs et al. (2006) and Tarr et al. (2008) have suggested that teachers used the intervention, whether it be a curriculum or a program, as a peripheral addition to their own practices rather than as the core change. Brown, Pitvorec, Ditto, and Kelso (2009) have suggested moving away from solely studying the link between FOI and program effect sizes to studying the link between the *intent* of the program to classroom practices. It needs to be noted that many FOI studies were quantitative analysis-oriented and often lacked asking teachers why or how they were carrying out the lessons the way they did.

The dominant discourse permeating PD research regards PD as something that is “done to” teachers rather than something with which teachers choose to engage (Webster-

Wright, 2009). This contradicts what teachers' professional identity research unearthed. Beijaard et al. (2004) asserted that teachers' sense of agency plays a large role in their identity: that they are the decider of what resources are pertinent to their professional success and growth. In this sense, the top-down approach of implementing MAP at some sites did not consider teacher identity. In keeping with a sense of agency as part of teacher identity, participants in this study changed the program or intended to change the program to better serve their students' needs because it is "what good teachers do," and good teachers care-for, in addition to care-about, their students (Noddings, 2005).

It is useful to frame teachers' identity in this study as that of "caring teachers." While teacher's identity can be understood as unstable "multiple selves" which is continually reconstructed through contextual influences (Cooper & Olson, 1996), the participating teachers in this study did not focus on their professional identities other than that of caring teachers. Instead, teachers in this study consistently focused on their role as a caring teacher and how this guided their implementation of MAP, even if modification of the program would directly oppose their understanding of the MAP2D goal. Caught between the belief—belief of professional identity and belief of the PD goal—teachers' navigation through multiple selves exemplifies Cooper and Olson's study.

In addition, teachers' self-identification as caring teachers and the role that identification process plays in MAP implementation is analogous to what MacLure found in her study (1993). MacLure asserted that it was more useful to understand teachers by "the categories which [they] chose in order to explain themselves" (p. 316); in the same vein, it was more meaningful to examine the lack of FOI through teachers' self-identification of carer rather than the traditional categories, e.g., novice vs. veteran

teachers, lifer vs. career changer, etc.. Considering that teacher identity frames teachers' ideas of "how to be, how to act and how to understand," and that the identity is a part of ongoing negotiation with teachers' experiences (Sachs, 2001), MAP teachers' lack of FOI typifies teacher identity mediating PD.

In light of the continuous formation and reformation of teacher's professional identity over time and the acknowledgement of the role identity plays in PD, the binary notion of FOI (i.e., teachers comply vs. resist implementation) needs to be critically examined. Such an assumption that teachers are either compliant or resistant to the program, I propose, is inappropriate. Consider the case of Susan in this study. She would be deemed a "compliant" teacher because she was faithfully implementing the program during the first year. However, at the end of the first year, Susan was intending to take parts of MAP and modify them to meet her students' needs. At the beginning of the second year, Susan would transform from being a "compliant" teacher to a "resistant" teacher. The labels of "compliant" and "resistant" depend on the context of the teacher at the point of data collection and overlook the ongoing characteristic of teacher identity formation in conjunction with caring.

Consider another scenario with Sarah. She conceded that MAP design did not "speak to [her] as a person" because of its strict adherence to the details in student journal entries and problem of the day answer formats. She did not implement MAP as intended the first two years, but admitted that MAP was a part of her teaching toolkit. A decade later, even if MAP does not exist as a district math program, Sarah might see the need to use MAP because of the particular composition of her class during that particular year.

Then she would become a compliant teacher. The identity of a caring teacher would have prompted FOI well beyond the implementation timeline.

Implications of the Study

This study explored the experiences of elementary school teachers as their district pushed for a math program to change classroom practices. Through research questions, I have described participating teachers' perceptions of the program goals, their perceptions of the goals of the PD effort to support program implementation, and the changes that they experienced as well as factors that moderated those changes. I have found that teachers who participated in this study implemented the program to varying degrees, and this departure from the traditional sense of FOI was due to their professional identity as a caring teacher, caught between the demands of the state standards and the realities of their student needs. In essence, teacher change was mediated by teachers' identity as a carer.

Implications for the District

A body of research has distilled the number of factors that support program implementation through PD. A multitude of correlational and case studies have suggested many promising "best practice" frameworks for effective PD with no mention of meaningful teacher engagement (e.g., Garet et al., 2011; Ingvarson, Meiers, & Beavis, 2005; M. Kennedy, 1998). These studies have defined *effective PD* as a causal link between classroom practices and improved student learning, yet the relationship between the two have been persistently difficult to confirm empirically (see Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009; Hill, Beisiegel, & Jacob, 2013; van Veen,

Zwart, & Meirink, 2012). In particular, Darling-Hammond, Hyler, and Gardner's 2017 meta-analysis indicated that not many studies showed significant effect sizes, despite some showing positive effects. Debunking their own previous findings that delineated the tenets of effective PD, the Garet et al. (2008) study indicated even those PD programs designed to yield positive results showed minimal effect sizes.

I selected MAP2D due to its design that followed the effective PD blueprint: MAP2D focused on elementary school level math (content-focused) and provided site-specific support (job-embedded); it was built from the ground up, specifically designed for the district teachers; it arranged support, sustained over multiple years through a variety of delivery methods, including school year workshops, summer workshops, coaching, and modeling, in addition to released time to observe other teachers; it established high teacher engagement through coaching and strong communities of practice (e.g., Darling-Hammond, Hyler, & Gardner, 2017; Gulamhussein, 2013; Johnson, 1990; Wenger, 1998). MAP2D even included an element of differentiation for teachers who have been implementing the program for multiple years, which is supported by research (Gabriel, 2010; Hodges & Jong, 2014; Kose, 2007). With the basic assumption that teachers changed, I purposefully posed research questions to seek how teachers changed. The data indicated that teacher changes resulted from MAP2D participation, but not the way the district intended, i.e., FOI. Teacher change was in essence expanding their teaching repertoire through PD, to be retrieved according to the teacher's professional judgment. As Charles quipped, "you take what you can, put it away, and take it out when you need it." Many participants in this study emphasized that good teachers would use whatever tool they had at their disposal to help their students

learn. And PD was another way of gathering tools to help their students learn, which did not necessarily coincide with state test scores. Teachers' disregard for high stakes testing as a measure of student learning is not new (e.g., McDonnell, 2004; Stake & Rugg, 1991).

The district could have embraced the recommendations set forth by Dewitz and Jones (2013) to give teachers opportunities to exercise their professional judgment and pick and choose different elements from the program. Dewitz and Jones argued that programs, such as basal readers or packaged curricula often adopted by districts, were built on the fallacy of fidelity of implementation. Programs that were "scientifically-proven" at the behest of NCLB and Reading First policies often failed to recognize the effects that factors outside of the classrooms can mediate on the outcomes. In essence, these programs ignored the reality that they needed to be addressed by "humans who dealt with human problems" (interview with Margaret). In addition, autonomy and control would have given teachers a sense of agency—a crucial element in teacher enactment of practices targeted by PD (Deci & Ryan, 2000).

Implications for Research

All of the teachers in this study implemented district-mandated math program to meet the needs of their students based on the student-teacher caring relations rather than to comply with the mandate. Considering that district mandates of program implementations are top-down enforcements of educational policies, the study demonstrated that policymaking should begin with teachers' input and voices in relation to what is best for students, echoing what Noddings proposed as moving from caring about students to caring for students. A lack of compliance, as technocratic education

researchers would describe the MAP modifiers in this study, is an indication of the distance between the policy and classroom practices, as supported by Valli and Buese (2007). Even though the data for this study was collected years ago, the current political climate suggests that policies, whether curriculum design or collective bargaining, continue to fail to reflect the voices of the ones who work with our students within the same room everyday.

Jenlink and Kinnucan-Welsch (2001) acknowledged that care ethics as a field encountered difficulty in the era of measurement and standardization. It is inherently difficult to operationally define what caring relation is since caring is highly individualized. However, Eaker-Rich and Van Galen (1996) countered that a body of research was forming around intentional caring as pedagogy, drawing attention to the importance and complexity of caring and connectedness in educational thought and practice. Active participation in this growing body of research is one way that teachers' voices as carers can be included in the policy making. Prillaman and Eaker (1994) criticized that there is a duality in the discourse of education, that the discourse on effective teaching and the discourse on caring each described the same phenomena of caring for students. Including teachers in action research would create a merged discourse that would include the actual work and voices of practitioners within caring pedagogy. It is about time that policies reflect their care for educators as well as for the students we serve.

The purpose of this study was to document teachers' experiences in PD participation, specifically hoping to find factors that supported successful program implementation through teacher change. As a qualitative study with a small number of

participants, this study provided insights into what the research questions posed. A limitation inherent in its design to be qualitative, the results of this study cannot be generalized to other settings. While the context of the study provided the opportunity to gather descriptive data of teachers' experiences with MAP2D training and MAP implementation, there are additional questions not addressed. As an outsider, I needed to convince some participating teachers that the information they shared was for research purposes only, not to be shared with the district. The following sections will critique this study based on these and provide suggestions for further research.

Critique of the Study

This phenomenological study focused on a limited number of teachers who were all employed by the Long Beach Unified School District. The district had commissioned a teacher to develop a math program based on his students' success with state math testing, which showed a substantial gain from the previous years. After the piloting year, the district had invested a significant amount of resources to support the program's expansion, eventually leading to the program's growth into a partner district in central California. The Long Beach district, in return for their permission to conduct research, had requested that I share the results of the study regarding whether the program was being implemented "correctly" across its sites. Although I was given complete freedom and access to teachers and schools, my association with the district discouraged a number of teachers and sites to participate in this study. Therefore, I have to concede that many teachers who participated in this study may have felt the pressure to highlight the positive side of MAP and MAP2D.

However, the interviews revealed an unexpected aspect of teacher change. I had anticipated teachers to share their experiences of MAP2D participation and factors that fostered and hindered MAP implementation. But what emerged from the data was the unequivocal evidence of teacher identity as a carer mediating the effects of MAP2D. This brought me to reexamine my conceptual framework and delve into Noddings's concept of caring. Had I known that teachers' sense of being carers mediated program implementation, I would have constructed the interview protocols differently to explicitly explore teachers' professional identity and their concept of caring.

Further Research

In line with the purpose of the study to describe how teachers changed, the major findings illustrated how teachers indeed experienced changes during program implementation. As themes emerged from data, program implementation needed to be viewed as a spectrum, since teachers regarded the program as an aggregate of teaching strategies rather than a single unit, which led them to pick and choose strategies to complement classroom practices. The exercise of autonomy and control were results of their professional identity as the carer for their students. I employed Noddings's notion of caring to interpret the findings and discovered that incorporation of the role that teacher identity plays in professional development had been overlooked in the majority of effective PD studies.

Sachs (2001) suggested that teacher identity "is not something that is fixed nor is it imposed; rather it is negotiated through experience and the sense that is made of that experience" (p. 15). As discussed earlier, a teacher's identity as a carer was a major element in teachers' PD experiences. I have used Sarah and Susan's hypothetical cases to

suggest that the need to maintain teachers' identity as carers would influence their decision as to what degree they would implement MAP in the future.

Teachers' identity at the time of the interviews is that of a caring teacher, responding to the needs of the students in the context of a push to standardize classroom practices in the era of high stakes testing. Even when some teachers bemoaned the use of MAP, or any other single-method pedagogy, they responded differently depending on their students' needs. The needs of students can vary by site, by classroom, and even by the day. As Margaret confided, a stellar student can easily unravel during her favorite math lesson because of her mother's mental health issues. Changing times and contexts can filter down to each student differently and the term "caring" takes on a different meaning reflecting the changing needs of that particular student on a particular day. On Monday, a student may volunteer as group scribe to try out using different colors to write the solution, while on Tuesday, the same student may seek a safe place in the corner to be left alone. Knowing students at the personal level and responding to their needs so intimately would epitomize a caring teacher's identity.

Studying how teacher identity emerges as on-going, socially situated, and layered can elucidate its role in teacher learning (Beijaard et al., 2004; Schultz & Ravitch, 2013). The fluidity of teacher identity would depart from the notion of stable teacher identity proposed by some teacher identity researchers; I would rather hope to illuminate on what Cooper and Olson (1996), as well as MacLure (1993), have suggested that teacher identities are not stable, static, or fixed. Rather, teachers define themselves through their beliefs and values about the "kind of teacher they hope to be in the inevitably changing political, social, institutional and personal circumstances" (Day, Kington, Stobart, &

Sammons, 2006, p. 610). In that sense, self-identification as a caring teacher would yield a different picture of program implementation depending on the context.

Based on the findings and limitations, I would pose further research questions.

Webster-Wright (2009) wrote:

Implicit in most current PD literature is an objectivist epistemology that views knowledge as a transferable object. Thus, professionals' knowledge can be "topped up" by undertaking PD activities. This perspective implicitly conceptualizes professional knowledge as primarily cognitive, "acquired" through learning, and able to be studied separately from the sociocultural context in which the knowledge is used. Thus, many studies also assume a dualist ontology that implies professionals can be studied in a meaningful way separate from their professional practice. Reframing this conceptualization of PD requires moving from a focus on "development" to "learning" and from an "atomistic" perspective to a "holistic" approach." (p. 713)

She implored the paradigm of PD to shift from Professional *Development* to Professional *Learning* that is embedded in the context. Applying her argument here, it would benefit to employ a holistic approach to explore, mediated by their contexts, who the teachers are as learners, what they learn, and how that learning is situated in their contexts.

As I have indicated before, the data collection took place over a period of three months. Considering the nature of teacher identity formation and reformation, this study is but a snapshot at the time of data collection. An immediate extension of the research could include returning to the same participant teachers and probing how their MAP2D participation changed their classroom practices over an extended period of time. This is pertinent since MAP has been discontinued to give way to the Common Core standards adoption. Even after the program ceases to exist, what lasting effect does MAP have on teachers' practices? How did their MAP2D experiences shape their professional identity? How do teachers' professional identities and the Common Core-related PD shape each other? How do teachers merge MAP2D and the Common Core-related PD? Further

research would involve veteran teachers' voices and the role their professional identities play in PD, as well as the role of PD in their professional identity. In this age of high teacher turnover rates, studying their longevity can inform teacher preparation.

Margaret described a former colleague who had just retired from her school as Margaret was beginning her teaching career. The retiring teacher was famous for her laminated planbook—a planbook she returned to year after year.

She had that plan book since she was...she had lifetime credentials because she is an older teacher, and she had her planbooks, and she taught the same grade year in, year out, and one of the teachers made the observation that you can tell what time of year it was by what was on the bulletin board. I thought, 'oh, come on, you guys are being silly. I don't believe that.' I started watching and it was true. After being there I thought, 'oh, they are not kidding...' For the teachers who have been teaching 25 years or whatever, and they keep seeing programs, and they are jaded by this point because to see one program come and go, another program come and go...what am I gonna do now?...By now I am one of those veteran teachers who is gonna survive whatever.

Sarah shared how she was resigned to the changing mandates as they were a part of her profession.

I guess it's just—I think it's my 10 year thing. I don't see the point of battling it. I tried battling the language arts issue a few years back...And you know, presenting valid questions, but I was basically told to shut it. It was, 'this is the way it is and this is the way it's going to be, and you're not gonna make any changes and we're not gonna change it.' So, from there, I was like, why get worked up? See, I feel like... after so long, I don't get riled up about it because it's always changing anyway.... It's the future until the next big thing comes. Because somebody else is going to come around with a new fancy idea and that's gonna be the new hot thing, and then you're gonna be the one put in the corner.

As disappointing as it is, I can personally attest to what Margaret and Sarah had experienced. I have conversed with countless teachers who shared their dismay as yet another educational reform or teaching innovation was presented at our faculty meetings. I have attended far too many PD sessions that were what Darling-Hammond and her colleagues have described as “drive-by” PD (Darling-Hammond, Hyler, & Gardner,

2017). Although I do not believe the complete overhaul Noddings suggests to teacher preparation would shift the societal view on teachers as mere technicians rather than engineers (Noddings, 2015), I believe PD needs to incorporate teachers' voices as well as be cognizant of their identities. A departure from the existing models of PD, in addition to all the facets of effective PD discussed in the research that came before, would involve a wide variety of experiences that would engage the teachers; not at their singular teacher identity level, but at their complex identities, as teachers' identity is layered (Beijaard et al., 2004). Digging your heels in and creating a laminated planbook because "this, too, shall pass," is a danger to the profession as well as to the professional.

Willem de Kooning is frequently quoted, "you have to change to stay the same" (Cowart, 1979). This adage complements the necessity of changes in the way Elizabeth identifies herself as a teacher, and it echoes mine.

Of course, the teachers in some way—you always evolve. You find some ways to improve the way you put together your lesson, or the lesson delivery, or something. So, I think...I can't say in what way, but I think it's a constant evolution. You know you're always changing, you're always trying to better yourself, and the composition of your class is different every year, so in some way, you have to change constantly to be a good teacher.

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Appendix A. Mapping Interview Questions to Research Questions

Research Questions

1. How do teachers describe changes as a result of MAP²D participation?
 - a. Changes in their knowledge?
 - b. Changes in their beliefs?
 - c. Changes in classroom practice?
2. What role do their experiences in MAP²D participation play as they affect teachers’
 - a. Learning as change in their knowledge?
 - b. Learning as change in their beliefs?
 - c. Changes in classroom practice as a result of learning?
3. Based on teachers’ experiences in participating in MAP²D training, what are the factors that contribute to teacher change?

Protocol Organization	Interview Questions	Research Questions
Interview 1 Background/ Context	How long have you taught and what grade level and subjects have you been teaching? How many years have you been teaching using MAP?	Baseline for 1 & 2
	What kind of teacher training have you had outside of LBUSD? (Pre-service, graduate school, etc.) Did you have any math-specific training? Do you have any single-subject credentials?	Baseline for 1 & 2
	What were your past experiences participating in professional development in Long Beach? (If new to the district but not new to teaching,) In other districts?	Baseline for 1 & 2
	What kind of math programs or packages do you have experience with? (including student teaching and non-educational site teaching experience, including tutoring, adult literacy programs, community outreach volunteer)	Baseline for 1 & 2
	In your opinion (regardless of what the “academics” or “experts” say), how do your students learn best? What about you?	1.b & 2.b
Interview 2 Experience Implementing MAP	How would you describe your class this year? How would you describe your math instruction this year? How does it compare to the model lessons that coaches demonstrate for you?	1.c & 2.c

	How did you get involved in MAP? What do you think the goal is? How does that compare to your philosophy teaching math? (Probe for change over time)	2
	What aspects of MAP have you found effective in terms of your students learning math? (Lead to what works well and what doesn't work well in terms of training to lesson planning to implementation transition)	1.c, 2.c, & 3
Interview 2 Experience with Support from School/ District	What are your thoughts about MAP ² D so far? What aspects of the program do you find most helpful?	2 & 3
	What do you think are the goal of MAP ² D? How do you think the training achieve that goal?	2
	Can you describe the support you are receiving or have received from MAP coaches? (Probe re: demo lessons, trainings)	2 & 3
	What are your thoughts on the trimester workshops? How has attending them helped you using MAP in your classroom?	2 & 3
	If you are using materials that you have found on your own, how do you access them?	2 & 3
	Other than coaching and workshops, what types of support are you getting from your school and district so you can implement MAP in your classroom? How would you characterize them? How have they been helpful and what can be done to make better use of your time?	2 & 3
Interview 3 Making Meaning of the Experience	(If non-new teacher) How would you describe your math instruction before you started MAP?	1.c
	How did teaching MAP influence your beliefs about the way your students learn? The way you teach? What aspect of the training was instrumental in that influence?	1.b & 2.b
	What are your concerns about continuing using MAP in your classroom?	2 & 3
	Based on your experience so far, what would a teacher new to MAP need in order to be successful in using the program in her/his classroom?	2 & 3
	What were the most meaningful aspects of the training to you personally? Were there differences between the years? In looking back, how does using MAP in the classroom differ now compared to when you started	1.a, 1.c, 2.a, 2.c, & 3

	using MAP? (Can refer to the beginning of the year as well as Year 1, 2 and 3 if appropriate)	
	Based on your experience so far, what are your own thoughts about math education? How do they align with MAP? In your opinion, what characterizes the best instruction for struggling math learners?	1.a, 1.b, 2.a, & 2.b
	Make sure to have addressed...Change in knowledge (content, pedagogy,	1.a & 2.a
	Make sure to have addressed...Change in beliefs	1.b & 2.b
	Make sure to have addressed...Change in classroom practices	1.c & 2.c

Appendix B. Interview Protocols

Interview 1

Background/Context

- How long have you taught and what grade level and subjects have you been teaching? How many years have you been teaching using MAP?
- What kind of teacher training have you had outside of LBUSD? (Pre-service, graduate school, etc.) Did you have any math-specific training? Do you have any single-subject credentials?
- What were your past experiences participating in professional development in Long Beach? (If new to the district but not new to teaching,) In other districts?
- What kind of math programs or packages do you have experience with? (including student teaching and non-educational site teaching experience, including tutoring, adult literacy programs, community outreach volunteer)
- In your opinion (regardless of what the “academics” or “experts” say), how do your students learn best? What about you?

Interview 2

Experience Implementing MAP

- How would you describe your class this year? How would you describe your math instruction this year? How does it compare to the model lessons that coaches demonstrate for you?
- How did you get involved in MAP? What do you think the goal is? How does that compare to your philosophy teaching math? (Probe for change over time)
- What aspects of MAP have you found effective in terms of your students learning math? (Lead to what works well and what doesn't work well in terms of training to lesson planning to implementation transition)

Experience with Support from School/District

- What are your thoughts about MAP²D so far? What aspects of the program do you find most helpful?
- What do you think are the goal of MAP²D? How do you think the training achieve that goal?

- Can you describe the support you are receiving or have received from MAP coaches? (Probe re: demo lessons, trainings)
- What are your thoughts on the trimester workshops? How has attending them helped you using MAP in your classroom?
- If you are using materials that you have found on your own, how do you access them?
- Other than coaching and workshops, what types of support are you getting from your school and district so you can implement MAP in your classroom? How would you characterize them? How have they been helpful and what can be done to make better use of your time?
 - Examples of the support teachers should be receiving are
 - Site coach for math at the school level
 - Department head at the school level
 - Collaborative planning activities, both at school level (department meeting, etc.) and district level (content workshops)

Closing the interview

- Finally, is there anything else you would like to tell me about the program or teaching math at your school?

Interview 3

Making Meaning of the Experience

- (If non-new teacher) How would you describe your math instruction before you started MAP?
- How did teaching MAP influence your beliefs about the way your students learn? The way you teach? What aspect of the training was instrumental in that influence?
- What are your concerns about continuing using MAP in your classroom?
- Based on your experience so far, what would a teacher new to MAP need in order to be successful in using the program in her/his classroom?
- What were the most meaningful aspects of the training to you personally? Were there differences between the years? In looking back, how does using MAP in the classroom differ now compared to when you started using MAP? (Can refer to the beginning of the year as well as Year 1, 2 and 3 if appropriate)

- Based on your experience so far, what are your own thoughts about math education? How do they align with MAP? In your opinion, what characterizes the best instruction for struggling math learners?

Make sure to have addressed...

- Change in knowledge (content, pedagogy, etc.)
- Change in beliefs
- Change in classroom practices