Secondary Mathematics Teachers' Perceptions of Their University Preparation to Become Teachers

by

Brian W. Gleason

(Under the direction of AnnaMarie Conner)

Abstract

The generally accepted view of teacher preparation is that it inadequately prepares undergraduates for teaching. In this study, I use a phenomenological approach to analyze the perceptions of six early career secondary mathematics teachers regarding their formal preparation to become teachers. I introduce a conceptual framework of perceptions as beliefs, motivated by criticisms of prior beliefs research. The teachers' perceptions were that their beliefs about teaching directly influenced their engagement in preparation activities, which influenced the quality of their learning experiences. They also expressed a more positive view of their preparation than would have been expected from the limited available literature base, and proposed recommendations for improving teacher preparation programs.

Index words: Teacher Preparation, Teacher Beliefs, Secondary Mathematics Teachers, Framework of Beliefs

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Dedication

From about the age of seven I have wanted a PhD so that I could be 'done' with school. Though I now recognize that learning does and should continue far beyond school walls, there is value in recognizing the reaching of milestones. I therefore dedicate this dissertation, and the degree which its completion signifies, to the accomplishment of my optimistically misguided boyhood goal.

Acknowledgments

There are too many people who ultimately support a dissertation to fully acknowledge all the contributions that have been made. My wife, Joy, and daughter, Jocelyn, have graciously sacrificed their rights to my time, energy, and especially my attention on countless occasions and have contributed their support in more ways than I can express. To them goes the first and largest thanks.

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I wish to thank my extended family — my brothers and sisters who have appreciated me, my parents who have supported me in opportunities they never had themselves, and my in-laws who allowed me to take their daughter, sister, and friend with me on this journey. I also extend a heartfelt thank you to everyone involved with the program of mathematics education at the University of Georgia. You have been my family in many ways during my time here, and I have learned much from your intellect and character.

Finally, I wish to thank those who participated in this study. You gave up your time, your stories, and a piece of yourselves to me. I have earnestly attempted to craft something that does justice to your experiences. Thank you.

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Chapter 1

Introduction

To fully appreciate the background to this study, you must understand two stories. The first is my journey through a teacher preparation program, my experience as a teacher, and my subsequent graduate experience. The other is the story of teacher preparation from an academic view. The second narrative includes research on the effectiveness of teacher preparation, as well as literature on teacher beliefs. As might be expected of a dissertation, these stories merge as they progress and establish a justification for the rest of this work.

Background

As a new secondary mathematics teacher, I felt confident. My student teaching[1] had gone well. My students performed exceptionally well on the state's standardized exam, and many parents went out of their way to tell me how much their children enjoyed mathematics. I felt very self-assured that my mathematical understanding was more than adequate for high school teaching. I had a few novel ideas for interesting my students in mathematics, and I saw no reason to doubt I would have the same level of rapport with my new students I enjoyed during that semester.

I began that new school year with high expectations and very little anxiety. Things went very smoothly at first. But then, almost imperceptibly, the dynamic in my classroom started to change in a way I did not understand. Most of my students were suitably engaged, but six or eight out of the 120 I taught every two days began to commandeer class time for social posturing, napping, or other decidedly non-mathematical ways to pass

[1] Technically, an internship in which I was *the* mathematics teacher at a small school.

the time. At first I ignored them, or treated them as if they were still engaged, thinking perhaps the downturn in their behavior was simply a cyclic phenomenon that would soon disappear. Instead it grew, until other students began to privately express frustration at the distractions of these few.

Sensing the ground shifting beneath my feet, and not wanting to lose any more students to this small but growing cadre of misbehavers, I started intervening. I changed the seating chart, and then changed it again and again. I sent emails and made phone calls to parents who expressed disbelief and confusion about my reports of their children's behaviors. I assigned detention after school. These interventions produced little long-term effect. By winter break, the behaviors of a group of about a dozen students consumed my thoughts. The balance between excitement and anxiety toward teaching shifted toward anxiety. I began to question if teaching was really for me.

I did not know then that disillusionment is common for many people in teaching (Lasley, 1980). I knew many teachers left the profession early, but I had not realized I could be one of them. Instead, I struggled with the difference in how I now felt. I had felt so prepared, and now something was happening in my classroom that I did not know how to confront. I sensed that their actions stemmed from boredom, but I did not know how to address that, because mathematics was supposed to be satisfying if taught well. I recognized that many of the kids who were acting out or disengaging were among the brightest in my classes. This bothered me deeply. They were intelligent, witty, clever, and appeared completely capable of doing significant mathematics. I was really stumped at how to reach them, and I was unable to fully grasp how I had lost them in the first place. I was embarrassed. I had done everything I had been taught to do, and yet I was failing some of the kids with the most obvious potential.

I was not alone. The sad reality is that teacher educators know prospective teachers do not emerge from preparation programs 'ready' to step into the classroom. They have recognized and worried about it for years, making so many calls for reform that the

inadequacy of teacher education is now an assumed backdrop for policy documents (e.g., Conference Board of the Mathematical Sciences [CBMS], 2001). It is so bad that teacher education has a reputation as an "intellectual wasteland" (Ball & Wilson, 1990, p. 13). Studies have noted the small impact teachers feel their preparation has had (P. S. Wilson, Cooney, & Stinson, 2005) even as any actual impact has been mostly mixed (cf. Borko et al., 2000; Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2008; Goldhaber & Brewer, 2000; Kane, Rockoff, & Staiger, 2007; Monk, 1994; Smith, Desimone, & Ueno, 2005). The varied facets of teacher preparation have been scrutinized, and recommendations have been made. These involve specific components as diverse as the mathematical knowledge needed by future teachers (Ferrini-Mundy & Findell, 2001; Proulx & Bednarz, 2008), the use of technology in teacher education (Ellington, 2007), the way in which teacher education programs approach reform (Peressini, Borko, Romagnano, Knuth, & Willis, 2004), and even the debate surrounding teacher education (Cochran-Smith & Fries, 2001) to name just a few.

These issues are no doubt important, and an ideal preparation program would be attuned to all of them. But the existence of so many disparate problems hints that the trouble runs deeper, that there is a systemic issue in the way teachers are prepared. Heaton and Lampert (1993) suggest as much when they point out:

> Teacher educators are often strong proponents of reform in teaching, but they lack both analytic and practical experience with the kind of teaching they advocate. In the main, the preparation of teacher educators who will work in universities consists of academic studies in the social sciences and curriculum design; it has little to do with examining the problems of actual practice. Even though they are taught about new strategies for teaching and learning that derive from research and theory, teacher educators are not educated to teach in ways that are different from how they were originally taught, nor are they educated to help others make such changes. The courses they take, and the

> courses they come to teach, follow the familiar scholastic pattern, organizing instruction according to academic disciplines. The way they learn to talk about teaching and the aspects of teaching that they learn to talk about are framed by important questions in those disciplines rather than by analytic frameworks derived from examining practice per se. (pp. 44–45)

This idea connects to my experience. There were several contributors to the confusion I found myself experiencing at the end of my first year of teaching. Despite the many collegiate mathematics courses I had taken, I did not really understand the mathematics in a way unique to teaching, as suggested by Ferrini-Mundy and Findell (2001). My orientation toward teaching mathematics would not have resulted in student experiences like those described by Boaler (2006). I had very little of the types of mathematical knowledge described by Ball (2003) or Shulman (1986). The students who did not accept the societal requirement of formal schooling found little to appreciate, or to connect to, in my teaching. They did not believe me when I told them linear equations, for example, would be important to them someday. I cannot say now that I blame them. Honestly, if I had not been a mathematics teacher at that time I do not know in what contexts I would have used linear equations or most of the other material from the textbook myself either. I dutifully preached the gospel of school mathematics because I did not know what else to do.

This revelation still troubles me. It seems that my undergraduate teacher preparation program superficially prepared me to teach mathematics. But under the surface (where it really counted) I had left the program lacking a grounded orientation and appreciation of either mathematics or teaching. My fundamental beliefs about what mathematics is and what teaching mathematics entails were malformed. How could this have happened?

It now seems to me that Heaton and Lampert (1993) have articulated an important characteristic of teacher preparation, one that has implications for both my personal experience and the larger academic education process. There is a body of literature describing a phenomenon known as an “expert blind spot” (Nathan, Koedinger, & Alibali,

2001), a situation in which advanced knowledge in a content area actually inhibits an expert's ability to facilitate a novice's learning. As an example, Nathan and Koedinger (2000) found teachers mistakenly believed more parsimonious representations of algebraic problems would be easier for students to solve than those requiring verbal reasoning. Heaton and Lampert's (1993) observation about the preparation of teacher educators suggests that prospective teachers' basic learning needs may be overlooked by teacher educators because they are too focused on the analogously sophisticated and streamlined representations of academic learning.

Simply put, suppose many prospective teachers labor under malformed beliefs about mathematics and teaching. Suppose these beliefs manifest themselves as mathematical hesitance and naïvety about teaching. From the point of view of a sophisticated learner, the obvious remedy is formal study in the theories of mathematics and teaching. This type of learning works and makes sense for advanced learners because they are able to internalize the symbolic nature of this type of study in a way that more novice learners simply cannot. Nevertheless, due to the authoritative roles of the more sophisticated learners, the novice learners muddle through as best they can, picking up here and there tidbits of knowledge that fail to deeply connect to the fundamental issues confronting them.

After several years of this veneer-making, you might get someone like I was as a freshly minted mathematics teacher. I had persevered through the coursework admirably, learning about many things but not really learning many things. My lack of fundamental grounding was exposed when a few students stripped away my facade of understanding to reveal a hodgepodge of poorly connected beliefs, an ignorance of depth, and my hastily constructed teaching persona.

Problem Statement

Of course, I didn't realize any of that at the time. I was simply galled that I had been funneled into such a situation. My feelings about my preparedness to teach had changed

dramatically. Later, I felt some natural curiosity as to whether other new teachers' experiences were similar to mine. Not a lot of research exists on how teachers feel about their preparation, either before or during the preparation program. The National Center for Education Statistics has acknowledged that "teachers' feelings of preparedness may indicate the extent to which their training prepares them to meet [classroom] challenges" (Lewis et al., 1999, p. 47), but most studies about preparation programs instead try to link aspects of that preparation to eventual student performance (e.g., Boyd et al., 2008; Goldhaber & Brewer, 2000; Kane et al., 2007; Monk, 1994). Though it is undeniably important that teacher preparation have a positive effect on eventual student learning, such studies seem to skip over the meat of the process: the experience of being prepared for teaching.

As a new graduate student in the field of mathematics education, I was given an opportunity to explore teacher preparation more fully from an academic standpoint. As I attempted to reorient my learning from the personal and normative to the intellectual and analytical (Labaree, 2006), I began to develop my own expert blind spot. Ignoring the lessons of my experience, I was attracted to straightforward arguments that proper teacher preparation could 'fix' education at all levels. I read articles such as Ball (1988) and felt justified in assuming that teacher preparation holds a unique position in education. At no other level can one as optimistically hope to teach many through teaching a few. Therefore, changes or improvements in teacher preparation should trickle-down to students at all grade levels, like Reaganomics.

Fortunately, I also became interested in the writings of mathematics educators such as Ernest (1988). Ernest conjectured that the beliefs one holds about the nature of mathematics are directly integrated with how one works with and even teaches mathematics. This supposition aligned with my earlier observations about my own teaching and piqued my interest in the literature on teachers' beliefs.

Toward research questions and a framework.

I needed a way to examine the role of belief in teacher education. As part of a course on qualitative research, I conducted a small study examining the perspectives two students had of their teacher preparation. My findings showed that I was not alone in many of my former feelings about my preparation, but the study lacked the theoretical grounding to provide any satisfying insight.

With the encouragement of my advisor, I began reading more about beliefs, and the roles they played in a variety of educational settings. I learned a lot of interesting things about beliefs and the groups that tend to hold them, but a convergent framework for understanding beliefs eluded me.

One reason was the focus of the literature. Much of the research on teachers' and students' beliefs is done in the elementary context. I had never been an elementary teacher and remembered little detail of my experience as an elementary student. Simply transferring these findings to the secondary setting did not seem justified because, in my own mind, I cannot separate the content from the teaching. The fact that secondary teachers are domain-specific while elementary teachers are multi-disciplinary has important implications, I believe, on how teaching and learning transpire.

One valuable thing that I did learn was that researchers use beliefs to explain complicated phenomena. For example, Cohen (1990) described a teacher who engaged in mathematical activities that, from the researcher's perspective, were grossly misaligned with the intent of the state's policy documents, even though the teacher cited those policies as having driven her teaching practice. This difference was reconciled when Cohen conjectured that the teacher was mediating her understanding of the policy initiative through an erroneous belief about the teaching of mathematics. As interesting as this circumstance was, for me the true revelation is that the articulation of an exceptionally clever and subtle belief statement almost instantly brings into coherence all the dissimilar particulars the reader had learned about the teacher previously.

Researchers also claim beliefs are hard to change, based on the widespread lack of success in observing significant and prolonged change in their participants' beliefs. Eggleton (1995) observed much of a prospective teacher's preparation, only to find that although some of the prospective teacher's beliefs had "evolved," others, such as his beliefs about the nature of mathematics, had not. Likewise, Haser (2006) seemed disappointed to report only very modest possible changes in the beliefs of her participants, even though she used a more longitudinal model by attempting to measure those beliefs during inservice teaching as well as during teacher preparation.[2]

In connection with the robustness of beliefs, researchers tend to believe directly confronting beliefs will be more likely to induce change than other courses of action. Moderate changes in self-reports seemed to confirm this, such as in Vacc and Bright (1999). Theoretically, this position feels very defensible. If beliefs can be somewhat hidden from even their holders, as Ernest (1988) suggests, then direct confrontation might lead to belief change in teachers whose belief structures (Cooney, Shealy, & Arvold, 1998) are reflective by initiating a greater level of belief awareness and prompting reflection.

When I began to try and piece together these ideas, however, I ran into some trouble. As an illustration, Cooney et al. (1998) describe a belief structure as a characteristic of a person's belief system which regulates how they incorporate conflicting beliefs. However, T. F. Green (1971) described something he called a "core belief," something which "might be described simply as a passionate conviction, a belief held with all the ferocity and seriousness that any important and truly fundamental belief deserves" (p. 53). He goes on to say that core beliefs can be thought of as those points "at which one has a closed mind" (p. 53).

I realized that T. F. Green's core beliefs were largely isomorphic to Cooney et al.'s belief structure, because both serve as the factor which allows for the assimilation of new

[2]In both Eggleton's and Haser's studies, the level of change in participants' beliefs was roughly commensurate with the intent of the participants' programs to change beliefs. The key point here is that even when beliefs did seem to change, the shift was small.

beliefs. Though it is somewhat heartening that different conceptualizations of beliefs would be structurally compatible, it was also disheartening that the structures were superficially so different. It had taken a moment of insight for me to connect the two constructs, which indicated other potential connections might exist that I had been missing.

I returned to Thompson (1992) and especially Philipp (2007) for a broader view of the research on beliefs, and became interested in Philipp's attempt to define several of the constructs in question. Perhaps his attempt was driven by an experience like mine, where one realizes that different language has been creating the facade of differing structure. More likely, the need for definitions probably arose from multiple authors using the same terminology in a way that obfuscated distinct structures or properties. As Thompson (1992) wrote: "For the most part, researchers have assumed that readers know what beliefs are" (p. 129). I thought about this a lot, and began to seriously question if the assumption Thompson referred to was justified. Even Philipp's definition of 'belief' is vague and overlaps several other of his defined constructs, including affect, conception, value, and even knowledge.

Frustrated with my inability to find a clear and rigorous definition of belief in the mathematics education literature, I broadened my search. In more general education settings (domain neutral or multi-disciplinary, sometimes including mathematics), I found literature that seemed to be about beliefs, but which used terms like "orientations" (Samuelowicz & Bain, 2001, 2002), "conceptions" (Andrews & Hatch, 1999; Samuelowicz & Bain, 1992), "attitudes" (Helterbran, 2008; Quinn, 1997), and a few other affective terms. Some authors defined their terms, though others simply used the terms as if they could only be broadly understood.[3] Even where defined, I felt the definitions lacked rigor because I could not always take an idea of my own and apply that definition to it to decide whether it was a belief, an orientation, an attitude, etc.

[3]The treatment of these words has, at times, caused me to recall hearing a research mathematician scoff at the idea of defining the concept of a 'set.' "It is a primitive construct," he said.

I found some direction, at least in spirit if not in content, in the field of symbolic logic. Articles such as Friedman and Halpern (1994a, 1994b) impressed me with their attempt to mathematize beliefs. I didn't know how to connect their structures and language to the beliefs in the mathematics education literature, but I returned to it armed with bigger ideas about what beliefs could be, and how they might be more rigorously modeled. I had also reasoned through many of the in-text distinctions between the various belief-like terms. I found it was easier for me to think about all of them as subsets of beliefs. I decided that each of the terms cited previously, and many other similar terms, can be called beliefs because they share the same key property: uncertainty. Even knowledge, from my constructivist perspective, is uncertain and predicated on assumptions of understanding, fidelity of stimulus, and logic. Thus, to me, they are all beliefs. I realized that the important thing is to provide a way to precisely delineate which ones I was interested in, call them what I would. I needed a definition grounded in actionability, a way of looking at the idea that allowed others to check if their understanding is compatible with mine.[4]

I also discovered the beliefs people hold about teacher preparation are generally negative (Labaree, 2006). Even teachers' prevailing expressions about their preparation have been extremely critical (Duncan, 2009). As one elementary school veteran teacher said, when discussing how she felt during her first year: "I was certified and stamped with a mark of approval, and I couldn't teach them the one thing they most needed to know how to do [how to read]" (E. Green, 2010, p. 3). Despite this, few intensive studies seem to have been conducted examining these beliefs in more detail to see what could be learned from them. Helterbran (2008) attempted such a study, but her chosen methodology of examining unsolicited anonymous comments online left me unsatisfied. I found another study by McFadden and Sheerer (2006) that reported teacher educators look more favorably on teacher preparation than those who eventually employ teachers, which supported some of Labaree's conclusions. I also found a study by O'Neal, Ringler, and

[4]Up to the limits of a language based on infinitely cyclic definitions.

Rodriguez (2008) that looked at perceived gaps in preparation from the point of view of teaching English language learners. None of these really gave me insight into how mathematics teachers believe their preparation affected them. Recognizing this gap in the literature, I was ready to formulate research questions.

I eventually called the beliefs I was interested in 'perceptions.' The position of perceptions inside of beliefs will be explained in the next chapter, but for now it is sufficient to think about them as a type of belief. Because I was interested in the beliefs about teacher preparation, I formed the following two research questions (which were also informed by considerations of population and methodology):

1. What perceptions do traditionally certified secondary mathematics teachers hold about the formal preparation they received?

2. What components do traditionally certified secondary mathematics teachers believe an ideal preparation program would contain?[5]

In Chapter 2, I provide the motivating definition of perceptions as part of a conceptual framework. I also strive to address some of the many critiques leveled at beliefs research, with the goal of illustrating ways of thought around these difficulties so that my theoretical foundation is as sturdy as possible. In Chapter 3, I provide a detailed explanation of the methodology that I used to conduct my study. It is my belief that the conceptual framework in Chapter 2 supports my methodology, and I attempt to connect the two throughout the paper. In Chapter 4, I present the results of my study. These results are ordered in a way that may seem counter-intuitive on the surface, in that the results directly related to my research questions are the second and third sections of Chapter 4. The first section of that chapter is dedicated to what I consider to be the most interesting finding of my study — a relationship between specific beliefs that is foundational to the

[5]It seems to me that one can not really understand the answer to the first question without answering the second as a point of reference for comparison.

other results and that also directly motivates the discussion and implications that are contained in Chapter 5.

Chapter 2

Conceptual Framework

> We have no one but ourselves to thank for the world in which we appear to be living. (von Glasersfeld, 2008, p. 6)

Research into Beliefs

One of the troubles in talking about beliefs is that the word belief conjures up a great many connotations, many of which overlap and some of which are contradictory. Examples abound to illustrate that what one person considers to be beliefs, another considers to be knowledge, and another considers those beliefs to be something else entirely. Consider the following example, constructed in the vein of Gettier (1963). An elementary mathematics student observes his teacher systematically de-concatenating 0s as a way to simplify fractions, as in:

$$\frac{22000}{1100} = \frac{220\not{0}\not{0}}{11\not{0}\not{0}} = \frac{220}{11} = 20$$

This student might believe $\frac{64}{16} = 4$ for the reason:

$$\frac{\not{6}4}{1\not{6}} = \frac{4}{1} = 4$$

In this case, the student's belief is true and he even has justification for his belief, and yet most of us would be hesitant to say that this student 'knows' $\frac{64}{16} = 4$.

This enormous conceptual baggage associated with the words belief, attitude, etc. has resulted in a situation in which defining beliefs has proven very tricky. In mathematics education, most researchers who take the trouble to define beliefs have resorted to describing them by identifying properties they do or do not have. Others prefer to insert

some space between the constructs by spreading them out through the use of contrasts. I find both of these methods unsatisfactory, partially due to my own mental connections to the terms that I am unwilling to relinquish, but also because such attempts appear arbitrary. The fuzzy overlaps in construct definitions that tend to be the norm in educational research limit the effectiveness of the descriptions.

What I propose to do here is to first describe some of the most pertinent attempts at outlining beliefs (and associated ideas) as they relate to the present study. Afterward, I will provide an alternative view of how the constructs might be separated. This alternative classification will be illustrated by a technical definition of perceptions that will serve as the theoretical grounding for the rest of the study.

Defining and describing the constructs in the literature.

One of the most appealing attempts to clarify beliefs property-wise was done by T. F. Green (1971). He infers that beliefs occur in a quasi-logical hierarchy, with some beliefs being derivative to others. These preliminary beliefs serve as the explanations and catalysts for their derivative beliefs. Following this chain of beliefs upward will eventually lead one to a belief that is derivative to no other belief, and T. F. Green names these "primary beliefs" (p. 44). He also reasons that beliefs vary in their psychological centrality, or strength. Thus, someone may believe something more or less strongly than they believe something else, and this facet of any particular belief exists independently of that belief's derivative status. Cross (2009) claims it is because of these "two mutually exclusive characteristics of belief systems," psychological strength and quasi-logical relation, that individuals are able to hold "two incompatible, inconsistent beliefs without internal conflict, granted they are never required to examine them concurrently" (p. 327).

T. F. Green (1971) also argues beliefs may or may not be held with respect to evidence. A belief evidentially held is subject to change with new information, but a belief not so held does not change because of new evidence. Differing from Cross (2009), he postulates

beliefs exist in clusters, so one may hold beliefs apart by context even if they would seem to contradict. Utilizing these constructs, T. F. Green suggests an optimal belief system to be one in which the number of psychologically core beliefs and the number of belief clusters are minimized, while the number of evidentially held beliefs and the connections between clusters are maximized. In addition to this, the quasi-logical order of beliefs must correspond to their actual logical order as much as possible.

One of the notable characteristics of T. F. Green's (1971) belief system is that he deduced much of it by accepting at face value the statements a person might make. For example, to deduce that beliefs exist in a quasi-logical way, he noted that if a person is asked why they believe something they will often respond with another statement of belief. This methodological decision is important because imbuing the apparent meaning of a statement with actual meaning is often done, and nearly as often criticized, in research on beliefs. This issue will be explored in more depth later. In fact, the reason it is done is probably that it so often seems to work. For example, Thompson (1992, p. 130) describes a hypothetical teacher who "believes it important to present mathematics clearly to the students" and, as a consequence of this more primary belief also believes in being "prepared to answer readily any question posed by the students." Not only is this antecedent $\rightarrow$ derivative relationship credible, but it also illustrates the independence of the psychological centrality and quasi-logical order of the beliefs. In this case, the derivative belief may actually be held with more conviction "for reasons of maintaining authority and credibility" than the preliminary belief.

In conducting a review on research into beliefs in the field, Philipp (2007) attempted to provide loose definitions of several affective constructs. He describes attitudes and emotions existing on similar dimensions as beliefs, but with different magnitudes. In his description, beliefs are more cognitive, stable, and less intense than attitudes or emotions, as illustrated in Figure 2.1. Such a description fits with many of the common connotations of these terms, but does not provide clearly delineated separations between the constructs. There is

no clear threshold along any of the dimensions when one transitions from one of the constructs to another.

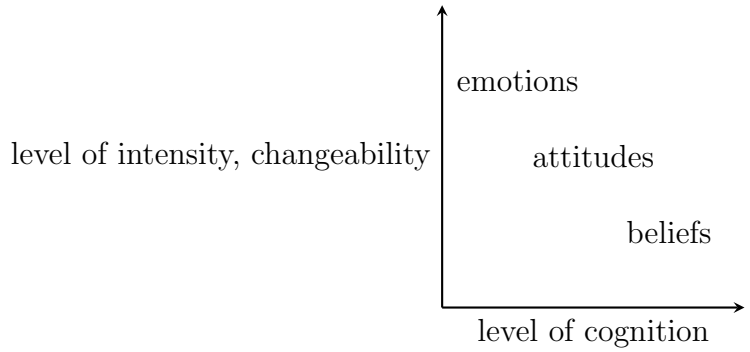

Figure 2.1: Common Characterization of Related Affective Constructs

It is tempting to think one can reconcile this messiness by first dealing with knowledge. If knowledge could be precisely and reasonably defined, then the rest of the constructs could be built off this foundation. Unfortunately, even knowledge is presented in many distinct, contradictory, and equally useful ways, rendering a universal application of the term impossible. For example, in Philipp's (2007) list of definitions, knowledge requires certainty. This clashes on a very fundamental level with the radical constructivist viewpoint, in which knowledge is simply the most currently viable model of the environment for a given entity (von Glasersfeld, 2008). Classically, knowledge is supposed to have veracity (what is known is true), such as in Plato's justified true belief (as cited in Gettier, 1963). More modern interpretations reject this requirement (e.g., S. Wilson & Cooney, 2002). In short, the literature is littered with conflicting definitions of even knowledge, and one is eventually left to accept that defining knowledge is like defining beliefs, what Pajares (1992) calls "at best a game of player's choice" (p. 309).

Addressing criticisms of beliefs research.

Aside from the plethora of definitions and overlapping constructs, research into beliefs has been criticized on other grounds. One accusation is that the research has not succeeded in what it was supposed to do. As Skott (2009) writes:

> [I]t was the expectation that research on teachers' beliefs could contribute substantially to overcome the 'problems of implementation' of the new and more process-oriented approach to mathematics instruction... if teacher education programmes were successful in changing student teachers' beliefs [but]... after 20 years of persistent effort, the field has still not lived up to the expectations of its founders. (p. 28)

Skott's contention that changing beliefs is a part of preparing teachers is supported by authors who place this difficult task squarely within the purview of teacher education (e.g., Cooney et al., 1998; Liljedahl, Rolka, & Rösken, 2007). Skott argues that the failure of research into beliefs to induce a groundswell of change is due to an overly individualized view of beliefs pervading the field, and a lack of attention to the role of context in the mediation of beliefs. Others have echoed his criticism (e.g., Lerman, 2001).

However, researchers in beliefs have long been aware of the constraints of context. Before research into beliefs was entirely in vogue, Scheffler (1965) warned us that only "with independent knowledge of the social context, we may judge belief as revealed in word and deed" (pp. 89–90). What Scheffler said next has been the real thorn in the side of beliefs researchers. "Where these latter two diverge we may need to decide whether to postulate weakness of will, or irrationality, or deviant purpose, or ignorance, or bizarre belief, or insincerity, and the choice may often be difficult" (p. 90).

The discrepancy between reported beliefs and observed actions is far more trouble than any failure to live up to heightened and unfair expectations. Many studies report beliefs appearing to misalign with practice (e.g., Vacc & Bright, 1999), and the most common

attempt to reconcile this difference has been to call the former "espoused beliefs" and the latter "enacted beliefs" (as in Perry, Howard, & Tracey, 1999). More recently, this position has been derided as assuming internal inconsistencies in a person's belief system. Rather, as Leatham (2006) says, "when a teacher acts in a way that seems inconsistent with the beliefs we have inferred, we look deeper, for we must have either misunderstood the implications of that belief, or some other belief took precedence in that particular situation" (p. 95). I find this orientation reasonable, agreeing with Sztajn (2003) that "beliefs and practice are consistent - if in a study we find they are not, then I think we asked the wrong questions" (p. 74). Other researchers have concurred (e.g., Speer, 2005).

With this issue mostly in hand, I return to T. F. Green's (1971) examination of linguistic conventions for the derivation of belief properties. Why should the way we talk about beliefs actually reflect the way beliefs are? Is it not possible that the language we use to describe or discuss beliefs instead reflects an external model, which may be entirely at odds with the actual structure of beliefs and belief systems? For example, statements such as "I very strongly believe X" are fairly common, and are taken as evidence that beliefs can be held with varying degrees of conviction, which is one property sometimes used to differentiate beliefs from knowledge.[1] Although such statements are consistent with the idea of varying conviction, why should they be considered evidence that beliefs are, in actuality, held with varying conviction? After all, it is likely that the language used to describe beliefs will change over time. Would this then mean that what beliefs are will similarly change?

My answer is that what we mean when we use the word 'belief' may very well change. The word simply refers to a concept that is in some way currently useful. Our use of it should by no means be considered evidence that we actually have a complete understanding of some mental structure. Physicists' understanding of what an atom is has changed dramatically in the last hundred years, and yet the word atom has proven useful throughout to refer to each instance of this ever changing model. It would be silly to argue

[1]Consider the awkwardness of the sentence: I very strongly know X.

that atoms at the beginning of the 20th century were less atomic than those at its conclusion, though they were understood differently. The important thing is that the properties of a class of objects do not only identify members of that class, they literally define membership in that class.

The language we use to describe objects does not serve just the purpose of description, but also the delineation out from amongst the ethereal mass of 'things.' That is, though some things undoubtedly exist physically, *classes* of objects do not exist outside our categorization of them. Admittedly, atoms and beliefs are somewhat different constructs, because while one word refers to some understanding of a physical object, the other refers to an understanding of a nonphysical object. This difference only serves to reinforce the point, however, since if physical objects are 'atomic' simply because we say they are (regardless of what they actually exist as), the greatly extended flexibility we are afforded in defining nonphysical things surely preserves this property. The only difference between the two relevant here is that in the one case we have tied the future use of the term to the results of certain physical experiments. We've agreed to continue calling this thing an atom even as our understanding of what it actually is changes. We may change our terminology with belief-like things, and use orientation, or opinion, or theory, or some other term, but that hardly matters. Eliciting the structure of beliefs from linguistic conventions is fully appropriate, as it is the way we talk about beliefs that determines what they are.

A final criticism of beliefs research is noted by Lester (2002): "For researchers to claim that students behave in a particular manner because of their beliefs and then infer the students' beliefs from how they behave involves circular reasoning" (p. 346). That is, beliefs are widely assumed to be hidden, and thus available only by inference. Such inference immediately leads us into trouble because the ability of beliefs to explain a complicated phenomenon, and so act as a pivot on which difficult human interaction can be understood, is too tempting to be left alone. Returning to Skott's (2009) argument, the

whole value of beliefs research was the promise that identifying and understanding beliefs would simply be steps on the way to changing beliefs in order to change actions.

Lester (2002) illustrates his point by asking us to consider a question in the specific context of mathematics: "How do you know that students' beliefs influence how they do mathematics?" alongside the answer he claims is sometimes implicitly used by researchers: "Because in our study students did mathematics in a certain way" (p. 346). This answer, I think, is insufficient. It hides an important aspect of beliefs research paralleling an oft overlooked feature of beliefs themselves, the aforementioned "primary beliefs" (T. F. Green, 1971, p. 44). For me, and for many others interested in beliefs research, the idea that beliefs cause actions is a primary belief. Lester's criticism should not be that beliefs research is circular, but that it is not complete (in the mathematical sense), which is a truly unavoidable difficulty and therefore hardly a criticism at all. We cannot rigorously support the idea that beliefs drive actions other than through defining beliefs as those 'things' driving actions. The real trouble is that the assumed hidden nature of beliefs restricts researchers to inferring beliefs from actions, and then attributing those actions to the beliefs they inferred.

Lester (2002) proposes two possible solutions to this perceived circularity, the first of which involves uncovering circular reasoning through "very careful conceptual and methodological analyses" while the other is to avoid it entirely by developing "research methods to uncover the beliefs directly" (p. 346). These suggestions lead directly into the conceptual framework for this study.

Conceptual Framework

The goal of this framework is primarily to provide a solid footing for my study into teachers' beliefs. To do so, I propose an alternative and, to my knowledge, novel way of defining the type of belief I am interested in: perceptions. Other researchers have also used the word 'perceptions' in beliefs contexts, but my finding is that they typically do so

without definition (e.g., Helterbran, 2008; McFadden & Sheerer, 2006; O'Neal et al., 2008). This practice leads to many of the difficulties in beliefs research I addressed earlier, and so I will provide a formal definition of perceptions as a primary component of my framework. An incidental benefit of my framework is that I am able to avoid Lester's (2002) suggestion of circularity because perceptions, under my definition, are directly accessible.

What I propose is that affective and cognitive constructs be defined by what process or action they drive. For my study, I define perceptions as the subset of beliefs responsible for the action of interpretation. Other researchers might be interested in beliefs governing decision making, evaluating, or a host of other actions, and so they would be interested in different subsets of beliefs. This definitional scheme is liberating because it allows the focus to be on the end product, the inner workings being what they may. For perceptions, it has the benefit of associating beliefs with a very visible action.

Interpretation, at least in a setting where it is prompted by external conversation, has a strong verbal component. In an interview context, for example, it is meaning-making acted out for the researcher to observe. Admittedly, not all aspects of interpretation need or even can be explicit, and so some inference is necessarily involved. But the degree of the inference is dramatically less than for other actions, such as decision making.

An example of a perception is the meaning we attach to our own hidden beliefs. Consider the beliefs you hold about mathematics. Perhaps you believe mathematics to be created, or discovered, or constructed. But how do you know you hold this belief? You perceive that you do. That is, you interpret the feelings you hold. Following in the tradition of linguistic examination, note that it would not be surprising to hear someone say "I think I believe X" or even "I believe I believe X." This act of thinking or believing an underlying belief to be X is an act of perceiving. It is easy to be ambiguous in the terminology because perceptions are a subset of beliefs, and so can rightly be referred to as beliefs in many situations. I will attempt to avoid this ambiguity throughout, and so I would rather

say "I perceive I believe X." In Figure 2.2, I attempt to illustrate the relationship between perceptions, non-perceptive beliefs, and actions.

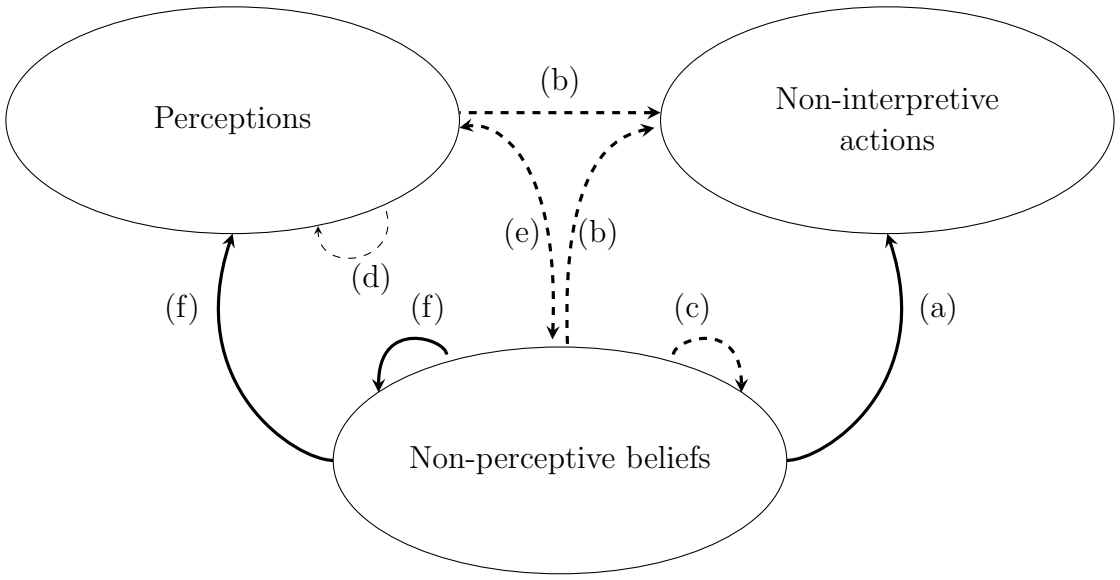

Figure 2.2: The Relationship of Perceptions to Beliefs and Actions. The solid lines represent the direction of 'motivation,' while dashed lines indicate which constructs are 'about' other constructs.

The easiest piece of the figure to understand is (a), the solid line at the right of the diagram, which arises from the fundamental assertion that beliefs drive actions. The key to understanding the rest of the picture is to recall that perceptions are those beliefs whose action is interpretation, and so the diagram partitions the entire construct of beliefs into perceptive and non-perceptive beliefs. The beliefs which are not also perceptions are responsible for actions other than interpretation, such as choice. One can have beliefs about these actions, as well as perceptions about these actions, and these are indicated by (b), the dashed lines terminating at non-interpretive actions. Furthermore, there are beliefs about beliefs, both of the perceptive and non-perceptive kind. An example of the latter is given by T. F. Green (1971) as an "enabling belief" he calls "a due regard for truth" (p. 54). A due regard for truth, by his definition, is "the conviction that beliefs can and should be rationally examined" (p. 54). Such non-perceptive beliefs about non-perceptive beliefs

are represented in the figure by (c), the dashed line emanating from and terminating at the set of non-perceptive beliefs.

Perceptions about perceptions are also possible, though engaging in such meta-cognitive self-analysis seems rarer and so I have indicated these perceptions by (d), a lighter dashed line. Such a perception would be expressed through statements like "I think I think I want to be a teacher" which, though grammatically acceptable, are uncommon and nearly incomprehensible. The two-tailed dashed line, (e), from perceptions to non-perceptive beliefs indicates the possibility of holding either type of belief about the other. It is more common to have perceptions about non-perceptions, but a careful analysis of the construct of perceptions indicates the reverse is also possible, as one is forced to try and 'dig-up' one's own beliefs about perceptions, as much as possible.[2] The final two lines, (f), a solid path from non-perceptions to perceptions and another from and to non-perceptions, exist because the act of perceiving or believing is driven by beliefs. This is not to say beliefs or perceptions are actions, but the holding of them is and the act of holding seems to differ from the act of interpretation.

If this framework is accepted, then the only beliefs subject to direct discovery are perceptions. If other types of beliefs are the object of study, then Lester's (2002) point about careful methodological design is pertinent. It seems one way to engage in a study of non-accessible beliefs would be to first identify a stated belief of interest, and then search for aspects of teaching practice that align with that belief. For example, though a teacher may believe mathematics is discovered and not created, this belief may not align with a particular aspect of his observed teaching practice, but it will align with some aspect of his practice, and it may only be visible in concert with some of his other beliefs. Thus, once confident the teacher holds a given belief, the researcher who wishes to connect beliefs with practices needs to search the teacher's practice for aspects aligning with this belief. This

[2]Being directly aware of the non-perceptive beliefs is technically impossible, however, because the actions of such beliefs are not interpretive. The best one can do is to dig-up one's perceptions about one's beliefs about one's perceptions.

process can also take place in reverse. An interesting aspect of a teacher's practice is identified and then the teacher's statements of beliefs are searched for those beliefs aligning with this aspect of practice. The connections made in this manner will always be tentative, due to the non-accessible nature of the non-perceptive beliefs, but the circularity Lester cautioned against is avoided.

Summary and motivation.

The literature on beliefs has illustrated two things: beliefs are thought to be important and beliefs have been difficult to analyze appropriately. I have endeavored to show that a particular set of beliefs, which have not been extensively studied, are accessible. To do so, I created a conceptual framework avoiding many of the problems identified in previous research on beliefs. A final question might be: Aside from filling the gap in the literature, why are perceptions worth studying? What could the perceptions of teachers contribute to the much larger issue of effective mathematics instruction for all?

I say perceptions are important because they represent the hidden part of the structure of preparation programs. Institutional components of preparation programs can be examined easily. They are mostly predictable and as stable as the institution wishes them to be. Nevertheless, they represent only one side of the equals sign, so to speak. It is the interaction of these components with future teachers that encompasses the whole of teacher preparation. Teachers' lived experiences cannot be ignored if a full picture of teacher preparation is to be had, because the education of teachers requires more than field experiences, classes on pedagogy and content, and mentor teachers. Like all beneficent teaching, teacher preparation requires willful cooperation from those being taught.

The general malaise that has been expressed toward teacher preparation is insufficiently defined. The consequences of teachers' perceptions cannot be uncovered without a more thorough understanding of what those perceptions are. Simple negativity cannot be the sum total of what is believed about the process of preparing teachers, a process I have

personally found challenging and rewarding. Clearly, there are "tensions between the hopes and expectations of teacher educators and the expectations and experiences of beginning teachers" (Wideen, Mayer-Smith, & Moon, 1998, p. 130). The goal of this study is to bring to light the source(s) of those tensions, inasmuch as they are related to the human side of learning to become a secondary mathematics teacher.

Chapter 3

Methodology

The novelty of the conceptual framework for this study suggests a methodological approach that may at times seem ad hoc. However, the framework was designed in response to criticisms and shortcomings of the literature on beliefs, and so this study can be seen as an attempt to lay some theoretical groundwork for future studies. Throughout, I attempt to make clear the connections between the framework and the methodology I used.

Overview

As perceptions are beliefs whose action is interpretation, the act of interpreting is concurrent with perceiving. Interviews can provide direct access to perceptions, then, if the following two conditions are met:

1. The participants actively interpret their experiences (from their preparation program) during the interview.

To induce this active interpretation, an interview structure and questions likely to provoke deep reflection and synthesis are required. I therefore used a repeated interview method wherein each participant was initially interviewed about their preparation, and their responses were used to inform subsequent interviews to probe further. Each follow-up interview took place several weeks later, which allowed each participant to reflect while I transcribed and constructed the next interview protocol from the transcript. That this requirement for active reflection was often met in this study is evidenced by the following representative comment from one of the participants: "This whole interview thing makes me really think a lot. . . like really process what I thought during the program" (Sun).

2. The concept of *access* is interpreted broadly enough to include the verbal component of the reflection and synthesis the participants engage in.

Admittedly, my interpretation of the participants' reflections is all that is contained in this written report, and readers will be limited to their interpretation of my report. But the actual interviews contained episodes of participant reflection (as noted above), and it is consistent with the framework that vocal expressions constitute part of the interpretive process. The common use of phrases such as 'thinking aloud' nicely illustrates this point.

I did not know at the outset how many participants would be needed for this study. Rather, in the spirit of grounded theory, I sought participants until a level of data saturation was reached. My initial pool of potential participants consisted of all recipients of a Bachelor's Degree in Mathematics Education from the University of Georgia [UGA] in the five years prior to my data collection. In order to qualify for participation, a member of this pool would need to meet other criteria, as will be outlined later, but the initial pool was intentionally much larger than I could accommodate.

Participants

I imposed several selection criteria on the potential participants in order to facilitate the data collection and focus the results. As can be inferred from my previous description of the pool, each participant would be a graduate of UGA's mathematics education undergraduate program (dual majors — mathematics education and mathematics — were eligible for participation). I required this common background to not only significantly simplify the recruitment process, but also to reduce the likely variation in the participants' preparation program experiences. Given the scant literature base on perceptions of preparation, I thought it unwise to recruit teachers from other programs as doing so would likely have increased the variability in the data and potentially inhibited the identification of themes. One goal of this dissertation is to establish a conceptual framework of perceptions because such a framework was missing from the literature. Although a tightly

Table 3.1: Typical Courses in Preparation Program

Mathematics	**Mathematics Education**	**General Education**
Calculus 2	Technology & Mathematics	Special Education
Calculus 3	Problem Solving	Educational Psychology
Linear Algebra	Concepts in Secondary Mathematics	Foundations of Education
Intro. to Proofs	Connections in Secondary Mathematics	
Abstract Algebra	Methods of Teaching	
Modern Geometry 1	School Practicum	
Modern Geometry 2	Field Experience	
Sequences & Series	Student Teaching	
Probability	Post Student Teaching Seminar	

focused participant base may not be desirable or analytically essential in the future, it is here.

The preparation program at UGA is fairly typical in its overall structure, with a combination of required mathematics and education courses, a largely observational practicum, and a more participatory field experience capped by a semester-long student teaching experience. Table 3.1 outlines a typical program of study for the participants, excluding the core requirements all University undergraduates must fulfill, though some differences could exist in the choice of electives. A dual major would generally have less freedom in the mathematics electives, and would take slightly more mathematics than a non-dual major.

I also required that participants be actively employed, or seeking employment, as secondary mathematics teachers. Including participants who had left the teaching profession would have been outside the primary purpose of this study, which is to assess the perceptions secondary mathematics *teachers* hold about their teacher preparation.

In addition, I required that each participant have graduated with a bachelor's degree (two bachelor's degrees, in the cases of dual majors) no earlier than five years prior to the term when I began collecting data. This requirement has theoretical justification, because it limited the probable variability in the participants' experiences; it also increased the likelihood the participants would hold clear recollections about their preparation and facilitated the recruiting process.[1]

Finally, I required that participants hold only a bachelor's degree (no graduate degrees) during data collection. This requirement eliminated (or at least mitigated, if some graduate work had been pursued) possible interactions between perceptions of undergraduate and graduate teacher preparation.

It is easy to see the role each of these criteria play in homogenizing the eventual participants. The simple passage of time, or intervening experiences related to teacher preparation could easily have propagated any noise in the data. Future studies might eliminate one of the time and graduate work restrictions, and at that point it seems choosing between the two would be a matter of deciding which one you believed would be more influential in clouding the recollection process. I kept both restrictions, but if pressed would have lifted the time restriction first because one of the few clear results in the literature on beliefs is that beliefs tend to not change if not directly challenged (Cross, 2009; Nathan & Koedinger, 2000; Pajares, 1992), and I hope graduate education would challenge one's beliefs.

To recruit participants, I collected departmental and University records containing the last known email and postal addresses of all those who had graduated with a bachelor's degree in mathematics education from Spring semester 2005 through Spring semester 2010, except for approximately one dozen students who had placed directory restrictions on their student records, for a total of 184 potential participants. In most cases, students' records included a University hosted email address, a local address, and one or more permanent or

[1]It seems reasonable to assume the contact information left behind by graduates steadily loses reliability over time.

secondary addresses. I sent a recruitment letter to each address on file, staggering the letters so, when potential participants responded, they would not receive additional recruitment letters at each of their alternative addresses after making their interest known. When recruitment letters were returned undeliverable, but with a forwarding address noted, I sent a copy of the recruitment letter to the new address. In total, twelve individuals responded to the recruitment letters and emails. Two did not meet the necessary participation criteria due to graduate work, two were not currently teaching, one gave no reason but declined to participate, and one discontinued correspondence for unknown reasons. The remaining six individuals constitute the participants of this study. See Table 3.2 for demographic information collected from the participants.

It was not known at the outset if important trends would emerge based on gender, ethnicity, or major status lines, but the information was collected so analyses in these areas could be conducted, if warranted. The information is presented here so the differences and similarities in the participants is apparent, though no patterns emerged based on these characteristics. The order in which the participants are listed in the table is the same as the order in which they were first interviewed, and will be used throughout when referring to the n^{th} participant.

Table 3.2: Demographics of Participants

Pseudonym	Ethnicity	Age-range	Dual major?
Bristol	White	23-26	Y
Sun	Korean	23-26	N
Grace	White	23-26	N
Joesph[a]	White*	23-26*	N
Catherine	Black	23-26	Y
Kayley	White	23-26	N

[a] Did not provide demographic information; Guesses are used for * values.

As will be elaborated on, these six participants provided sufficient data for this study. If further data had been required, it would have been necessary to expand the potential pool of participants, as no other means of contacting the initial pool was known.

Data Collection

The data for this study was collected by interviews and electronic surveys, found in Appendices A and B respectively. When a prospective participant responded to the recruitment letter with interest, I sent them the link to an initial electronic questionnaire,[2] available in Appendix B, which included questions about their preparation and teaching experience. One purpose of this questionnaire was to screen candidates as to the inclusion criteria; another purpose was to provide a basis for interview questions about each participant's perception of the typicality of his or her experience. The responses to this questionnaire, and in some cases email follow-ups on incomplete or unclear responses, helped me determine which candidates to schedule initial interviews with and which candidates were not eligible for participation.

Interviews.

A participant's initial interview typically lasted between one and one and a half hours. Each interview was semi-structured, and a candidate's first interview followed the protocol found in Appendix A. Deviations from the protocol occurred as participants interpreted or anticipated questions in unexpected ways, mentioned interesting strands of thought not covered in the questions, or requested opportunity to talk about additional concepts. After a participant's initial interview, I transcribed the audio file and set up a second interview. A participant's second interview was informed by his or her responses in the first interview, as well as by larger themes that began emerging from the growing set of participants' responses. For example, during the first interviews, several participants stated that ideal

[2]I use the terms questionnaire and survey interchangeably.

Table 3.3: Schedule of Interviews

Psuedonym	Years Taught at Interview #
Bristol	-0.5 0 0.5 1 1.5 2 → 1 3 2
Sun	-0.5 0 0.5 1 1.5 2 → 1 3 2
Grace	-0.5 0 0.5 1 1.5 2 → 1 2
Joseph	-0.5 0 0.5 1 1.5 2 → 1
Catherine	-0.5 0 0.5 1 1.5 2 → 1 2
Kayley	-0.5 0 0.5 1 1.5 2 → 1 2

preparation would include an early opportunity for prospective teachers to decide early if "this is really what you want to do" (Grace). In other words, part of their ideal preparation program would provide a convenient point at which to opt-out. I did not anticipate this intriguing aspect of ideal preparation, and so I had not prepared for it in the first interview protocol. I designed questions in the second interview protocol to address it further, and these assisted me in the analysis when I came to understand the significance of 'belonging' in teaching to the participants, and the position it held in relation to the other findings. The full interview schedule is available in Table 3.3.

First interviews.

The first interview included an activity in which the participants were asked to critique the preparation of four hypothetical teaching candidates (profiles available in Appendix A). I constructed and refined these profiles based on pilot interviews with graduate students who were former teachers. The purpose of these profiles was twofold: to contextualize participants' perceptions of their preparation within specific program features that might prompt further comments about their perceptions, and to serve as a way of assessing the consistency of the participants' comments about teacher preparation. To elaborate on the latter purpose, the profiles represented teaching candidates with varying academic strengths and weaknesses. Thus, when a participant stated something about a candidate, or chose a candidate in a way that seemed to contradict something they had said earlier in the interview, I was provided with an opportunity to clarify meaning. For example, Sun stated that she was concerned that one of the prospective teachers in the profiles, Dan, had changed careers from engineering to education: "Honestly, this is how I feel. Why would he change his career? Is it because it was so stressful as an engineer? He felt like the teaching is easier?" At this statement, I recalled that Sun had previously described a teacher she greatly respected who had been employed as a banker prior to teaching. I asked Sun about this apparent discrepancy, and she was able to articulate the difference in the two situations: her teacher had not left banking right away, but only after a long and fruitful career that, Sun felt, gave her some appreciation for teaching. Dan, on the other hand, had left engineering after only three years, and so Sun worried he saw teaching as an easier career path. In a sense, the two purposes of the profiles are one — to act as an impetus for further discussion in the hope that additional perceptions are uncovered.

Second interviews.

Interested candidates responded intermittently, so the resulting interviewing timeline differed for each participant. In each case, the first interview was transcribed before the

second interview was conducted so the transcript from the first interview could be used in the construction of the protocol for the second interview. Some portions of the second interview protocol were common to each participant, driven by larger themes appearing across the expanding group, while some were individual. These interview protocols are included in Appendix A. The second interview included an activity where the participants were given a list of randomly ordered (and emotionally balanced) emotion words and asked to circle those which they would use to describe how they felt about their preparation. They were also asked to cross out those they would definitely not use to describe how they felt about their preparation, and to talk about each word they had circled or crossed out and their reasons for doing so. The second interview also presented the participants with brief synopses of teacher preparation programs in Chile and Japan.[3] This was done because the first set of interviews indicated the participants might be cognizant of only a very limited range of possibilities for teacher preparation outside their own experience, and so had some difficulty in precisely articulating the changes they would like to see.

Anomalies in data collection.

Two of the participants, Bristol and Sun, began their professional teaching careers after their second interviews. In order to assess their perceptions of their preparation after they had some teaching experience, and to clarify some possible issues relating to data saturation, they were each interviewed a third time. Following what had been done previously, the third interview protocols were informed by the transcripts of the second interviews. These protocols are also included in Appendix A. One participant, Joseph, declined repeated follow-up interview requests after his first interview. Fortunately, his first interview encompassed much of what was generally covered in other participants' first and second interviews. It appeared Joseph had already reflected substantially on his teacher preparation beforehand, which enabled me to probe more thoroughly than I had anticipated

[3]I am grateful to my fellow graduate students Victor L. Brunaud-Vega and Jun-ichi Yamaguchi for sharing their first-hand knowledge of teacher preparation in these countries.

during an initial interview (in fact, his interview was the longest of any interview in the study), and so his data is complete enough to be included. In total, thirteen participant interviews were conducted, lasting a total of fourteen hours and fifty minutes.

Questionnaires.

The initial survey was used primarily for screening potential participants. The second survey gathered basic demographic information about the participants and also asked the participants to identify experiences in their background that might plausibly have had an impact on their feelings of preparation, such as previous work with youth, additional job-related responsibilities, and the type and amount of support they received through interaction with colleagues. Both are available in Appendix B. The second survey was conceived after a few of the participants had been interviewed once, and so was distributed separately from the first survey. All interested potential participants completed the first questionnaire, and all participants except Joseph completed the second.

Data Analysis

The analysis of the interview data occurred in many stages. Some analysis inevitably takes place during the transcription process itself, as unclear sounds must be interpreted and rendered into text in light of the conversational context. Additionally, I follow Seidman (2006) in arguing that, if not in transcription, then in analyzing and reporting participants' words the various and common fillers, such as 'like' and 'you know' are omitted to "maintain the dignity of the participant" (p. 122). This conscious omission constitutes a certain level of analysis as well. Beyond these rather superficial analyses is where the bulk of analytical time was spent, beginning with the initial analysis to determine data saturation.

Initial analysis and data saturation.

The examples in the previous sections illustrate that consistencies across the set of participants, as well as patterns specific to particular participants, were identified in what I have called the initial analysis. It is this analysis that ultimately convinced me no further participants were needed, and so this analysis needs to be explained in detail.

As I interviewed the participants, I was initially most conscious of the differences that existed in the accounts they gave of their preparation and in those things they wished had been different. These differences absorbed my attention, I think, because the interviews were guided by the same initial protocol and so I was somewhat surprised at the apparent range of results. As I began to transcribe the first interviews, I realized I needed a way to begin constructing the second interview protocols.

To accomplish this, I created a document for each participant where I would record questions, thoughts, and other notes I had about a participant's perceptions while transcribing his or her first interview. Then, when it came time to construct a second interview protocol for a participant, I would read through that participant's first transcript and my notes, marking off sections of my notes as I created questions serving to address particular entries.

As the overall interviewing schedule was staggered, it would often happen that I would be engaged in transcribing and making notes about a given participant's first interview while preparing a second interview protocol for another participant, and even reflecting on a completed second interview with still another participant. Though this asynchronous data collection was mentally and organizationally demanding, it also provided a unique side-window through which I could see all of the participants at once. The differences I initially saw in the participants' perceptions steadily diminished, and I began to see a great many similarities instead. Weekly meetings to discuss the research with my advisor significantly facilitated this process.

I began to see that, with some important caveats, the participants were largely satisfied with their preparation. Without getting too much into the results of the study here, I came to understand that most of the suggestions the participants made, in addition to being of similar type, were seen by the participants as relatively minor modifications to the existing program of teacher preparation, rather than large structural revolutions.

I was able to leverage this broad theme in the initial interviews of the later participants by asking more nuanced follow-ups to my interview protocol questions. For example, as the fifth participant, Catherine, was being interviewed for the first time, she talked about how she wished she had been involved in more field experiences. She had seen her friends in other education programs participating in what she thought were more extensive field experiences than she was having.

As a result of the previous four participants' first interviews, I had surmised that it was often the case that my participants hadn't specifically thought about what should be included in the process of preparing teachers before they entered the preparation program. They were often strongly influenced by activities they saw other prospective teachers engage in. To test this conjecture, I asked her what she had expected the program to be like when she first began it, and she stated:

> I didn't have too many strong expectations. I think that I did think we would be doing more field experiences, but I didn't really have that many strong expectations. . . . I think it was more of a feeling that came as we were in the program, like it'd be nice if we were doing this more, but not really going into it expecting it.

I included a question similar to this on the next interview protocols of the other participants to further probe and confirm or disconfirm this idea.

As the second interviews progressed, the similarities between the participants intensified, to the point where it became necessary to search for possible reasons for the correspondence. Many theories as to why the participants were expressing such congruous

views were proposed and rejected in the weekly advisor meetings. Finally, I conjectured that the similarity might be explained by the fact that three of the participants happened to teach at the same school.[4] This observation led to the realization that not only did those three teach at the same school as each other, but two of them (and possibly the third) had gone to that school as secondary students. Of the remaining participants, one was employed by the same school at which s/he had completed student teaching, and another was teaching in a school that had overt similarities to the school at which s/he had student taught.

This raised the question of whether the type of school the participants had attended or worked in significantly influenced their perceptions of their preparation. More particularly, did the alignment between the schools in the preparation program (field experience, student teaching) or in the participants' lives (as secondary students) and the school of employment induce the consensus in perceptions that had become visible? Would participants tend to feel more prepared if they taught at schools they were intimately familiar with?

The remaining participant, Bristol, was employed as a teacher in a school that was, from my perspective, quite different from the schools she had attended and worked in. I concluded that I could address the question of whether the aforementioned school alignment necessitated the recruitment of further participants by interviewing Bristol after she had begun teaching. The third interview with Bristol contained questions aimed directly at discovering whether the type of school she had been prepared in, because it was different, adversely affected her view of her preparation. Bristol remarked that the support she felt from the administration and her colleagues, rather than the type of school she was in, most directly affected her comfort level in teaching. She also said that there were other types of schools at which she would feel uncomfortable initially, but this discomfort would be ameliorated by a couple of more years of experience as a teacher. Her responses demonstrated to me that factors other than the type of school were the key to feelings of

[4]To my knowledge, none of them were aware the others were participating.

preparation, and perhaps an important theoretical distinction needed to be made between feeling prepared in a mental sense and feeling emotionally ready.

Bristol's responses suggest it is possible to feel prepared without feeling ready, and that familiarity, such as in the type of school or even the specific school, plays a bigger role in how ready one feels to teach than in how prepared one feels to teach. In this view, readiness is further along the emotional continuum than is preparedness, and so it is more volatile and context-dependent.

Long after data collection had concluded, I came across similar uses of the terms prepared and ready in other literature (Powell & Seed, 2010). The main implication of this construct is that Bristol's third interview provided a reason to believe that the similarity in the first two interviews was not tied entirely to the alignment of school type. This allowed me to conclude sufficient data had been gathered to adequately assess perceptions of preparation. A more emotionally comprehensive study of perceptions may have required a different set of participants, specifically participants whose attended and student taught schools differed significantly from the schools of employment.

Further analysis.

Each participants' first interview transcript underwent individual analysis in order to prepare the protocols for the follow-up interviews. Additionally, as Bristol and Sun were interviewed a third time, their second interview transcripts underwent a similar analysis to prepare the final interview protocols. This process was useful in clarifying responses in the first interviews that didn't seem clear and for probing further into interesting ideas. However, this process was insufficient for *really* understanding the data in depth, and so a more substantial analysis was undertaken.

Coding the data.

After each participant had been interviewed at least once, the set of first interview transcripts were condensed into a content summary. This summary was organized into three sections: Perceptions of Specific Components, General Feelings about Preparation, and Other. The purpose of this summary was to provide a more convenient big-picture view of the data. For example, this summary allowed me to easily compare the overall impressions of the participants, and this comparison pointed to the large measure of similarity across the participants described in the section on data saturation.

After creating this summary, I began a list of codes identifying traits or trends I saw in the data. This summary also allowed my advisor to easily suggest other codes. Eventually, I felt I had enough codes to begin applying them to the entire set of interview transcripts. I assigned a color or notation to each code and began marking the transcripts to identify chunks of the data that fit in with each code. During this process a few additional codes emerged and some were consolidated. Ultimately I arrived at a list of nineteen codes (identified in Table 3.4) marking the transcripts. The name of any code only hints at my conception of it, which evolved throughout the coding process. It was often necessary to refer back to earlier coding in order to maintain consistency.

During coding, I also recorded frequent analytical notes in the margins of the transcripts, hinting at possible relationships between codes, possible new codes, and other analytical thoughts. As part of the coding process, pieces of transcript that seemed especially clear or core to particular codes were marked with colored tabs, corresponding to the code's assigned color. I found that rather frequently pieces of data straddled different codes, representing something of the distinct dimensions along which groups of the codes existed. As a result, it was not uncommon for chunks of transcript to be coded with multiple colors to capture the complexities of the data in relationship to the codes.

Table 3.4: List of Codes Identified and Marked in Transcripts

Things they wished had been changed/included in program
Self-initiated additions/modifications to preparation
Stuff they thought was helpful in preparation
Most important
Indeterminate good feelings about
How perceptions of preparation impact action
What does it mean to be prepared?
Feelings of preparation
Feelings of non-preparation
Perceptions now
Perceptions (recollections of) then
Perceptions of content
Perceptions of student teaching and field experience
Perceptions of methods (including technology class)
Additional things that would be helpful, but not in the program
Teaching as a calling ('belonging' in teaching)
Perceptions of teaching
Overall perceptions of program
Constraints on preparation program

After the coding of the transcripts had been completed, a more nuanced picture of the participants' perceptions had emerged. To figure out what this picture meant, however, required even more analysis.

Grouping the codes.

The coding process helped me to see the participants in a more detailed manner, but my perspective of them still largely relied on separating them by individuals. I knew they had a lot of similarities, but the common structure of their experience was not completely clear. To figure out this structure, I began separating the codes by the research question that each code addressed. Some codes were placed in both categories, but many seemed primarily connected to the participants' perceptions of their preparation and others to the

participants' perceptions of ideal preparation. After separating the codes in this manner, my advisor and I identified groups of codes likely to have interdependencies and other types of relationships. These groups of codes existed both within and across the research question sorting, and often a code was assigned to multiple groups. These groups of codes represented ideas about how the transcript data might be connected across participants. I believed that looking at the data this way would allow me to see the common structure.

After grouping the codes in this manner, I went back through each transcript several times in detail, attempting to extract the essence of the data by writing summaries of the coded parts according to the newly formed coding groups. For example, one coding group consisted of the codes 'Perceptions now' and 'Perceptions (recollections of) then.' To create the summaries of this coding group I am describing, I found each instance of transcript coded with either of these codes and recorded careful synopses of the intermixed data in an analytical notebook. This process required several more passes through every transcript, one for each coding group used. These extractions from the data, organized by groups of codes, finally allowed me to identify some underlying structure in the participants' experiences. This structure is presented in the next chapter as the results of my research. Figure 3.1 illustrates the entire analytic process graphically in order to provide a convenient visual summary.

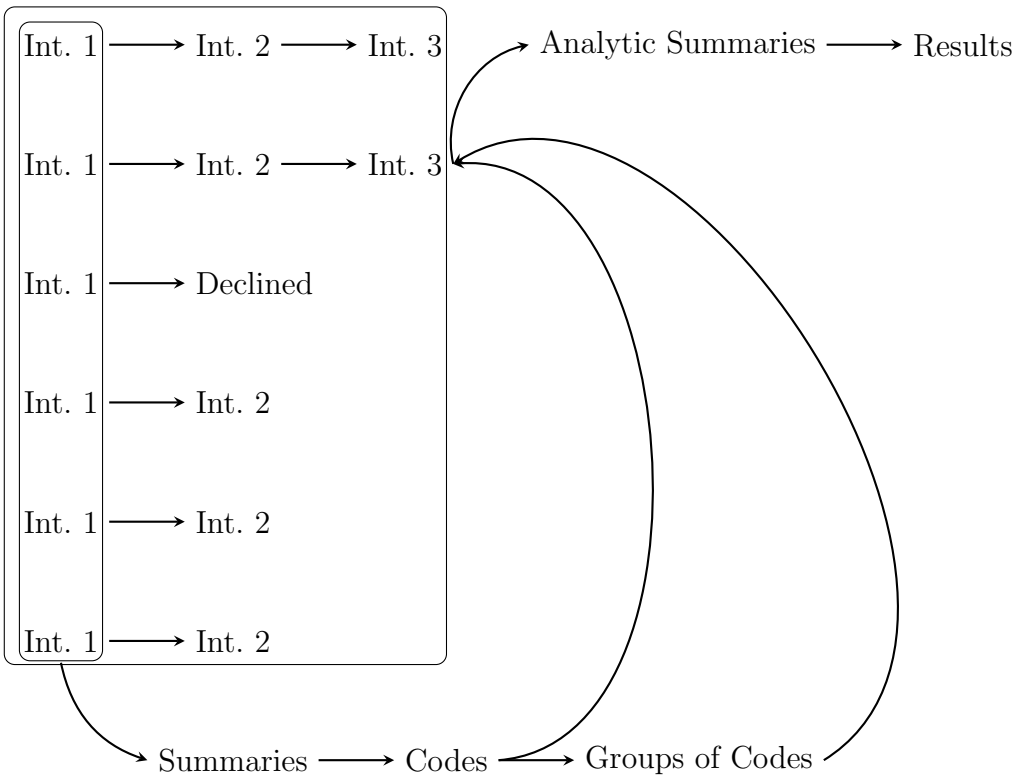

Figure 3.1: Illustration of Analysis. The arrows represent points of analysis.

Chapter 4

Results

The methodology for this study was based on the conceptual framework, and so the results of the study serve as a test for the validity of the framework. How can one evaluate the results of this test? The core of the framework is the idea that belief categories can be delineated by actions. The following chapter presents results which I claim to be the perceptions of the participants. That is, the participants interpreted their experience in their preparation program for me during the interviews. I analyzed the differing accounts from the six participants and present here the aspects of those accounts relevant to my research questions. If these synthesized descriptions accurately capture the participants' beliefs about their preparation that drove their interpretation, then the framework is validated for perceptions.

I do not know of a true objective test of accuracy. Indeed, if there were such a test it must provide a known accurate representation of the beliefs of the participants for comparison. If I knew of a test capable of doing so, I would have administered it instead of interviewing. Simple member checking would not suffice, because the unit of analysis is *teachers'* experiences and member checking could only provide information about a *teacher's* experiences. However, as will be seen, the results are substantially consistent within participants as well as coherent across participants. Even though each participant experienced their preparation uniquely, the distillation of the experiences conforms to an identifiable structure. Contained in this structure is both a description of the participants' beliefs and an explanatory mechanism for their beliefs. These characteristics of the results point strongly to an authentic representation of the participants' beliefs, and so I believe

provide some evidentiary backing for the conceptual framework. Further support for or challenges to the framework need to be driven by research into non-perception beliefs, beliefs responsible for another class of actions, or by a clear theoretical critique.

The Cycle of Disengagement

The major finding of this study is that the perceptions that teachers hold about their preparation are heavily influenced by their beliefs about the nature of teaching. The participants' recollections and experiences revealed that, in a way consistent with T. F. Green's (1971) notions of preliminary and derivative beliefs, their view of what teaching is drove their views of what teacher preparation should be. Furthermore, changes in their beliefs about teaching subsequently led to changes in their beliefs about teacher preparation, and this relationship had profound implications for how the prospective teachers experienced their preparation.

Beliefs about teaching.

> . . . the profession of teaching is generally seen to be relatively easy. And this perception is not simply characteristic of the untutored public; it is also endemic among teacher candidates. (Labaree, 2006, p. 56)

The participants in my study recalled initially holding naïve views of teaching consistent with the statement by Labaree. As Catherine recalled "I just watched my teachers do it and it seemed so effortless." In hindsight, this unsophisticated view should not be unexpected — prior to their undergraduate program, most had never watched a classroom through the eyes of a teacher. Sun put it this way: "When I actually got into the program, I always focus[ed] on myself first. . . I didn't picture big enough the relationship between students and me and how. . . the real classroom looks. . . . I was always a student."

Additionally, much of the mathematics instruction they had experienced prior to college did not appear to require much more than a basic understanding of the content and a

supply of markers. Bristol, describing her middle and high school mathematics classes, said "The teacher stood at the overhead projector and went through the lesson, basically from the book. Occasionally [he or she] had different examples." Joseph attributed his misconception (by his own admission) of teaching to the strict regimen of honors classes he had participated in as a student, which were greatly different in character than the remedial or standard courses he often encountered as a teacher. With this background, it should not be unexpected that teaching candidates would initially believe teaching to be "relatively easy."

This conclusion is supported further by the participants' lack of expectations regarding what teacher preparation would include. When asked how they visualized the preparation program when they began it, the participants gave only vague answers or stated outright that either they did not have too many expectations or that they did not know what to expect. If one views teaching as easy, it is hard to conceive of what might fill several years of required preparation for teaching.

The participants' initial perceptions of high school teaching are intriguing along another dimension as well. Typically, when the participants spoke about how they viewed teaching during their undergraduate experience, it was through a social or cultural, rather than a cognitive lens. This led to many of their expectations for teacher preparation — that it would encompass "dealing with parents" or extensive training on classroom management rather than an emphasis on student thinking or mathematical content. For example, Sun, answering before her employment as a teacher, believed that the most important thing in a high school classroom was the bond between students and teachers. She referred to the movie *The Emperor's Club* (Abraham, Bruce, Bliss (Producers), & Hoffman (Director), 2002), a film about a teacher's emotionally trying relationship with his students, as having a significant impact on her as she tried to mentally prepare herself for teaching. For some of the participants, this perception of teaching endured past the preparation program. Grace argued that:

> High schoolers and middle schoolers are a completely different animal from college kids. I think there's a lot more one-on-one, you're more invested... there's a lot more stuff that you have to deal with at the high school level that deals with education.... whereas college teachers are just there, almost, to deliver the information.

Sometimes these beliefs changed, and the participants' views of teaching reflected a growing awareness of the complexity and conscientious nature of effective teaching. After she had begun teaching, Sun agreed that it was difficult "more than I could ever imagine.... I thought math would be the easiest subject to teach." Typically, it was field experiences that most directly affected the participants' views of teaching. Joseph explained this situation well:

> I went through honors classes all through high school. Went into college, took my classes, wanted to teach high school, did my first observation my second year of college (end of my second year), and I observed [an] Algebra 1 [class] at the time... and just thought "What the heck is going on in here? These kids don't care. They don't want to learn. They're spending as much time telling them to sit down and behave as they are teaching."... I didn't know that. I didn't have any [understanding] until... almost going into my third year of college.

Other experiences sometimes contributed to these shifts as well, at least by helping the participants to recognize that alternative views of teaching were possible. These experiences, though not belief altering in themselves, provided a moment of enlightenment regarding teaching that allowed the beliefs to shift during subsequent experiences. For example, Joseph recalled an experience where his view of teaching clashed directly with the view espoused by one of his professors: "I think his whole goal was to take kind of everything we [had] learned and kind of just throw it out the window and start over." Joseph's personal view of teaching conflicted with the "outside the box" thinking this

professor exhibited. He admitted that he still had "mixed emotions" regarding the underlying philosophy, believing that a style of teaching focused solely on learning outcomes (as this professor lobbied for) "could work a little bit better in college, not in high school as much." He described later faculty as being "detached from what it's like to teach [non-honors] freshmen," which is consistent with the two parties holding conflicting beliefs about what teaching is.

Other participants also spoke about how they sometimes perceived the faculty to be removed from the real work of teaching, and to not understand what real teaching was like. This is consistent with a schism in beliefs between prospective teacher and teacher educator, or at least the perception of such a schism. For example, Grace expressed surprise that most of the faculty in the mathematics education program had not taught in *Georgia* high schools.

Several participants were at times disenchanted by the rudimentary teaching practices they experienced in their mathematics courses. Catherine related an experience where she believed that one faculty member created tension in the class because she "rubbed people the wrong way." In general, the participants expected their professors to be master teachers, and they perceived this to not be the case due to a variety of reasons. This circumstance affected the participants significantly, beginning a process of disillusionment wherein they wondered whether their professors were really able to teach them about teaching.

As the participants continued through the program, however, many of them began to be disabused of their naïve views of teaching through opportunities to interact in high school classrooms in a non-student way. Joseph's illuminating field experience during his third year of college helped him realize that teaching was different than he had thought. "It's tough to really get a broad sense and a real accurate sense from being more in the classroom [as a student], just having people talk to you about it and discussing it, rather than getting out there as much as you can and doing it" (Joseph). Others echoed this

sentiment. They recalled that what they observed in their field experiences began to change how they viewed teaching.

It seems that some necessary criteria for this belief shift can be identified from the participants' recollections. There needs to be an awareness that teaching can be thought of differently. This step is important because virtually all of the classroom experiences the participants had participated in prior to the preparation program were viewed through a student-oriented lens. Thus, the teaching was not examined critically, if it was examined at all. Rather, the focus was on fulfilling the typical roles of a student — learning the material, acting in accordance with social norms, and advancing oneself personally through the system. These kinds of experiences, especially when engaged in by extremely capable students, are likely to induce a sense that teaching is not all that difficult and consists primarily of clearly conveying information to willing learners.

The awareness that teaching can be conceived as consisting of more than dissemination of information does not always occur naturally, and can lead to a schism between the beliefs of prospective teachers and the perceived beliefs of teacher educators. This occurs because being aware that someone believes differently than oneself is different than embracing or even valuing that belief. The participants consistently pointed to interactions with students, from a teacher's or non-student's point of view, as being the catalyst in modifying their beliefs. If this actual modification does not happen, and the prospective teachers progress through the preparation program aware that their instructors likely think about teaching differently, but not sharing this belief, then significant ruptures in the learning process can occur, as will be explored more in the next sections.

To summarize the current section, the participants' initial views of teaching were undoubtedly naïve because they had experienced classrooms only as students prior to their preparation program and the teaching they had experienced as students was usually teacher-centered. The participants also had adopted a mostly non-cognitive view of teaching, where they believed the real work of teaching is emotional and social. This view

of teaching is consistent with the larger cultural expectation that teaching is emotionally intimate work (Labaree, 2006). Finally, the participants' views of teaching underwent some shifts, particularly toward seeing teaching as more complex, often in response to experiences interacting with students in a more teacher-oriented way.

Effect of beliefs about teaching on beliefs about teacher preparation.

The participants' beliefs about teaching exerted a profound effect on their beliefs about teacher preparation. To use T. F. Green's (1971) framework, the participants' beliefs about teaching were held as antecedent to their beliefs about learning to teach in the quasi-logical hierarchy of beliefs. To the extent that the participants believed teaching was easy when they began their preparation, they correspondingly believed that teacher education would (or should) reflect this straightforwardness. In fact, Catherine's recollection that her teachers' work had seemed effortless was immediately followed by the remark that she had assumed teaching "was something you could learn just by observation." Kayley had felt similarly, remembering that she and her fellow prospective teachers had discussed the idea that "[because] you learn best by experience anyway, why don't they just throw us in there?"

Sun expressed regret that she had not fully engaged in some of her coursework, believing at the time that it was not valuable: "I wish I [would] have taken more advantage out of it... when I actually [was] in the classroom, actually getting things out of it.... I'm contributing [acknowledging] my attitude as a problem as well." Others acknowledged mentally disengaging when the activities in the preparation program were not aligned with what they felt they needed at the time. Even those prospective teachers who believed that the coursework would be valuable to them as teachers were not always able to really synthesize the material and activities due to their previous lack of experience in the role of a teacher. Joseph compared learning to teach to learning to be a parent, in that preparation is relatively ineffective without actual experience:

> People read parenting books and they buy all this stuff and they talk to people about it and get all kinds of advice and get counseling. . . but how do you prepare to be a parent?. . . I [think] it's the same way with teaching. I can read articles until I'm blue in the face, I can take all the math classes [until] I can teach it, but until I get in there and really do it — and student teaching was the closest thing I had to that. It was the closest thing I had to relate.

Grace expressed a bit of each idea: the activities sometimes did not seem to fit with what she felt she needed, and she did not have the motivation or ability to really engage with an activity because it was not real —

> I'm sure other people are different, but with me, if I'm not actually going to use it, I'm not actually going to teach from it, I don't put as much thought into it.. . . it's just another thing to do. Whereas, if I'm actually going to be up there teaching the lesson and I'm going to be the one that the kids are looking at for that knowledge, [then] I've got to think through it and I've got to process all that information and process what I want them to get through the lesson.

Catherine responded similarly:

> Why were we reading all these articles and going through all these books when we didn't have anything to relate it to and we didn't have any experiences that. . . that article would be relevant for at the moment? And I know it's not my nature to, especially when something isn't relevant to me then and it doesn't strike me then, to got back and look at it a year later and be like "Oh, here it is."

The disconnect between the participants' beliefs about teaching and their perceptions of their instructors' views of teaching, coupled with the lack of appropriate schema on which to connect new knowledge, led participants to intermittently disengage from the coursework. In turn, this disengagement led to the participants not benefitting from the

activities as fully as they might otherwise have. Catherine described the experience in terms of waiting for a "reveal," such as might be had at the end of a fable or a magician's trick where missing plot elements suddenly make sense:

> [In] some of the EMAT and the methods classes, different topics [we] were just like, "Why are we doing this?" And I suppose that it was all for that big reveal at the end, when we graduate or [in] student teaching or in teaching. But because you have that feeling, like "Why am I doing this?" it kind of makes it not stick with you, so then later on you're not thinking about it when you're supposed to be.

Thus, a self-fulfilling negative expectation occurs where prospective teachers doubt the efficacy of some of their preparation. This is due to the schism between their beliefs and what they perceive their instructors' beliefs to be, or their lack of experience (or a combination of the two). This doubt leads to disengagement from portions of the preparation which contributes to substandard learning experiences during the preparation and reinforces the original belief.

It is important to distinguish here between the participants' beliefs about their preparation and their actual experiences during their preparation. No participant used the terminology cycle of disengagement, and it seems that they were not cognizant of the construct in its entirety. Neither was I during the interviews. Rather, they shared their remembrances with me, and interpreted those memories in response to my questions.

From the collective set of experiences, I have drawn out a synthesized model of the general experience, illustrated in Figure 4.1. Though each participant reported experiencing stages that, combined, I have called the cycle of disengagement, various components were more pronounced in some participants' descriptions than others. The identification of this construct serves as some validation for my conceptual framework, as the components of the construct would likely have gone unnoticed in the data had I not been actively interested in the participants' perceptions.

The perception of the participants is that their beliefs about teaching are pseudo-logically primary, as meant by T. F. Green (1971), to their beliefs about their preparation. These beliefs about teaching took on particular forms, identified as lack of prior knowledge and the perception of a schism. They further perceived that their beliefs about their preparation influenced their engagement and learning in the program. Whether things actually played out this way is beyond the scope of the research questions, but I find the perceptions internally consistent and possessing the explanatory power valued in beliefs research. For these reasons, I find their perceptions credible.

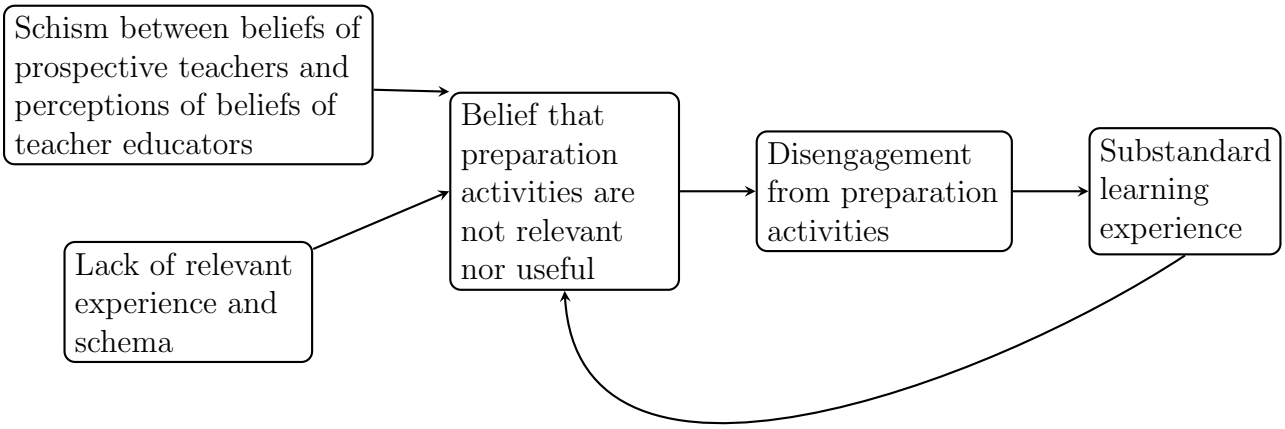

Figure 4.1: The Cycle of Disengagement

As would be expected from T. F. Green's (1971) theory of derivative beliefs, if the more quasi-logically primary belief changes so too should the derivative belief. This interpretation is consistent with what happened to the participants, throughout their preparation program and into teaching. Kayley described the shift she experienced and how that altered her perception of her preparation:

> I'm able to look back... and see, I think, the value of things more than I could see right at the time. I couldn't really understand the context in which I might use a particular skill set or activity or questioning method, but now I can

> [be]cause I've walked through situations where I used that exact questioning method or that very instructional process. I think looking back now perhaps I might even look more favorably upon [the preparation program] just because I can see the exact types of things that... my graduate assistants and professors were trying to tell me. I can remember things [like] "You'll want to... do this with your students." and I thought "Really? No, I won't."

Catherine expressed a similar sentiment: "Since then I've matured and feel as though the classes were more relevant than in the beginning... or during them I thought they were."

To the extent that the participants' beliefs about teaching did not shift, their corresponding perceptions of their preparation likewise remained static. Sun, whose beliefs appeared to change only in that she saw teaching as more difficult, but not more cognitive than before, retained a more negative perception of her preparation even after she had begun teaching. Compare her statements from her second interview (before she began teaching): "I don't think I'm ready... [the] last two years, I really felt like I wasn't doing much" to her feelings during her third interview (after she had begun teaching): "I still think I wasn't really prepared."

Thus, it appears that the prospective teachers' perceptions of their preparation were intimately tied to their perceptions of the nature of teaching. If, or when, they felt that teaching was relatively easy emotional work, they believed that teacher preparation should be more straightforward and concrete. If, or when, those beliefs later shifted to seeing teaching as highly demanding, intellectually involved work, then their perceptions of teacher preparation followed suit. This is exemplified by their valuing the pedagogical and mathematical activities of their preparation experience to a greater extent. As Sun described it,

> When you go to that classroom, the real classroom, people ask you questions that you might not know and... you come back like "I wished I'd paid attention

more [be]cause this is what we talked about, but I don't remember [be]cause I was okay with getting [a] B or something."

Breaking the cycle of disengagement.

The teachers I interviewed seemed intuitively aware of the connection between the perceptions of teacher preparation and the outcomes of teacher preparation. They offered suggestions for improving teacher preparation programs that most often aimed directly at breaking the aforementioned negative expectation cycle. Chief among these suggestions was extending and foregrounding the field experience component for prospective teachers. Being out in the field more often and earlier would, in the participants' minds, result in more authentic learning of what it is like to be a teacher. It would also mitigate the discomfort associated with frequent affronts to their belief system. However, from the point of view of the cycle of disengagement, an extended and foregrounded field experience would facilitate the shifts in beliefs about the nature of teaching *and* provide substantive experience around which to construct schema. This would lead to fewer periods of disengagement from the other activities of teacher preparation, thus weakening or preventing the cycle.

An authentic learning experience.

The participants' contention that field experiences provide the most authentic learning experience reflects something about their beliefs about learning. These beliefs are connected to their beliefs about teaching, but the relationship does not appear to be strictly quasi-logically preliminary-derivative. The participants' descriptions of learning and teaching appeared qualitatively different. Sun contrasted learning mathematics and learning to teach by constructing a dichotomy between knowledge and skill. Teaching was the skill in her dichotomy, "you obtain it by doing it, you practice and you learn from it" but mathematics she categorized as knowledge, "you can just [learn] it by reading the book or solving the problems." Catherine disagreed, stating that "I think that there is more to

learning about being a good teacher besides just being thrown into it." She described a mathematics class that "sparked that part of [her] brain that made [her] want to figure out why these things [mathematics concepts] worked." This experience influenced her throughout her preparation to become a teacher, but the analogous teaching concept seemed to come about from a different set of experiences: experiences set in teaching —

> I had an experience where a student was challenging me and I didn't know why it was, and I actually still don't and I have to teach it this year... it was logs. And they were like, "What is a log? Why is it doing that? What is it doing?" And I was like, "I don't know. It's just a rule."... but those kinds of situations make you want to be more aware and more knowledgeable.

From an outsider's perspective, Kayley's beliefs appeared somewhat contradictory, or at least textured with unrevealed nuance. She explained that "there are some things that you don't get a feel for until you just do them," but also acknowledged that:

> If you go through a preparation program, you don't have to guess on nearly as much [as you would otherwise]. You just guess on the little details, but the big bulk of what you're doing everyday in the classroom, you've been instructed how to do.

Part of the difficulty in unraveling the specific relationship between beliefs about learning and beliefs about teaching is that beliefs about learning were not a focus of the study and so appeared in the interviews only peripherally. From the distinctly different, albeit limited perspectives offered by the participants, a reasonable conjecture is that beliefs about learning and beliefs about teaching are both quasi-logically antecedent to a great many other beliefs, and may be central to different beliefs clusters, as in T. F. Green's (1971) framework.

Nevertheless, the participants expressed that field experiences offered the most authentic learning environment for teacher preparation. All of them ranked student

teaching as being the most important, or at least tied as the most important, component of their teacher preparation. Typical among the reasons given for this high regard were Kayley's statement that "it's working with *real* students in *real* schools" and Grace's estimation that she "learned more that semester than the three and [a] half years before that."

Though the field experiences and student teaching were clearly important to the participants for the reasons already mentioned, they also offered another service to the prospective teachers. They balanced out the less exciting aspects of the preparation program, such as the coursework. Catherine articulated this best, though it was apparent that others felt similarly due to descriptions they gave of watching friends in other programs go out into the field earlier and more often than they did. The descriptions were tinged with something akin to jealousy. The following exchange containing Catherine's description occurred while she was trying to describe why she expected the "reveal" moment mentioned earlier. The entire exchange is included because it reveals how nebulous this feeling was, even to the participants.

> Catherine: I guess that was my personal reasoning.. . . maybe that was my own personal coping method.
> Brian: Is there anything that could have been done so that, as an undergraduate, you would have. . . felt the way that you do now?
> Catherine: Kind of how we talked about watching my friends going out on field experiences and stuff. Maybe not feeling like we were being stuck in a classroom and actually going out and doing what we wanted to learn about would have made it easier to cope with the other stuff. Does that make sense?
> Brian: . . . Do you mean that it would have made more sense or you would have accepted it because you were compensated by more field experience or [something else]?

> Catherine: The second thing. Accepted it [be]cause we were compensated, which sounds funny, but it's probably the true feeling.

It seems that the process of experiencing a way of learning to teach that did not appear aligned with their beliefs about teaching induced some emotional strain on the participants. The observations and field experiences, on the other hand, appeared more consistent with how they felt teaching should be learned, and so it provided a sense of relief, or compensation, that made the belief shift easier to bear. Watching others in related programs experience more time in the field produced anxiety:

> I had a lot of friends in education, and especially [the] early childhood [program], and it felt like they were constantly out there doing stuff and... maybe that's still resonating with me. [It's] not necessarily jealousy, but just feeling like, why aren't we doing more of that? (Catherine)

Facilitating the shift in beliefs

In terms of view of breaking the cycle of disengagement, the participants felt that foregrounding and expanding the field experience component may have provided an opportunity for them to simultaneously build up their schema of teaching. This allowed them to better engage in preparation activities later in the program and begin the difficult process of belief shift sooner. Catherine shared that experiences from her student teaching helped her see more of the cognitive side of teaching, "I learned that I had to... understand what I was teaching before I could try and teach it." Kayley's belief shift took on a different form. She learned something about what Labaree (2006) refers to as the "deep acting" of teaching, "construct[ing] a persona that is an authentic expression of real feeling, even though this feeling is brought to bear on a role that is consciously constructed to serve a particular purpose" (p. 50). "I've kind of had to learn how to morph into a more stern, more structured personality while in the classroom, and yet still making that a part of who I am" (Kayley).

Regardless of the form of the belief shift, its existence seems to play an important role in the process of learning to teach. The participants felt that foregrounded and expanded field experiences would enhance their ability to learn in the remainder of the program because their view of what teaching consists of would change sooner. This would cause the activities of the preparation program to appear more relevant, resulting in greater participation and ultimately better preparation. As Sun said, "If you had more field experience, you would get more serious about math class and then you learn more [be]cause you're more serious. You're more willing to take more classes, you're more willing to pay more attention to what's happening and that will obviously equip [you] better."

Other avenues for breaking the cycle.

In lieu of increased field experience opportunities during their own preparation, many of the participants engaged in activities external to the program to compensate for the gaps they perceived. Several of the participants reported reading books on classroom management in the months between graduation and beginning employment; Wong and Wong's (2009) was the most popular. Other common activities valued by the participants included tutoring, particularly with remedial students, and volunteer work with youth organizations such as camp counseling and coaching. Some of the participants reported taking extra mathematics classes, outside of their major requirements, because they wanted to learn more.

Less commonly done, but still valued by the participants, was working in an applied mathematics field such as physics or engineering, knowing a foreign language, or having work experience outside of the field of education. In fact, Sun heavily contemplated delaying her employment as a teacher so she could get more life experience, believing that doing so would ultimately make her a better teacher and help her to appreciate the school environment more. Many of the participants had also begun, or planned to soon begin,

graduate work. One reason for doing so was to "get what I feel I didn't get in my undergrad" (Grace).

Some of these individually pursued patches seem to serve both of the same purposes as the foregrounded and expanded field experience — to facilitate beliefs change and to gain real knowledge by practicing the art of teaching. Sun's contemplated delay of teaching rested largely on an anticipated change in beliefs. She said doing something else before teaching would help her to "get more matured and know. . . how hard living [in] the world is." She anticipated this belief change would make her more "patient with students and. . . more generous and more understanding." Joseph's experiences working with youth helped him handle the sometimes awkward emotional connection between teachers and students and helped his own beliefs change. He explained how his experience as a counselor helped prepare him for managing the complicated relationship between students and teacher:

> It's not that I had every answer and did it perfectly, but. . . I'd dealt with it before. I guess I just didn't care as much what they thought of me. I didn't care if they got mad at me. . . because I'd dealt with it before.. . . It's something I had to get used to when I was going through. . . doing these camps, but I had a little bit of experience and it didn't faze me as much.. . . I kind of learned that lesson a little bit sooner and had to adapt a little bit, but for the most part, it helped a lot.

Perceptions of Preparation

The short answer to the research question about what perceptions the teachers held about their preparation is that the participants felt a large measure of satisfaction regarding it. They were consistently able to point to activities or courses that positively impacted their teaching practice. They expressed gratitude for the growth they underwent during the program, and, with the exception of Sun, all summed up their preparation

favorably. Table 4.1 contains quotes from each participant, illustrating their overall estimation of the preparation, listed in the order of their first interviews.

Table 4.1: Individual Perceptions of Preparation

Pseudonym	Overall Perception
Bristol[a]	I do feel prepared.... I don't feel like I'm drowning, so that's a good thing.
Sun[a]	I still think I wasn't really prepared.
Grace	I think I was prepared from the math side of things... I really did not feel prepared from the teacher side of things.
Joesph	I felt as prepared as anyone, I think, could have gotten me... I think they did the best job anyone could have done, but I still think you're not totally ready.
Catherine	I feel like I was well prepared.
Kayley	I just [feel] like the program was high quality... so I was proud to be a part of it.

[a] Quote taken from third interview, after beginning of employment.

One of the characteristics of these quotes, which is representative of the rest of the data, is that the feelings of satisfaction were often hedged. In fact, the participants were eager to share their ideas for improving teacher preparation, to the extent that it would be easy to get an incomplete impression of the participants' perceptions as negative. I want to make clear this was not the case. Each participant, including Sun, referenced portions of their preparation that had proven extremely valuable to them as teachers and all except Sun viewed their preparation in an overall positive light. This is an unexpected result, given the broad swath of negative perceptions other groups usually hold about teacher preparation (Cruz, 2009; Duncan, 2009; E. Green, 2010; Helterbran, 2008; Labaree, 2006). It is instructive to explore why the participants held these perceptions, and what relationship these perceptions had with their teaching practice.

Hedged satisfaction.

> Going into my first year, I don't think I was as prepared as I would liked to have been, but going into my second year I feel a little bit more prepared just from teaching my first year. So, it's like we're pushed to... the edge of the mountain through undergrad., and then we just kind of take steps up the mountain as we teach and get experience and get confidence in what we do. (Grace)

The more complete answer to the first research question is, though the participants believed their teaching benefitted from their preparation, the extent to which they felt prepared was not to the level they had initially hoped for or they thought would be ideal. This qualified evaluation provides insight about not only the participants' perceptions of their preparation to become teachers, but also their presumptions of preparation in general.

Difficulty caused by lack of coherence.

One of the primary reasons for their hedged satisfaction is that the participants often felt they had to decide for themselves what could be gained from the preparation coursework. The specific goals of much of the coursework, as well as its relation to the work of teaching, was often not clearly understood by the participants. Combined with the participants' lack of preconceived ideas about what teacher preparation would be like, the participants sometimes felt adrift, unsure if what they were studying really would be useful and completely at a loss as to why they were studying it. Exacerbating this situation, the participants initially felt a great deal of trust in the University to prepare them to be teachers. When their beliefs about teaching seemed to conflict with their perceptions of their preparation, some angst naturally arose.

On the one hand, the University's teacher preparation program is highly structured, providing limited options for how one learns to be a teacher. The participants recognized this constriction, and it chafed them when the structure dictated by the University contradicted their ideas of what it meant to be prepared. For example, Grace expressed

significant frustration at being required to take upper-level mathematics courses at the expense of additional field experience or pedagogical classes:

> I say this, and it's probably [going to come] back to haunt me, but I will never use linear algebra. I will probably not use my game theory class that I took.... Combinatorics, the basics that I learned in other classes, but other than that I'm never going to use that.... I would have rather had more in-class experience or in the classroom experience or more math education focused classes.

On the other hand, many of the classes and coursework did not seem to fit together, or flow from semester to semester or even from day to day in a coherent and meaningful way. The precise descriptions of this phenomenon varied widely, but each was consistent with a term used by Sun, "imminent." That is, the coursework sometimes felt as if it was planned "moment by moment." Joseph described the process as inefficient, and others spoke of odd gaps or overlaps in content between, and even within, the sequences of coursework. Such fractured instruction required a great deal of cognitive effort on the part of the prospective teachers to individually make sense of the experiences. But ironically, the proactive mindset required to effectively handle such untidiness was inhibited by the restrictive structure of the overall program, leading to some frustration.

In spite of this, the participants were fairly successful in gleaning important pieces of teaching knowledge from the experience. They valued these insights, and the cumulative effect was their overall perception of their preparation was positive. A course on technology was often referred to as a valuable piece of their preparation, though often the pieces mentioned were less systematic. Kayley, for example, speculated that taking honors courses benefitted her for two reasons:

> Most of the grad. students that I was able to interact with had taught previously, [and] so that was really neat to be able to draw on their experience.

> We [would] talk about something in the class and then they would be able to say, "When I taught for a couple years, I did something like this" or "I used this particular tool or technique."... So that was really neat, as someone about to become a teacher, to hear from their experience and the same with the professors, but mainly just taking them at the honors level with the graduates, if nothing else, just pushed me a little more because it was a little more rigorous and so... I think perhaps I learned a little more content knowledge maybe, or just at a... higher cognitive level, which I think always benefits you.

Sun related that the stories and experiences she heard about teaching helped her:

> He didn't teach us strategy,... like methods, but his stories and his experience, he share[d] his experience a lot and then that help[ed] me a lot [to] just imagine how it is, like how real classrooms are, like how students are.

For Grace, it was discussions about navigating the relationship between students and teacher:

> One thing that is... always in the back of my head is one of our discussions that we did... during our student teaching [post-seminar], was about interacting with the kids and how to be their friend, but at the same time be their elder.... [The student teaching post-seminar instructor] told us... it's fine to interact with them and to be their friend, and that's totally fine outside of the classroom, but once you step into that classroom you're their teacher and you have to keep that line well-defined.... That's definitely a conversation that stuck with me.

These almost serendipitous insights constituted a significant portion of what the prospective teachers believed they had learned about teaching during their preparation, and this fact makes it possible to see why the preparation sometimes felt patchy to the participants.

In short, most of the participants were able to have enough meaningful experiences in the program for them to view the overall program in a positive light, even if the specific experiences varied from participant to participant. As Catherine said:

> I got what I needed to out of it.... I needed the content. I needed the student teaching. I needed to learn about GSP.[1]... I needed to read articles. I feel like I can't think of, well I could probably think of one class that I may have just said, "Eh, I don't know if I really needed that," but what's one class out of all of them?

Perceptions of coursework.

Though they did not have many explicit expectations about what teacher preparation would be like when they entered the program, the participants were surprised at the content of their coursework. They were surprised, firstly, at the amount of upper-level mathematics courses they were required to take. This finding is not unexpected, and is, anecdotally at least, widely known to teacher educators. What is surprising is the majority of the participants came to appreciate the mathematics coursework as they later saw it meaningfully contribute to their teaching for reasons that might not have been expected. Joseph recalled deriving the quadratic formula for one of his classes, prompted by an unanticipated student question. He credited his experience in Abstract Algebra with giving him, if not the content necessary for this derivation, the mathematical confidence necessary to perform such impromptu analytical thinking in front of his students. Kayley recalled a similar set of experiences, acknowledging that although the specific content of her class on mathematical proofs was not intrinsic to her work as a mathematics teacher, her experience in constructing rigorous proofs was, in her own words, "essential... because I went through the season of [thinking] I can't write this proof. I don't know where to start, I don't know what to do, and I don't know when I'm done."

[1]The Geometer's Sketchpad is a dynamic geometry software package produced and marketed by Key Curriculum Press.

Several of the participants also valued the experience of struggling mathematically as undergraduates. They claimed the upper-level courses they were required to take as part of their preparation program were the first time they had ever seriously faltered in a mathematics class. In addition to instilling them with a sense of pride and accomplishment, they perceived this experience as valuable to them as teachers because it gave them empathy for their current students by demonstrating to them that a lack of understanding did not necessarily imply a lack of effort. This occurred in spite of their perception the mathematical content from the upper-level courses is not critical for their teaching. As Joseph said,

> I think it was good for me to struggle because it helped me to understand what other students see when they look at me teaching and, [for me] the professor, on the board, writing in chalk, was explaining it fine. I mean, he's saying everything right; it just wasn't being communicated. I wasn't getting it. So it helped; it helps me to be a little more sympathetic, I think, with students.... I really do think I benefitted from even my failures in math and I think it's helped make me a better teacher.... Even if I don't use all the math, which I don't use a lot of... it made me think and it helped [to] struggle through the material.

This change in beliefs about learning is significant. It is interesting in that it seemed to be driven by experiences the participants had as learners, much as the changes in their beliefs about teaching were prompted by experiences in teaching-like field experiences and student teaching. This is consistent with the previous suggestion that beliefs about teaching and beliefs about learning exist in separate belief clusters.

The participants' perceptions of their non-mathematics courses bear some resemblance to their perceptions of their mathematics courses, with one primary exception. As with the mathematics courses, the participants came to appreciate their non-mathematics courses more as they saw applications of course material in their teaching. In general, the participants valued their non-mathematics courses a bit less than their mathematics

courses, primarily because they saw the mathematics content knowledge as more necessary for teachers to know and the non-mathematics knowledge as less requisite.

The major difference in the participants' perceptions between mathematics courses and non-mathematics courses is the non-mathematics courses were perceived as significantly less rigorous than the mathematics courses. Carroll, one of the hypothetical teachers profiled in Appendix A, was considered highly suspect because of her high mathematics grades and lower non-mathematics grades. This was seen to reflect poorly on her character or work ethic, whereas Annette (another hypothetical teacher) had grades which caused little or no concern, even though they are essentially the inverse of Carroll's. As Kayley explained it:

> I think that Carroll is obviously really good at math and... probably doesn't have to try that hard to be good at math, but it seems to me if she's getting C's in her [non-mathematics] classes it's just from a lack of effort. I don't think that you can get a C in [a non-mathematics] class unless you just don't try.

This perception that the non-mathematics classes had less rigor is consistent with a broader cultural perception that "education schools are easy" (Labaree, 2006, p. 2). The full impact of this perception is not entirely clear from the data, but it may have contributed to the cycle of disengagement by lowering the perceived cost of disengaging, and thereby making the cycle easier to enter. Sun explained that she never went to the scheduled office hours for her non-mathematics classes except to complain about her grade because the visits were not necessary to pass the class in the same way as in her mathematics courses. She recognized that as a result of not visiting office hours she did not build as strong a relationship with her non-mathematics professors as she did with her mathematics professors. It is possible this weaker relationship facilitated the disengagement by keeping the perceived belief gap open.

A highly regarded program.

An interesting relationship exists between the participants' private assessments of the preparation program and the external impressions of the program they became aware of after beginning their undergraduate work. During the interviews, the participants were keenly aware that the University has a well-regarded program of teacher preparation. But they were usually unable to say how they became aware of that perception, even though they first learned of the reputation sometime during the program. The positive reputation of the program had some intricate and important effects on the participants.

While experiencing the cycle of disengagement, the renown of the preparation program caused cognitive disconnect, to which the participants responded in different ways. As already mentioned, Catherine constructed a "reveal" metaphor to cope with the times she felt the activities were not beneficial to her as a future teacher. The reputation of the program gave her confidence in her experiences, "I had confidence going through the program, knowing that it was supposedly one of the best programs to go through," and so she created the metaphor to resolve the cognitive disconnect she sometimes felt: "I don't think we were in a poor program. I [thought] we were in a good program, so obviously there's got to be some. . . reason why we're doing this."

Others responded to the perturbation differently, and it is not entirely clear if each participant had fully resolved the mental conflict at the time of interviewing. Rather, the degree of the perturbation seemed to depend on when the cognitive disconnect occurred, relative to the cycle of disengagement. The participants felt less conflict and hence less need for resolution now, after they had begun to appreciate more of the preparation program's activities, than they did when they were in the midst of the experience.

Nevertheless, it appears the reputation of the program had some impact on the participants during their preparation. The participants clearly recalled discussing the program's standing within their cohorts and responded with a wide range of emotions including surprise, skepticism, and pride. What is not certain is how, or even whether this

impact affected the participants' shift in beliefs about teaching. In some cases it seems to have improved their estimation of their preparation experience. Kayley described how taking honors courses allowed her to work more closely with the faculty and graduate students running the program, and this experience helped deepen her appreciation of the program because she was able to learn about the faculty's reputation. This is interesting because there is no obvious connection between Kayley's beliefs about teaching and her estimation of the faculty. This may indicate her beliefs about preparation are derivative to additional beliefs alongside those about teaching.

Whether this separate change in her beliefs about the teacher preparation program subsequently affected her beliefs about teaching in any way is unclear. It is theoretically possible that it did; T. F. Green's (1971) framework suggests the possibility "belief systems might change in respect to the arrangement of primary and derivative beliefs" (p. 45). With the present data, it is not possible to fully trace the impact this information had on the participants or to fully separate out other confounding factors.

Understanding Sun's perceptions.

In many ways, Sun's perceptions of her preparation experience differ from the other participants' perceptions. This is notable because, despite the significant differences in their perceptions of their actual preparation, many of Sun's perceptions of ideal teacher preparation, and thus her recommendations for teacher education programs, closely aligned with the views of the other participants.

Sun's negative overall perception of her preparation is also curious because it does not seem to align with many of the specific examples she gave about her preparation. She highly valued the mathematics content and field experiences, cited an article she read as part of an education class as having a lasting impact on her views about teaching, and expressed significant confidence that someone with her same preparation would be a good teacher.

Unlike the other participants, Sun also valued the general education, or core classes she took, believing teachers had a responsibility to be well versed in a wide variety of fields. So why did she report an overall perception of the program that was so negative, and so in conflict with many of her other statements?

The answer to this question lies in the cycle of disengagement discussed earlier. Like the other participants, Sun experienced the cycle. Unlike the other participants, Sun went through a prolonged cycle that covered several semesters of her preparation, by her account nearly the entire final two years. This cycle of disengagement began just as the smaller cycles did for the other participants — her beliefs did not seem to align with the beliefs behind the activities of the program and she lacked the necessary schema to substantively process the material. To illustrate, Sun talked at length about her frustration that the goals of the non-mathematics courses were rarely made explicit to her, resulting in her not being able to measure her progress in learning to teach. When the goals were stated, such as on a syllabus or course description, she felt the coursework was not true to the stated goals, instead ranging superficially over a variety of topics.

> Okay, [non-mathematics] class, like I said, it's a little bit of everything even thought it was under title of [list of several course titles], but you never follow the title or you never fulfill the title.... So if you [want to] talk about that, only just talk about that. Just go deeper, as much as you can. You [shouldn't] talk about little bit of everything [be]cause... you don't get one thing complete.

Additionally, she perceived the non-mathematics courses to be too easy or shallow to keep her motivated. In the math courses, "if I try harder... then I end up knowing more" but "there's [only] so much you can gain from [a non-mathematics] class." This set of beliefs merged with a typical lack of experience in looking at classrooms as a teacher:

> [Be]cause you're a student, you don't care. You just have to get an A and that's it. You don't bother looking [at] other students and [seeing] how student[s] [are]

> understanding words and how interaction between student and teacher is important.... It's [a] totally different point of view.

With these two factors in full force, she disengaged from her non-mathematics courses, beginning a prolonged period of malaise:

> In [my non-mathematics] class I don't even have a notebook. I mean I had it, but at [the] end of class I just kind of looked through it and [thought] I don't really need [this] stuff. I don't think I'll need this stuff again. Threw it away.... Maybe it was just me, but maybe I didn't value the [non-mathematics] class enough.... Honestly, I had the mindset... I think I will learn when I actually go into a classroom and learn from my experience. I don't think I will learn from hearing their stories or reading articles.... By the time [of my] fourth year, my expectation for [non-mathematics] class[es] was really low.

The cycle of disengagement lasted until she had nearly graduated: "I think toward [the] end of my student teaching [was] when I actually felt like, oh, I have to teach for real?... Uh-oh." Afterward, Sun recognized the missed opportunities her disengagement had caused:

> When I was in the [non-mathematics] classes I was annoyed... about things that I have to do, and I didn't feel like it was helping me. [I thought] I'd rather just go out and teach and learn what I have to learn instead of doing this.

As with the other participants, Sun points to increased and foregrounded field experience as the remedy:

> I wish I would have appreciated [my non-mathematics] classes as well. I would have asked questions from my own experience — that would have been more meaningful, not like you read articles over and over and over again. Those articles are very useful, but unless you experience that in your life, like you connect that to your real classroom, it's still [just an] article from [a] journal.

The reason she suggests more field experience is clear — it results in changed beliefs and increased ability to assimilate the preparation activities:

> When you're in your math class[es] and [non-mathematics] class[es] only, you don't know what your student would ask. You don't know how much you don't know. And actually, when you go to that classroom, the real classroom, people ask you questions that you might not know and... you come back like "Ah, I wished I'd paid attention more [be]cause this is what we talked about, but I don't remember [be]cause I was okay with getting [a] B or something." It just passed by. So, I think that will help me to get more serious about my math classes and... [in non-mathematics] classes, maybe I could participate more in discussion... maybe we could talk more about my own experience from my field experience.

Sun's cycle of disengagement is almost textbook in its form, but the magnitude of the cycle substantially exceeds any of the other participants' experiences. This extended cycle explains a great deal of Sun's contradictory statements about the quality of her preparation. From her point of view, the preparation was not especially good, though it could have been. There are several possible reasons for why Sun experienced such an extended cycle of disengagement.

1. The severity of the cycle may have been due to cultural and language issues. Sun is the only participant to self-identify by ethnicity, rather than color, and her sentence construction suggests English is not her native tongue. These issues could have exacerbated the conflict of beliefs Sun perceived.

2. The cycle may have been precipitated by specific circumstances within her program experience, such as multiple poor experiences in close succession. For the other participants, cycles of disengagement came and went as the coursework or instructors

changed. It is possible Sun perceived strong differences in beliefs at the beginning of each semester, preventing the cycle from lifting.

3. It is likely some of Sun's other beliefs played an important role. She described herself as being someone who considered anything less than 100% to be akin to failure. When Sun began the cycle of disengagement, her belief that the program was responsible for completely rendering her as a capable teacher at its conclusion might have contributed a sense of discouragement to her feelings, thereby deepening the disengagement.

Impact of perceptions on teaching.

There is some evidence in the data about the effect the long cycle of disengagement had on Sun as a teacher. During her third interview, Sun became acutely emotional when describing a teaching experience for which she felt inadequately prepared. A particular student appeared uncooperative and Sun, unsure of other possible explanations, took the student's responses at face value. Later, she discovered the student lacked even the most basic understanding of algebraic operations and was simply unable to meaningfully participate in the classroom. Sun expressed a great deal of guilt for not understanding the student's true issue earlier, and for creating tension and wasting time by believing the student was just lazy. She placed a great deal of blame on the preparation program for the way this experience turned out, claiming that had she been taught more about students, she "would have done something different." Whether or not Sun is justified in laying this event at the feet of her preparation program is not the point here. Rather, Sun's experience exemplifies the suggestion that prospective teachers' perceptions of their preparation can deeply affect them, not only during their preparation but also as teachers.

Sun is not alone in showing some impact of perceptions from the program on her teaching. The following excerpt shows how Grace's perceptions of her preparedness influenced instructional decisions she made.

> Classroom management was my biggest fear going into my first year teaching, and being walked all over was my biggest fear. . . I think I could have done more with them [her students] as far as hands-on activities and discovery, especially with my Math 1 kids, instead of being so worried about what was going to go wrong. [Be]cause I would come up with an idea,. . . for box plots I was going to do this activity with a human box plot and we're going to have them set up and have them figure out Q_1 [first quartile], Q_3 [third quartile], median of their heights, but then after I started thinking about it, I was like "Well, that's going to be impossible to control. They're not going to do it. . . they're going to goof off". . . and so I didn't do it with them and we just did like a worksheet activity instead and I think if I had more confidence in my classroom management, then I probably would've gone ahead and done that and they probably would have understood it a little bit more because it was something that they could see and they could touch.

One of the salient points to draw out of Grace's recollection is that she felt adequately prepared to design the activity, but it was the implementation of the activity for which she did not feel prepared.

Perceptions of Ideal Preparation

The participants were remarkably similar in their descriptions of ideal teacher preparation. Their perceptions were rooted in their own reflections about teaching and in their recollections of what teacher preparation was like. They were also situated within constraints they perceived on either preparation programs or prospective teachers. Perhaps the most striking aspect of the participants' descriptions is the fidelity with which they adhered to their own preparation when talking about ideal preparation. As Kayley said, when asked to design an ideal program: "Honestly, I would probably mirror something very similar to the program that I was in." This feature of their descriptions supports the earlier

contention that the participants were largely satisfied with their preparation, despite their hedging and their eagerness to share ideas for improvement.

Some of the uneven balance between overall perception and the corpus of data can be explained by two interesting phenomena. First, the participants seemed to initially hold the expectation that a teacher preparation program should, and probably could, completely prepare its students for teaching. Thus, any shortcomings in their preparation were magnified by their expectations. This is an interesting belief for future teachers to hold. It is likely one of the specific beliefs upon which prospective teachers and teacher educators usually differ, leading to the schism (perceived or real) in beliefs that precedes the cycle of disengagement. As explained earlier, the participants had perceived teaching to be relatively easy when they started the preparation program. It is not a very big leap in logic to conclude that a few years of training is more than enough time to get one completely ready for a straightforward task.

Secondly, at times the participants seemed to view the student teaching experience as part of their teaching experience, rather than as part of their preparation experience. This was most notable in the descriptions given by those who had student taught but were not yet employed (Bristol and Sun during interviews 1 and 2). They spoke of perceiving a gap between their preparation and teaching, even though, officially at least, they had only been engaged in the former.

Upon closer inspection, other participants sometimes seemed to hold the same view. For example, consider the following statement from Grace: "I did not know how to plan a lesson. I knew how to write a lesson plan, but I didn't really know how to plan out an entire unit of lessons until student teaching." A fascinating characteristic of her statement is that she is claiming she was unprepared to do something because she didn't know how to do it until her preparation was nearly over!

At other times, the participants clearly classified student teaching as part of the preparation program, such as when ranking the components of the program in importance.

This rather confusing dual view of student teaching is consistent with many characteristics of the participants' perceptions. If they sometimes viewed student teaching as teaching rather than an opportunity to learn to teach, then it is no surprise they had a large number of suggestions for improving teacher preparation. On the other hand, if at different times they viewed student teaching as an opportunity to learn *before* teaching, then their relative satisfaction with the preparation experience makes more sense. They are then able to count all they learned and experienced during student teaching as part of the program.

Preventing the cycle of disengagement.

Predictably, a large portion of the participants' perceptions of ideal preparation was related to the shortcomings they saw in their own preparation, of which the cycle of disengagement occupied a prominent place. Without exception, the participants believed foregrounded or expanded field experiences would be the centerpiece of any ideal preparation program.

Belonging in teaching.

The participants included in this field experience component a significant amount of time working with remedial mathematics students. Interestingly, one of the primary reasons for espousing work with remedial students was so prospective teachers could figure out if they truly 'belonged' in teaching. As Joseph said:

> I think as soon as possible I would get them in a low level math class to observe, just to see what it's like.... That's probably the, in my experience, one of the toughest groups you'll deal with. I think it'd be good to see right away [be]cause a lot of people change their mind and they get out and they [realize] "Okay, this isn't what I want to do. I don't think I could handle that if I had to teach that." I think that'd be good. It'd be fair to a lot of students [prospective teachers].

This question of whether or not one belonged in teaching was rooted in their own experiences. In several contexts, the participants spoke about the moment when they received an intrinsic confirmation teaching was right for them. Bristol, in explaining why student teaching was so valuable to her, spoke of her own moment of figuring out she belonged:

> I would definitely say I enjoyed student teaching more than taking classes because it just kind of all comes together and you feel, okay, this is what I'm supposed to do. Or, you might have the feeling [that] this is not what you're supposed to do, and that would be bad, but I felt [positively].

Sun was adamant future teachers should 'belong' in teaching. She claimed teachers should view teaching not "as a job, but [a] vocation, career.... because teaching, that's impacting too many people's lives." Several of the participants included an explicit opportunity to discover one's belonging in their designs of ideal preparation programs. Grace explained hers this way:

> I think having your junior and senior year focus on education would... make the transition easier into teaching, just [be]cause I was still taking math classes through my first semester of my senior year and so I think if you could focus on education all through those last two years, (a) then it kind of tells you if this is really what you want to do or if you need to change your major, but it also... I think it would get you better prepared.

Often this idea came out when discussing the sample teacher profile named Dan, found in Appendix A. Dan caused the participants a great deal of concern because they felt his background indicated he did not really want to teach badly enough. The following exchange with Catherine indicates this clearly.

> Catherine: I like Dan better than Carroll.
>
> Brian: Why is that?

> Catherine: I guess I think that it takes a different kind of person to have a career in a field that you'd probably make more money in, to want to go back and become a teacher... you are showing that you care... I don't know why I have this perception, but I just do, that people like Dan tend, because [as] I said, that they're just wanting to teach so bad and that it's just something that they feel like they're called to do, that maybe they're more apt to [go] into a more urban environment. And I feel like I was called to be a teacher, and that's what... I've always wanted to do...
>
> Brian: How would your perception of Dan change if he told you that he wanted to stay an engineer, but had got[ten] laid off because of the economy?
>
> Catherine: Hm. I guess it would change a lot.... I guess I just automatically assumed that he wanted to be a teacher and just decided to change fields for his own personal satisfaction.... I think it [teaching] has to be a choice, not an alternative.

It seems belonging in teaching, or being called to teach, is perceived by the participants to be an important belief for current and future teachers to hold. One of the primary factors inducing the cycle of disengagement was inappropriate (by the participants' admissions) beliefs. Because believing one belongs in teaching is important to the participants, it is not surprising they recommended additional or earlier field experiences as a way to help prospective teachers figure out if they belonged.

The benefits of variation.

Another notable component of the participants' perceptions of ideal preparation was the value they placed on having a range of experiences. While reviewing the profiles in Appendix A, several of the participants remarked that private tutoring experience was probably less valuable than tutoring experience that would put them in contact with students from a range of mathematical backgrounds, particularly lower-level students.

Bristol, when asked to design an ideal preparation program as part of the first interview, included field experiences in different kinds of schools so "when it came time to figure out where you wanted to student teach, you'd have more knowledge about [different schools]. I wish I had more knowledge about different schools."

Part of the motivation for the desire for diverse experiences was that the participants viewed their own experiences as students as largely homogenous. This referred to both their high school and earlier experiences, and reflected the perception that preparation activities were geared for teachers of advanced, or at least average mathematical aptitude. As Kayley described it, "One of the things I wasn't expecting was teaching more of a lower-level class. . . I felt like most of the classes we observed and most of the type of situations we discussed and thought about were sort of the average level CP [college preparatory] class." In a similar vein, Sun remarked that one of the major activities of one of her preparation classes, an extended look at an alternative curriculum, was not useful to her as a teacher because she taught mainly lower-level students. She speculated that it would be useful for others in her cohort who ended up teaching more advanced students. Bristol felt fortunate to have been through a student teaching experience that put her in a different environment than she'd been accustomed to, even though she'd been fearful of the experience at the beginning, saying "We had special ed. classes [in middle and high school], but I wasn't in them, so I never saw. . . those types of things. . . . so to have that experience was really good and really helpful."

The desire for a variety of experiences was somewhat tempered by the constraints the participants saw on preparation programs, which will be discussed more fully later. One example of this mitigation occurred when Catherine described a friend from her cohort whose student teaching experience differed dramatically from her own. She valued both experiences and clearly wished there was a way each could have learned what the other did, in addition to growing from their own experiences.

> So hers is obviously really different from mine. . . Both of us probably learned. . . . but I think that we both learned different things from our experience, but there's no way that I could have learned what she learned at [school] and she couldn't have learned what I learned at [school], and unless we're talking about doing like three student teaching experiences then there's probably no way for that to really feasibly happen.

The benefit the participants saw to this variety is that exposing future teachers to more types of experiences would provide additional authentic learning experiences and speed up the change in beliefs, particularly through exposure to students unlike themselves. In theoretical terms, the participants perceived that a diverse experience was less likely to result in the cycle of disengagement.

A localized, practical approach.

> UGA was great. I felt like it really prepared me to teach the math and do these lesson plan[s], that type [of] stuff, but that's a small part of being a math teacher, unfortunately. I think seeing the University professors who teach math, that's great [be]cause that's all you're doing is teaching math. You're not having to deal with personal issues, you're not having to deal with parents, you're not having to deal with administration really. You have to deal with research, I'm sure, and different things like that, but with high school, it's like we never spent time [on] classroom management, dealing with parents, even understanding how to keep good parental contact. . . . very practical things. . . . It's just all those things that I never experienced and never was fully prepared for. (Joseph)

Embedded in Joseph's statement, and appearing in various ways throughout the data, is the idea that teachers are well prepared for only part of the job of teaching. In almost every case, the responsibilities that the participants felt ill-prepared for were the more practical,

hands-on, or applied parts of a teacher's average day. As Catherine responded when asked how she would design teacher preparation, "I guess I'd try and make it look more realistic."

Classroom management.

From the participants' point of view, the most blatant omission was the lack of instruction regarding classroom management or discipline. Every participant expressed the view that teacher preparation programs should, and may even be morally obligated to, more fully prepare future teachers with this capacity. The most common reason given for this mandate is summed up well by Sun:

> Without classroom management, you cannot teach no matter how prepared you are [otherwise]. No matter how much time you spend on lesson planning, if you don't have that [classroom management under control], it's waste, [be]cause you cannot teach without students paying attention to you and willing to participate. Teaching cannot happen without students.

The participants acknowledged some elements of classroom management are best learned on the job as one gains more experience and develops a style within the autonomous confines of a classroom. However, the participants strongly felt that because classroom management was an essential part of being a teacher, they should have received more preparation for it than they did. Joseph and Catherine both gave examples of fellow mathematics teachers, who had recently graduated from the University's program, who had faced administrative or disciplinary action because of a failure to effectively institute a high level of classroom management. Watching a colleague's employment jeopardized by poor classroom management imbued them with the conviction that classroom management should *somehow* be included in teacher preparation programs.

The participants also gave an additional reason for wanting instruction on classroom management included in teacher preparation. The participants felt classroom management concerns exerted a considerable drain on their teaching focus. Though they were eventually

able to figure out a system and establish classroom norms that worked for them, the process of doing so without structured guidance precluded them from turning their attention to the other activities of teaching. As Kayley described it, having additional preparation in classroom management prior to student teaching would have allowed her to have more success with classroom management as a student teacher. This would have resulted in her being that much further ahead when she began her own teaching. In fact, she attempted to get advice on this issue prior to student teaching, but felt rebuffed:

> I'd asked the question, "What do you do about classroom management?" and... I felt that it was kind of brushed aside.... It was answered, "You just kind of have to see what works best for you. Be consistent." I understood that... but I was also like, that doesn't tell me anything, [be]cause I don't know what works for me. And I guess my worry was, sure, I'll figure out what works eventually, but what am I going to do [until] I figure it out? Are my kids going to run amuck? And I'll be like, note to self, don't let them run amuck.

Classroom management clearly weighed heavily on the participants' minds, for multiple reasons.

The way in which classroom management would be addressed in the participants' ideal preparation programs is less well-defined, however. Some suggested role-playing as students and teachers in methods courses, though they were not sure exactly what that process would look like, what content would be utilized, or even how effective it might be. Other suggestions included courses on classroom management using articles or books containing practical suggestions, such as "the pros and the cons of a rewards-based system" or "here's how to talk to a student that is acting out" (Kayley).

The most effective way to learn classroom management in the participants' eyes, however, was to experience it. Talking beforehand can provide a basis of action, but as the cycle of disengagement suggests, a lack of pertinent schema would interfere with prospective teachers' abilities to really assimilate even such practical information. As

Catherine said, "I just don't think that it would have been relevant conversation until you've actually experienced it and then can reflect on it." Thus, it is not surprising their ideal preparation programs included explicit courses on classroom management as well as extended field experiences in which to observe and practice it.

Interacting in the school environment.

The participants also struggled with the social and cultural demands put on them as teachers. Though they expected to struggle to some degree, many experiences caught them completely off guard. These unanticipated experiences were the primary motivators for other sets of courses and experiences in their hypothetical ideal preparation programs. They were more varied across the participants, reflecting the individual nature of the unexpected incidents. For example, Grace, early on in her teaching career, had the unpleasant experience of being confronted vocally by an angry parent. Grace was taken aback, and though an administrator was present during the exchange, Grace inferred from the administrator's response to the parent that she had little recourse other than politely taking the verbal abuse. Afterward, she asked other teachers how she should have responded and was surprised to learn she was not legally obligated to endure the parent's wrath as she had done. Thus, a course on school law figured prominently in Grace's perception of ideal teacher preparation.

Other suggestions for ideal preparation that were born from specific experiences included preparing for a substitute, handling outside school responsibilities such as collecting funds for school activities, deciding on an appropriate grading scheme, organizing a seating chart, and even a setting up a homework collection schedule. Taken together, these recommendations support the ideas that the participants felt there should be no part of being a teacher that prospective teachers are not prepared for by their preparation program and that practical matters figured prominently into their ideal preparation programs.

A different mathematical focus.

As previously noted, the participants valued their mathematics coursework. Nevertheless, some modified it in their ideal preparation programs to include more lower-level mathematics courses and fewer upper-level mathematics courses. The reasons for this are two-fold. First, these participants worried about their knowledge of the content they saw themselves destined to teach. As Sun said, "Through my student teaching, I had something that I didn't know and... I would get really anxious about it, like I don't know this and I'm supposed to be teaching... maybe I'm not ready [be]cause I don't know this." This worry was not entirely fanciful either. Several participants mentioned not knowing lower-level mathematics as well as they should, and believed the preparation program made incorrect assumptions about their prior knowledge.

> In with the mathematics content courses, [one is needed] that kind of reviews some of the basics, [be]cause most of us were getting so far into linear algebra and abstract algebra that you almost forgot how to just solve a system of equations the four different ways. (Kayley)

> I think professors, they expect "Oh, they're going to be good already, or they know the math portion, it's not our job to deal with it"... and then when we actually don't know math, [they] just get surprised.... [A professor] asked us about [the] definition of [a] parabola, and then we didn't know it... and then he like freaked out, like "How come you don't know this?" [Be]cause we did it in high school [and] we never went back. And then when we were in high school we never actually studied... we [didn't] truly understand the definition of parabola and we just got by. (Sun)

Consequently, the participants felt preparation programs should have more of a focus on secondary mathematics.

Secondly, it seems some, or maybe even all of the participants were not entirely sure why all the upper-level mathematics courses were required for future teachers. When asked to speculate on a possible reason, Grace responded that it probably made the University appear more prestigious. As already mentioned, many of the participants felt the struggle they went through as mathematics students was valuable, and for some of them this was enough to justify the courses. But even those who felt this way acknowledged that the specific content of the courses was not all relevant to their work as teachers. This theme is probably tied to the participants' beliefs about mathematics, which was not the focus of this study, and so should be considered extremely tentative. In fact, the participants sometimes appeared self-contradictory in this regard. For example, Grace, who could not deduce a reason for the mathematics courses beyond the esteem of the University, later said "It makes sense that a mathematician and a math teacher, the only difference between those two would just be education classes. . . we're kind of like a math professional, if you will."

The relationship of ideal preparation to actual preparation.

In all cases, the participants designed their ideal preparation programs in a way that bore a strong resemblance to the program they experienced, which is consistent with their overall positive views of the program. The changes the participants recommended were not phrased as significant restructuring, but as changes in focus, moderate additions or omissions, or a shifting of assumptions on the part of teacher educators. There are several possible reasons for this fidelity. It is possible the participants were not able to imagine a program significantly different from theirs, due to inexperience, lack of real impetus or reflection, or any other factor. However, there is in the data another explanation for why their views of ideal preparation so closely mirrored their actual preparation.

Perceived constraints on teacher preparation.

The participants were keenly aware of various constraints on the preparation of future teachers. Cultural, institutional, temporal, financial, and even personal reasons placed parameters on what they perceived could be done. Many of these constraints came to light when the participants considered teacher preparation programs as they exist in other countries. These perceived constraints, although they were not mentioned by all participants, provide valuable insight into how some of the participants view teacher preparation.

One constraint the participants saw on preparation programs was cultural — the idea that requiring a great deal more of future teachers would interfere with college life. As Bristol said:

> I think it would definitely take a toll on my friendships... [and] I'm a really big football fan and [having more work] would... make me have to sacrifice my other parts, like my church activities, that I wouldn't have been able to go to and be a part of, and those *other parts of college* that [the program's] not a part of. (emphasis added)

Institutional issues also came into play. Joseph, despite advocating for a larger field experience component than he experienced, noted that teachers could not be asked to always give up their classroom to student teachers (or other types of field experiences), and that a balance had to be maintained between providing new teachers with valuable experience and protecting the learning environment of high school students. Time was also perceived as an issue, as Kayley remarked "I know there's not a lot of room in college curriculum because... there's already so much and people want to try to graduate in four years [which is] growing near impossible now."

Several participants also noted that the Chilean model, from Appendix A, would be untenable in the United States because, domestically, many students must work part or

full-time to afford college and this would be impossible with significantly more field experience. This is especially interesting because the participants were so adamant about expanding the field experience component of preparation programs, and even acknowledged that the Chilean model, if adopted, would likely result in better prepared teachers because of the increased field experience.

One of the more significant constraints the participants felt existed on teacher preparation programs, in light of their previous belief that preparation programs should completely prepare students, is their later acknowledgement of a program's inherent inability to fully ready future teachers.

> There's never going to be be a perfect program and there's not going to be anything that I think I would leave from saying I'm completely prepared to be an awesome teacher and step in a classroom my first year and not have any anxiety and not have any worries. I don't think that's possible. (Grace)

In fact, the participants were asked to reflect on themselves as undergraduates and conjecture what they might have been like if they had gone through their ideal preparation programs. As if to make this point, they responded that there would have been times, even in their custom designed programs, when they would have struggled to engage in the activities and the cycle of disengagement might have set in. As Catherine described it, "I think there's always going to be a little bit of that, especially with people who are coming from adolescence, who think they know everything already and want to just get it over with... there's so many aspects to a person when they're in that stage in their life." Grace related this surprising phenomenon to one of her pieces of ideal preparation, a course on school policy or school law motivated by her unfortunate exchange with an angry parent:

> A lot of the classes that I took... I really didn't see any point to... Having taught, makes complete sense. Totally makes sense and I'm glad I had those classes. If I were an undergrad. and took school policy, I probably would have

> been bored out of my mind and not paid attention... but then teaching, having that background knowledge would have helped and would have just kind of helped me know a little bit more of what was going on and what happens at the school level... So, I think I would have probably been the same as an undergrad.

The construct of readiness.

Taken all together — the participants overall satisfaction with preparation, their extensive suggestions for ideal preparation, their belief they may have responded similarly in both ideal and actual preparation, and especially their perspective on the possible constraints of preparation from their perspectives as teachers — it is possible to recognize a para-construct alongside preparation. This construct, which I will term readiness (as mentioned in the previous chapter) is more volatile and emotional in nature than simple preparation. As Joseph described it, it's something you cannot have until you've done the thing for which you needed it.

> I felt as prepared as anyone, I think, could have gotten me. Leaving UGA, I think they did the best job anyone could have done, but I still think you're not totally ready. I think it's the same thing with getting married or being a parent.... It's like, how do you really prepare to be married? I mean, they tell you, you can read books all you want, or to be a parent you could read all the books about taking care of a baby, but you have a baby, it's like you don't know what to expect until you actually do it and it's very different from what you were told. I'm not saying it's bad or good or better or worse, it's just you can't really fully be prepared, in my opinion. I think it's the same way with teaching math.... I think you could be well prepared. They can do their best. UGA did a great job, I feel, but there's still things, it's just being in the classroom. It's the first time a student says "No, I'm not giving you my cell phone." How [are] you going to respond? It's the first time a student comes to

> you crying because they're dealing with some serious issues at home and how do I deal with that? It's awkward situations, students trying to flirt with you or make inappropriate comments or students that you know are using drugs. How do you communicate that? Even stuff that doesn't necessarily deal with teaching math, you just have to deal with a lot and at times it's kind of being a counselor, being an older brother or parent, being a math teacher, it's being, not necessarily a friend, but someone who they can come to. It's just a lot of different roles that you may have to play and I don't know if four years of [math education] and math courses can really get you fully prepared for that.

Future teachers, according to the participants, can be better prepared by their preparation programs, but they cannot be fully readied for the challenge of the classroom.

Chapter 5

Discussion and Implications

> The ultimate goals for novice teachers — that they assume the professional responsibilities of a teacher and teach competently — are undoubtedly shared by members of the multiple communities involved in teacher education.. . . [but] To the extent that conceptions of professional competence or the practices that guide teachers' development toward these conceptions are incompatible across communities, these communities are likely to compete rather than support each other in their impact on novice teachers' learning. (Borko et al., 2000, p. 203)

Discussion of Issues Surrounding the Cycle of Disengagement

The participants' perceptions of their preparation brought to light a phenomenon that plays an important role in how they were affected by their preparation. As discussed in the prior chapter, the cycle of disengagement was precipitated by a lack of necessary schema on the part of prospective teachers, a perceived schism in beliefs about the nature of teaching between prospective teachers and teacher educators, or a combination of both of these. The cycle resulted in prospective teachers not fully engaging in classroom activities or coursework and consequently not fully profiting from portions of their preparation, validating the disengagement in the prospective teachers' minds. As teachers, the participants reflected back on these portions of their preparation program with regret, believing the activities and coursework had untapped value for them in learning to teach.

Understanding the cycle of disengagement.

The participants' tendency to enter the cycle is counter-intuitive, as an informed and rational analysis would suggest it is self-defeating. Each of the participants wanted to be a teacher — they believed strongly they 'belonged' in teaching — so why would they engage in a process that would ultimately inhibit their preparation to become teachers? In a similar vein, it is worth wondering if at least some of what the participants wanted in their preparation was actually contained in it, but they were unable to fully assimilate it because of the cycle of disengagement.

Take Grace as an example. She talked about not being as conscientious as she should have been when making practice lesson plans during the program because she knew they would not actually be implemented. She also claimed she did not know how to *really* plan a lesson until her student teaching experience, and she considered this to be a shortcoming in her preparation. One explanation is given by Catherine:

> It's kind of like practice with a sport. Everybody hates practice. Everyone wants to play in the game. And when you practice, practice, practice, of course you're going to moan and groan about it, but then when you get to the game it's a lot better.

Indeed, it is tempting to pass off Grace's (and the others) experiences as an intractable part of human nature, a universal shortcoming that is to be spuriously expected. However, this view misses the larger picture — the parts of the metaphor Catherine did not mention. Most prospective teachers have never actually been "in the game" and furthermore might think their coaches do not even know how to play. Practicing to play a sport I enjoy is one thing; practicing to play a sport I think I will enjoy but have never tried, and whose rules I believe to be different from the rules of practice, is another thing entirely.

Another explanation is that teacher preparation for the participants was a bit like Schrödinger's cat[1] — simultaneously impactful and not impactful. Indeed, the cycle of disengagement seems to require an act of doublethink because it requires a prospective teacher to participate in preparation activities (which would require some level of engagement), but at the same time to mentally distance himself or herself from those activities.

This fascinating phenomenon places teacher educators in a difficult position. Planning and preparing are useful activities, and certainly more than just doing is required to learn something as complex as teaching. The participants themselves now recognize the value in the planning activities and believe simply throwing them into the classroom would have been counterproductive. On the other hand, the participants' reaction to the preparation while in the midst of it would seem to indicate practicing is not extremely valuable precisely because they do not value practice at that point! There is no obvious reason to believe other prospective teachers do not experience the cycle of disengagement in some way, and so teacher preparation both is and is not impactful on them during that process as well. All in all, it is a perplexing dilemma.

To try and find a solution to this paradoxical situation, let us return to the reasons for the cycle of disengagement. The prospective teachers' understanding of what preparation should be was driven by their beliefs about what teaching is like, and they initially surmised their professors' beliefs about teaching to be malformed. There are several possible scenarios consistent with their judgment. First, the schism may be real or it may be imagined. Additionally, either group may hold malformed beliefs about the nature of teaching. What can be concluded from the data is that the participants later viewed some of their earlier beliefs as malformed, and that the schism is likely sometimes real and sometimes imagined. It is probable that at times the participants did observe faculty with

[1]Physicist Erwin Schrödinger proposed a thought experiment critical of the contemporary understanding of quantum physics, which implied a cat in a specially rigged box would be both alive and dead at the same time.

ineffectual beliefs about teaching. After all, even the best teacher educators do not have a perfect view of how to prepare future teachers (itself an act of teaching), and the teaching practices in many college courses have occasionally been soundly criticized (e.g., National Research Council [NRC], 1991). At other times, the schism may simply have been imagined, due to expectations built from prior experiences and lack of authentic communication between the prospective teachers and faculty members. Sun's prolonged cycle of disengagement in particular suggests the possibility that prospective teachers carry significant baggage with them into each new course, coloring their reaction to the course's work.

The solutions to two of the above scenarios seem straightforward, though not necessarily easy. Theoretically, if all teacher educators held views of teaching that were consistently born out by practice, then the participants would have less actual reason to doubt their preparation's philosophical foundation (i.e., if all teacher educators were 'good' teachers by some defensible measure[2] then presumably good teaching would be a cornerstone of the preparation program). Likewise, if teacher educators consistently and explicitly revealed their beliefs about teaching, then imagined differences in beliefs could be mitigated. The situation of naïve beliefs of prospective teachers is a little more difficult to sort out, though a suggestion worth considering was given by the participants themselves. This possibility will be considered shortly.

The second main motivator for the cycle of disengagement was the participants' lack of prior experience/schema/knowledge on which to hang their learning about teaching. Teaching is complex, and it is perhaps naïve on the part of preparation programs to presume students can meaningfully learn about such an activity in an almost entirely academic way. There is some literature suggesting the types of knowledge experts suppose

[2]Defining such a measure is beyond the scope of this research. The point of the argument is simply to state that we could worry less about students (prospective teachers) claiming their professors (teacher educators) were bad teachers if we could safely assume professors were good teachers. There might still be issues related to the perceived schism, but at least the situation would be more straightforward.

is most fundamental is not the type of knowledge most useful for novices attempting to learn, in a variety of fields, including mathematics (Nathan et al., 2001) and mathematics education (Nathan & Petrosino, 2003). The participants' descriptions are consistent with a similar "expert blind spot" in teacher education. Again, the participants suggest a course of action they believe would overcome the problems of this blind spot. In what feels like a bit of serendipity, it is the same as their suggestion for facilitating the necessary shift in beliefs needed to prevent a schism from inducing the cycle of disengagement: foregrounded and expanded field experience.

The challenges and possibilities of change.

The irrational nature of the cycle of disengagement implies the participants did not enter it strictly by choice. To argue otherwise is to impose a model of deficiency on the participants, suggesting their perceptions were grossly distorted or their decision making ability was unsound. Even if they did not believe full engagement would lead to them being better teachers, it strains credulity to suppose they believed it would be damaging to them as teachers. The only conclusion then is that they were not capable of fully engaging in all the activities of their preparation.

As such, it does not seem the cycle could be prevented merely by making prospective teachers aware of it. A more systematic approach is needed. The participants suggested foregrounding and expanding the field experience component of preparation programs in order to help them see what real teaching is like earlier on, figure out if they "belonged" in teaching, and provide meaningful experience for them to reflect on later in the preparation program. These suggestions are at least sensible on the surface, but there are more issues to consider than just a straightforward change in the structure of most preparation programs.

As the participants noted, there are many constraints on universities in general, and teacher preparation programs are no exception. The participants were wary of any radical modifications to teacher preparation that would impinge on other typical activities of

college-age students, and they also recognized the larger societal pressure to design a program that could be completed within the standard four year undergraduate experience.

It is also true many undergraduates work to support themselves during college. Recent reports suggest more than half of all undergraduates work during college to meet expenses (Staklis, 2010). Additionally, colleges are usually loathe to offer degree programs that cannot be completed in four years due to the capitalistic nature of higher education. Requiring future teachers to engage in a dramatically more intense program of study would doubtless preclude some otherwise interested individuals from participating. The field of teacher preparation has faced a similar choice before. As Labaree (2006) explains, while recounting the history of teacher preparation:

> . . . normal school leaders faced a choice between selectivity and monopoly. They could remain as elite institutions providing an idealized form of professional preparation for a small number of aspiring teachers. . . or they could expand the system to meet the demand for teachers, establishing an eventual monopoly over access to the profession while risking the dilution of the normal school ideal in the process. They chose expansion. (pp. 22–23)

Labaree explains in some detail the results of this decision, particularly the negative consequences of the dilution, but does not offer much in the way of conjecture on how things might have turned out if normal school leaders had chosen selectivity instead. It is certainly worth pondering what might happen if that choice was made now.

It is also necessary to consider that changes in complex and dynamic systems do not occur without ripples. How might the rest of the process of teacher preparation be affected by a foregrounded and expanded field experience? If the current constraints on preparation programs were adhered to, it would be necessary to eliminate other coursework or activities from the preparation program. In such a scenario, the participants were most willing to sacrifice some of the more abstract, upper-level mathematics courses to make room. Pedagogical or methods courses were also occasionally proposed for trimming, but the

single component most universally thought of as expendable was the collection of core, or general education courses required of all undergraduates. In fact, only Sun felt such courses should play a more prominent role in teacher preparation, on the basis that teachers need to be well-versed and authoritative in a wide range of topics.

There are several common justifications for keeping such courses part of the required curriculum: allowing students time for exploration in choosing a major, producing a well-rounded graduate, and providing a common experience unique to the culture of the university. Only the first of these was even approximately approached by the participants, and mainly in the context of belonging in teaching.

The participants' belief that one should belong in teaching was very strong, and would seem to indicate they would dismiss the argument that general education courses are necessary to allow undergraduates time to figure out what they want to do. For future teachers, they might argue, this does not apply — you know you want to be a teacher, you get confirmation or disconfirmation of this knowledge in the field, and outside requirements are little more than distractions. It would be difficult to know just how many undergraduates eventually choose, and stick with, a major based solely on general education required courses, so it is impossible to really speculate intelligently on the participants' probable line of reasoning. However, I will say it *feels* naïve, and does not take into consideration my anecdotal evidence that often prospective teachers experiment with a great many majors before settling into education.

In short, eliminating a part of the preparation program as it now stands is sure to upset somebody, and there is not enough evidence at present to make a recommendation as to which pieces could be most profitably removed. Foregrounding the field experience, however, does not require the same substitution of values as expanding it does. Moving the field experience to earlier in the preparation program does present its own unique set of implications. On the whole, they seem more manageable than a direct expansion.

Certainly, moving the field experiences earlier, perhaps having a minor experience in the first semester of the sophomore year and a major experience the next, and possibly even positioning student teaching a semester or even two semesters before the end of the program would change the dynamic of the program considerably. If the participants are correct in their conjecture that an earlier field experience would help facilitate belief shift and provide experiences or schema, increasing their ability to meaningfully contribute to discussions and activities later in the program, then teacher educators would need to prepare for more advanced and mature prospective teachers in their classes as a result. The prospective teachers would have some authentic teaching experiences (albeit a limited number) to draw upon in their thinking about teaching, and their beliefs about teaching would be more explicit and formed. Though such a population of students probably sounds ideal, it would place an increasing onus on teacher educators to have well-formed beliefs about the nature of teaching, a willingness to openly discuss those beliefs, and a clearer view of creative, engaging, and meaningful classroom activities to help the prospective teachers develop at an accelerated rate.

On the other side, mentor teachers and teacher educators involved in the field experiences would be required to prepare for younger prospective teachers with less formal background about teaching. This would seem to provide both a great challenge for maintaining the consistency of the experiences (especially from the high school students' point of view), but also a great opportunity for creativity and authentic learning on everyone's part.

On the possibility of interrupting the cycle of disengagement.

To this point, my focus has been on the possibility of preventing the cycle of disengagement. It is also worth examining whether and how the cycle might be ended prematurely. Any teacher can probably relate to the feeling that some of their students are 'not all there,' but the question is what to do about it. The participants reported coming

out of their cycles in just two ways. The first, and most dramatic, involved the realization that the activities were about to be real, or authentic. This is very much the way Sun experienced it, suddenly becoming conscious of the fact that she would soon be graduating and responsible for her own students. This comprehension shocked her, and made her realize how many opportunities she had missed. To replicate this awakening in other students, it would seem an actual implementation of their work would be needed.

Authentically doing the work of teaching, with real consequences, might spur greater engagement. Grace hinted as much, noting that if she had been asked to design a lesson plan to teach to actual eighth graders during the next class meeting she would have seriously worked through the process of preparing a lesson, rather than just half-heartedly doing it as she was accustomed to.

The other avenue for exiting the cycle suggested by the data is a conclusion of the activities and circumstances that prompted the cycle to begin with. Excepting Sun, the participants felt that at least some of the activities of the courses were worthwhile and so they engaged in those when they came about. Similarly, one can imagine that if it is a lack of schema preventing a student from engaging in a particular activity, when the direction of the course shifts to something in which they have more experience the engagement will be correspondingly fuller. Such options require a great deal of awareness and proactivity on the part of teacher educators, and it is possible different students undergo the cycle at varying times, increasing the complexity of the teacher moves needed to neutralize the various cycles of disengagement. In short, confronting the cycle after it has already started is probably more difficult than putting in place steps to prevent it in the first place.

Issues concerning the participants' perceptions of ideal preparation.

It is striking that the participants expected teacher preparation to be über-effective and yet did not have strong expectations for what it would contain. Functionally, ideal preparation would serve two very different purposes. First, the ideal preparation experience

would do less to disturb their emotional equilibrium. Secondly, ideal preparation would produce teachers who were thoroughly prepared for every difficulty of teaching the participants had encountered or expected to encounter. Therefore, the participants' ideal preparation heavily reflected their own particular experiences. There are many factors in common, such as increased or foregrounded field experiences, a more practical approach to pedagogy, and (mostly) a lesser mathematical emphasis, but they varied in other respects related to their own experiences as both prospective and inservice teachers.

Taking the union of their visions (where not contradictory), paints a picture of idyllic training that would effectively blend instruction in mathematics and pedagogy with experiential learning. It is difficult to sum up in a word, but one that comes close to the sense of the descriptions is *organic*. From their point of view as prospective teachers it would be seamless, caring, grounded in the real-world, and indelibly clear. From their perspective as inservice teachers, it would be both broad and deep, accounting for their naïve beliefs about teaching in such a way as to change them without affront, and oriented toward local (state-wide) issues of education. For both purposes, teacher educators would be master teachers deeply connected to high schools.

Such a description of teacher preparation is consistent with the participants' initial conceptualization of teaching as easy. That is, if one believes teaching is easy, then learning to teach should also be easy. A program like the preceding description, in which learning to teach would be nearly tranquil, would not perturbate that belief. One might graduate from such a program expecting teaching to be easy. In other words, if one is to be taught to face difficult challenges, then the teaching must in some way reflect the difficult nature of those challenges.

I see this as a special case of a problem common to all teaching. Part of a teacher's job is to become superfluous, to render the learner capable of competently confronting circumstances alone. The paradigmatic way we, as a species, have endeavored to do this is to incrementally require more proficiency of the learner in tackling ever-growing pieces of

the circumstances in question. Even if we did this perfectly, however, our ability to remove ourselves from the equation is discrete. There exists at each stage some gap between the learner's previous prowess and the challenge, which requires an as yet unexplained ability to grow or a leap in skill or knowledge by the learner. The existence of these gaps, and the subsequent leaps, prevents education from being perfectly smooth. Certainly it can be relatively smoother or rougher, but true continuity of learning eludes us.

There are small hints in the data that some of the participants recognize this phenomenon. Joseph is the most explicit, using the experiences of newlyweds or new parents to show that one can be brought to a certain edge, a brink if you will, but beyond which you must jump into the experience if you are to cross. This is a rather long way to say that teacher preparation failing to illustrate the difficulty of teaching would ultimately be a disservice to prospective teachers. Phrased along these lines, the participants' recommendations might be seen as a suggestion that such an illustration is better accomplished in a 'controlled' setting, such as a field experience, than in the everyday interactions of collegiate coursework.

A recommendation for preventing the cycle of disengagement.

The possibilities of foregrounded and expanded field experience for preventing the cycle of disengagement hold real promise. First, the earlier field experience would potentially begin the process of belief change much sooner in the program, rendering the participants less likely to discount the value of various activities later in their preparation. Secondly, the field experience could provide much needed teaching knowledge or schema the participants could draw on later in the program, making future coursework more real and meaningful to them, and thus much more likely to have a lasting impact. The primary downsides to implementing such changes would be the necessary addition of time or the removal of other content from the program, the necessarily increased logistical coordination with secondary

schools, and the uncertainty of the unpredictable nature of the actual field experiences themselves.

One of the participants' other clear departures from traditional preparation, the issue of mathematical focus, has a relationship to relatively recent mathematics education literature. Some teacher educators have argued that prospective teachers deserve a greater focus on the mathematical concepts of secondary school, rather than forays into more academic mathematics (e.g., Proulx & Bednarz, 2008), and the growing research base on pedagogical content knowledge (Shulman, 1986) and mathematical knowledge for teaching (Ball, 2003) also suggests some teacher educators are not entirely satisfied with the long-standing contention that prospective mathematics teachers simply need the equivalent of an undergraduate degree in mathematics. The participants did not have a well-developed idea of what the alternative focus would look like and so it is unclear if they would regard the constructs in the literature as meeting their needs, but the surface similarity is striking.

Discussion of other findings.

One of the interesting characteristics of the participants' recollections of their experiences is that they appeared so different from what they were probably intended to be. For example, one of the most valuable things the participants carried with them from their experiences in upper level mathematics courses is an increased capacity for empathy for struggling students. I find it highly unlikely this end result is exactly what the designers of the preparation program had in mind. This disconnect between the intended and the actual results is consistent with the participants' descriptions of the program as scattered or "imminent." The preparation program did not appear completely cohesive or clearly purposeful to them from the inside, and so they were forced to take from it what they could. An increased appreciation for struggling students is certainly not a bad thing, and it seems reasonable that this attribute will serve them well as teachers, but one has to wonder if requiring several time and resource intensive courses over the course of many semesters is

the most efficient way to develop such a trait. Or if the development of affective components is even explicitly part of the preparation program's structure and goals. Or if it should be.

It is also worth pointing out the present design of the preparation program (and most U.S. programs), with student teaching as the capstone, suggests a certain philosophical stance towards learning. Specifically, it suggests knowing is a prerequisite for doing, and it also assumes that in doing the knowing can be applied. The participants' perceptions dispute this stance, agreeing with Lave (1996) that knowing comes with doing. If not, then the participants would have been able to effectively apply their knowledge from the coursework during their student teaching, and the student teaching would have been perceived as learning to teach rather than an opportunity to teach. As this is not the case, and it is likely other prospective teachers experience the cycle of disengagement and so are not able to retroactively connect their learning to their experience, it is worth considering other options for the placement of student teaching.

There is another possible explanation for the placement of student teaching in most teacher preparation programs. Student teaching is the primary time where the prospective teacher's roles overlap. Prior to that experience they are mainly students, and after that experience they are generally teachers. As such, it is the one time when the university and the high school really come into confluence with each other, and where differences in philosophy and practice are most likely to come to a head. Because the prospective teacher is viewed as the product of the university, rather than of the school, it is in the university's reputational interest to present that product in the best possible light. Therefore, student teaching might be at the end of teacher preparation because it allows the university to shift responsibility, and blame, for the messy transition from student to teacher onto the school. The often troubled relationship between mentor teachers and university student teaching supervisors (e.g., Bullough & Draper, 2004) is consistent with a philosophical misalignment between the institutions. Philosophical misalignment would naturally lead to skewed perceptions between the two, which could form the basis for such a shrewd arrangement.

In any case, the participants' experiences did not always impact them in the way that was likely intended, and the participants felt intuitively that sometimes things were not going as they should. That they were able to still meaningfully learn from some of the experiences is commendable; this suggests many prospective teachers contain a measure of flexibility. The difficult thing for the participants in this study was that this flexibility was simultaneously required and institutionally discouraged. The participants had little real freedom in determining their course of study, and even their participation in course activities was possibly over-regulated. Joseph related the following experience along these lines:

> I felt sometimes almost like we were viewed as little kids. . . sometimes we'd have a desk full of all my friends and we['d] sit together and work fine together, but they'd split us up because we were all guys and they didn't want us all sitting together. . . and we wondered for what reason. And it wasn't really for any reason, but just to be split up.

The structured and non-cohesive dual nature of the program inhibited the participants' experiences, producing an environment in which false-starts of self-initiative ruled. This characteristic is very likely unintended and suggests all aspects of a teacher preparation program be given careful consideration for fit with the underlying educational philosophy.

Implications

"Teachers' feelings of preparedness may indicate the extent to which their training prepares them to meet [classroom] challenges" (Lewis et al., 1999, p. 47). The participants' perceptions of their preparation are interesting in many theoretical lights, but are also relevant because of the relation they may hold to their actual preparation. The overall positive evaluation of the participants is heartening, and suggests much of the preparation program serves a valuable purpose. Likewise, the hedging, extensive recommendations, and

existence of the cycle of disengagement all imply that much work remains to be done in learning to prepare teachers.

Applications of lessons learned.

It is important to consider what might be the consequences of extended cycles of disengagement, such as Sun underwent. Despite passing all the necessary requirements, graduating, and obtaining certification to teach, Sun does not feel she was adequately prepared and keenly regrets not having taken her preparation more seriously. This condition could have significant implications for her as a teacher. It could happen that the experience spurs her to be more conscientious about future opportunities for learning about teaching and the acute emotional stress she now feels will drive her to improve her knowledge of teaching, ultimately resulting in more growth as a teacher than she would have undergone otherwise.

Conversely, it is also possible Sun will carry a sense of distrust of formal preparation with her for some time, spurning professional development or other growth opportunities as farcical. This second course of action could conceivably result in heightened tension in future situations where she is directly involved in formal preparation, such as in the role of mentor teacher or department chair. It is not possible to tell at this time precisely how the baggage Sun carries with her will eventually affect her, but it is likely it will impact her in some way. Even if the former scenario ultimately comes to pass, and Sun uses her experience as a platform for accelerated growth, it is unreasonable to suspect the same would be true of all others who proceed through teacher preparation in such an unnecessarily strained manner. The unrefined nature of their experience would suggest a greater degree of vulnerability to happenstance and therefore a larger measure of unpredictability in their eventual path.

If students prone to prolonged cycles of disengagement could be identified prior to completion of the program, perhaps something could be done. One avenue for potential

identification is the idea that a person's "belief structure" regulates, or is at least associated with their response to notions that conflict with their current beliefs (Cooney et al., 1998). It may be that prospective teachers who are the least able to suspend their disbelief when they perceive their professors' beliefs about teaching to conflict with their own are least able to engage meaningfully in the activities designed by those professors. This characterization most closely aligns with the isolationist belief structure identified by Cooney et al. Although the interviews were not designed to identify belief structures, Sun's responses are consistent with isolationist thinking.

In particular, it is worth noting that Sun frequently sought affirmation for her beliefs, asking me during the interviews "Don't you agree?" and, after expressing that she believed students would eventually change as long as she did not give up, "Is it true?" This behavior is similar to that exhibited by Cooney et al.'s isolationist participant Henry. Both Sun and Henry also interpreted experiences in such a way as to reinforce their beliefs. Ironically, for Henry it was his belief that he was well prepared to teach, driven by what he perceived to be positive interaction with his students. For Sun, her belief that the program had somehow failed her was reinforced by experiences such as the one related earlier where she initially assumed a student was lazy, but later uncovered that the student was simply lacking even basic content knowledge. It makes sense that isolationists would be most prone to the cycle of disengagement, given that the defining quality of isolationism is inability or unwillingness to meaningfully integrate new and conflicting beliefs. Identifying isolationist students during their teacher preparation would provide teacher educators with a window in which to work more directly with them. The nature of this intervention, unfortunately, is not immediately suggested by the data.

Sun's recommendations for ideal preparation were largely similar to the other participants' calls for foregrounded and increased field experience. The magnitude of the belief shift required for Sun to directly benefit from this modification, however, seems significantly larger than for the other participants. After all, changing beliefs is the thing at

which isolationists are least able, and so the field experience would possibly need to be so much larger in scope or higher in intensity as to render it impractical. Another possibility is to require prospective teachers to participate in teaching-like experiences outside of the classroom, such as tutoring or volunteer work with youth. Most prospective teachers would see this as clearly relevant to teaching, and the interaction with students would be authentic, if narrow. This impoverished form of field experience might serve as an intermediary for prospective teachers like Sun, allowing them the opportunity to encounter some of the real difficulties of teaching early on, and thereby transition the belief shift at a more realistic pace in addition to providing them with some experiences on which to reflect during future preparation activities. In all likelihood, there is no easy solution to preventing disengagement.

Directions for future research.

A next step in this line of research would be to determine how common these participants' perceptions are. What do early career teachers from other preparation programs, or other routes of preparation, have to say about their experiences? Additionally, how do other stakeholders view the process of preparation? It would be informative to contrast the perceptions of teacher educators with those of new teachers to see if an analogue or counterpart to the cycle of disengagement exists on the other side.

It would also be interesting, from a theoretical perspective, to study whether the cycle of disengagement exists in some form for students in other contexts and, if so, how the causes differ. It certainly seems plausible for mathematics students at varying stages, as the participants in this study experienced parts of the cycle in relation to their mathematics courses. My own memory seems to suggest a similar experience in a multi-variable calculus course, where I suddenly 'awoke' to discover I had not learned much during the latter third of the course and was now staring down a very formidable final exam.

Research is needed on whether such disengagement can actually be prevented in teacher preparation by changes to the structure or content of the preparation program. Based on the data and the theory it would seem it can sometimes, but not always, be prevented. This is because it is partially induced by beliefs, and beliefs have proven exceptionally temperamental.

Of particular note is the close relationship between beliefs and emotions, which are sometimes defined by their volatility (Philipp, 2007). Even if we were successful in mitigating the cycle of disengagement, the process of preparing teachers will still probably be turbulent and demanding, perhaps more so. The participants acknowledged that even a perfect preparation program would not be perfectly received, and the sheer complexity and subtlety of prospective teachers indicates significant challenges in understanding and responding to their needs. Sun's protracted cycle of disengagement helps illustrate this. Her extended cycle precluded her from benefitting as fully as she might have from her preparation and contributed directly to her overall negative perception of the program. Nevertheless, she later saw value in much of the program and consistently reflected on a few specific activities. Ultimately, she saw the program as locally positive but globally negative. A capacity for such a textured response to the program would seem to require an equally tailored modification to any standard program, which would place severe demands on teacher educators and schools.

There is also the possibility of a corresponding cycle of engagement. The data is spotty in this area, but it does suggest Catherine experienced something along those lines. Having taken AP Calculus as a high school student, she enrolled in Calculus 2 as an undergraduate. She categorized Calculus 2 as largely a repeat of what she had learned in AP Calculus, but at a deeper level. The result is something every teacher educator would likely hope for in all prospective teachers: "It made me understand everything a lot deeper and then, maybe from there I just decided. . . I really like this and I want to get [it], I want to figure it out more." Not surprisingly, Catherine's cycle of engagement was spurred by

the inverse of one of the motivators for the cycle of disengagement. Whereas one of the precursors of the cycle of disengagement was a lack of schema and previous experience with which to connect to the new material, Catherine already had a basic knowledge of the calculus concepts and was able to look at them deeper. An extrapolated cycle of engagement is modeled in Figure 5.1.

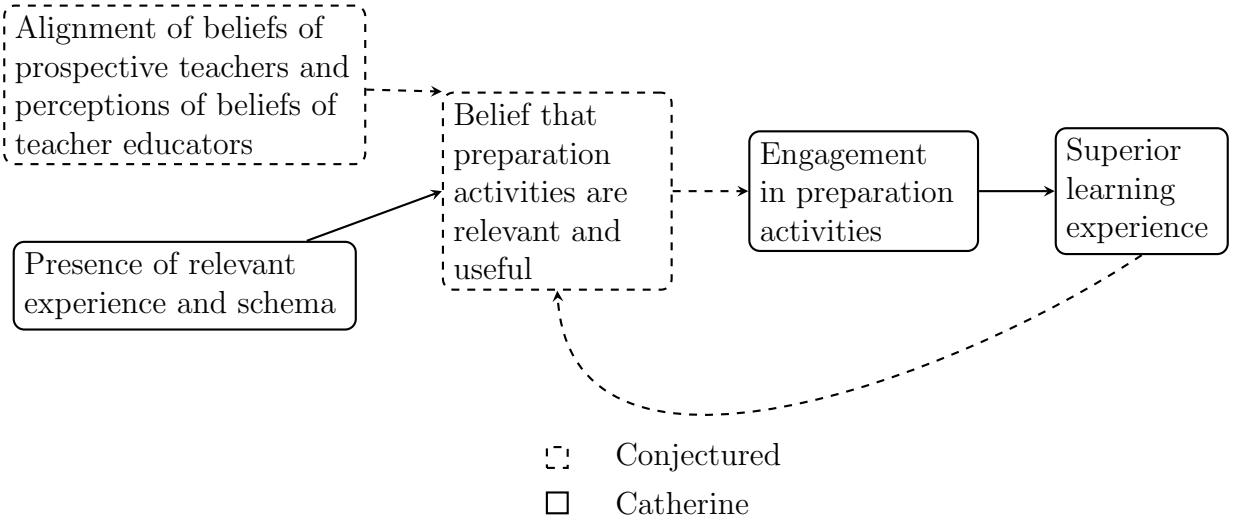

Figure 5.1: A Possible Cycle of Engagement

Future research might be able to flesh out the cycle of engagement further, to confirm or refine the structure conjectured here. As stated before, the participants were eager to share their ideas for improving the preparation program, to the extent discussions of suggested improvements are far more prominent in the data than perceptions of productive aspects of preparation. To successfully study the cycle of engagement, one would need to find participants who expected less of their preparation than did these did, or else design the interview protocol to probe episodes such as Catherine's. It might also be possible to study the cycle by interviewing prospective teachers *during* their preparation, as it seems plausible students who are engaged would be more cognizant of their perceptions than students who are disengaged. Indeed, the very nature of disengagement suggests elements of the cycle of disengagement would not be apparent to prospective teachers during their disengagement, but only afterwards, as was the case with my participants.

A thoughtful teacher educator might wish to identify if or when his or her students are in the cycles of disengagement or engagement, with the hope of altering (or maintaining) the circumstances so as to best engage the prospective teachers. I cannot derive from the data or theory a precise mechanism for identifying which students are in the midst of the cycle of disengagement. It seems the prospective teachers themselves would not be fully cognizant of their disengagement during the cycle, because at some level they would still be engaged in the activities in the form of turning in homework, attending class, and otherwise participating in ways necessary to get a grade. If anything, their likely frame of mind would reflect a sense of malaise or discomfiture, the cause of which would be only vaguely sensed.

The only possibility I can think of for identifying the cycle of disengagement in action in a student would be to earnestly probe that student's motivation and beliefs regarding the subject, and to analyze their responses in light of the theory. If a student expressed something akin to the motivators of the cycle of disengagement, one might conclude he or she had entered or were about to enter the cycle. A negative response, however, would be simply uninformative. To reliably identify this experience from the outside would require flashes of intuition I am incapable of describing.

As for the cycle of engagement, it appears more likely one would be able to self-assess this condition, due to the nature of engagement and the subsequent heightened understanding. Externally, such an engaged student would appear to make rapid and significant progress, though even here identifying the reasons for the phenomenon would be challenging.

To frame the difficulty in identifying the cycle another way, let me use personal experience. I have at times experienced the distinct impression that I thoroughly understood the task in which I was involved. I felt I could sense both the obvious and subtle facets of the challenge and that I could even predict how things were going to turn out and identify why it would turn out that way. Experience has shown me that sometimes during such times of believed competence, my beliefs are supported by events and things

unfold precisely as I expected them to. Other times, unfortunately, my thinking turns out to be incorrect and my confident understanding collides with a completely unexpected reality. In both such cases the initial feeling of full engagement and understanding is real, it just turns out to be inconsistent with later experience in some cases. It is likely most have similar experiences.

If we knew how to reliably know when we really did know, then we would not have such disconcerting and confidence undermining experiences as those. The fact we do, or that I have, indicates to me that the nature of knowing and not knowing, similar to the nature of engagement and disengagement, precludes us from recognizing either all the time. The best we can do is gather data from those we suspect might not be fully engaged, hypothesize and implement a course of action to reengage them, and return to collect more data, ever aware that their learning experience might pass by all of us unawares and incompletely fulfilled.

Conclusion.

The results of prior research on teacher preparation have been mixed, with some studies claiming teacher preparation (at least aspects of it) does have a measurable effect on its participants (e.g., Borko et al., 2000; Boyd et al., 2008; Monk, 1994; Smith et al., 2005) and others suggesting teacher preparation has little lasting impact on teachers (e.g., Goldhaber & Brewer, 2000; Kane et al., 2007; P. S. Wilson et al., 2005). Certainly, if one expects teacher preparation to have a significant effect on teachers the research is disappointing.

The goal of my study was not to measure what effect the preparation program may have had on the participants, but rather to uncover what their experience was like in the program and what their perceptions of it are now. Doing so allowed me to uncover an interesting phenomenon each participant experienced during their preparation: the cycle of disengagement. Two instigators of this cycle were also uncovered, and this discovery provides at least a basis for considering how the cycle might be prevented or mitigated in the future.

If there is one overarching lesson to be learned from this study, it is that the perceptions of prospective teachers must be taken into account in the teacher preparation process. Teaching to teach, indeed teaching anything, is largely unsuccessful without the cooperation of the students, and their cooperation depends in some measure on their belief in the teaching. The challenge is daunting, but the data suggests much of what is needed is already in place and in need of only moderate modification. Despite the complicated nature of teaching teachers, I still believe that teacher preparation has enormous potential as a fulcrum for improving all levels of teaching. Such improvement cannot be accomplished without careful consideration of the perspectives of future teachers.

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Appendix A

Interview Protocols

This appendix contains the interview protocols used throughout data collection.

First Interview Protocol

Each participant's first interview utilized the same interview protocol.

Questions.

- If you were to describe someone as "prepared to teach," what would that mean?
- Tell me about the preparation you received to become a teacher.
- You indicated that you believe your preparation was (a)typical [from questionnaire]. How was it different/similar to others in your program?
- How well prepared do you feel you were by your undergraduate program to be a teacher? What was beneficial? What was lacking?
- What's something that you learned about teaching as an undergraduate that's always stuck with you?
- What is something that you wished you had learned or experienced during your undergraduate program but didn't?
- There are several components in a typical teacher preparation: student teaching, field experiences, pure math classes, education classes, math education classes, etc. How important were each of these components in your preparation?

- What do you think is essential for every high/middle school mathematics teacher to know? Where should they learn that?
- How would you structure a teacher preparation program?
  - What components would it include and how much of each?
  - With the teaching experience you have now, what would you say should have been different about your preparation to teach? Why those things?
- If you were asked to change one thing about the way that math teachers are prepared, what would you change?
- Suppose you are asked for your input on hiring a new mathematics teacher at your school. Here are the profiles of a few prospective teachers. [Participant is given profiles one at a time and allowed to read them.]
  - How well prepared do you feel this person is for the work of teaching?
  - What do you (dis)like about this person's preparation?
  - How typical do you believe this person's preparation is?
  - Does this person have something in their preparation that you wish you had?
- What kind of background would you like to see in a new teacher?
- Which of these hypothetical teachers would you recommend for your school? Why?
- Are there some that you would not recommend for your school? Why?
- Which one has been prepared most similarly to yourself?

Hypothetical teacher profiles.

Annette

	Major: Mathematics Education			
Prefix	**Course**	**Grade**	Required (**R**) Elective (**E**)	**Credits**
EFND	Critical Issues in Educ.	A	R	3
EFND	Socio-Cultural Perspectives	A	R	3
Total		4.00		6
SPED	Special Education	A	R	3
Total		4.00		3
EPSY	Learning & Teaching	A	R	3
Total		4.00		3
MATH	Calculus 1	B	R	3
MATH	Calculus 2	B	R	3
MATH	Linear Algebra	B-	R	3
MATH	Intro. to Higher Math	C+	R	3
MATH	Abstract (Modern) Algebra	C	R	3
MATH	Modern Geometry	B+	R	3
MATH	Calculus 3	C+	E*	3
MATH	Sequences & Series	B-	E*	3
Total		2.66		24
STAT	Statistics 1	B-	R	3
Total		2.70		3
EMAT	Problem Solving	B+	E*	3
EMAT	History of Math	A	E*	3
EMAT	Technology and Secondary School Math	A-	R	3
EMAT	Practicum	S	R	3
EMAT	Concepts in Secondary Math	A	R	3
EMAT	Connections in Secondary Math	A-	R	3
EMAT	Teaching Methods	A	R	3
EMAT	Field Experience	S	R	3
EMAT	Student Teaching	S	R	15
EMAT	Student Teaching Seminar	A	R	3
Total		3.81		42
Total		**3.34**		**81**

E* signifies an elective that satisfies a requirement of the major

- 60 hours experience as a private mathematics tutor
- Volunteers weekly with Boys & Girls Club
- Received positive student teaching evaluation from University supervisor and average evaluation from mentor teacher

Ben

	Major: Dual — Mathematics & Mathematics Education			
Prefix	**Course**	**Grade**	Required (**R**) Elective (**E**)	**Credits**
EFND	U.S. Schools	A	R	3
Total		4.00		3
SPED	Special Education	A	R	3
Total		4.00		3
EPSY	Learning & Development	A	R	3
Total		4.00		3
PHYS	Intro. Physics 1	A	E*	4
PHYS	Intro. Physics 2	A-	E*	4
Total		3.85		8
MATH	Calculus 1	B	R	3
MATH	Calculus 2	B	R	3
MATH	Linear Algebra	B-	R	3
MATH	Intro. to Higher Math	C	R	3
MATH	Abstract (Modern) Algebra	C+	R	3
MATH	Modern Geometry	B+	R	3
MATH	Calculus 3	C+	E*	3
MATH	Complex Variables	B-	E*	3
MATH	Sequences & Series	B-	E*	3
MATH	Combinatorics	B-	E*	3
MATH	Real Analysis	B	E*	3
MATH	Differential Geometry	C+	E*	3
Total		2.67		36
STAT	Statistics 1	A-	E*	3
Total		3.70		3
EMAT	Technology and Secondary School Math	A-	E*	3
EMAT	Practicum	S	R	3
EMAT	Concepts in Secondary Math	A-	R	3
EMAT	Connections in Secondary Math	A-	R	3
EMAT	Teaching Methods	A	R	3
EMAT	Field Experience	S	R	3
EMAT	Student Teaching	S	R	15
EMAT	Student Teaching Seminar	A	R	3
Total		3.82		36
Total		**3.26**		**92**

E* signifies an elective that satisfies a requirement of the major

- 30 hours as a private mathematics tutor
- Speaks conversational German
- Received positive student teaching evaluation from University supervisor and average evaluation from mentor teacher

Carroll

	Major: Mathematics Education			
Prefix	**Course**	**Grade**	Required (**R**) Elective (**E**)	**Credits**
EFND	Critical Issues in Educ.	B	R	3
EFND	Socio-Cultural Perspectives	B-	R	3
Total		2.85		6
SPED	Special Education	B	R	3
Total		3.00		3
EPSY	Learning & Teaching	B-	R	3
Total		2.70		3
MATH	Calculus 1	A	R	3
MATH	Calculus 2	A	R	3
MATH	Linear Algebra	A-	R	3
MATH	Intro. to Higher Math	A-	R	3
MATH	Abstract (Modern) Algebra	B+	R	3
MATH	Modern Geometry	A-	R	3
MATH	Calculus 3	A	E*	3
MATH	Sequences & Series	A	E*	3
Total		3.80		24
STAT	Statistics 1	A-	R	3
Total		3.70		3
EMAT	Problem Solving	A-	E*	3
EMAT	History of Math	B	E*	3
EMAT	Technology and Secondary School Math	C	R	3
EMAT	Practicum	S	R	3
EMAT	Concepts in Secondary Math	C+	R	3
EMAT	Connections in Secondary Math	C	R	3
EMAT	Teaching Methods	B-	R	3
EMAT	Field Experience	S	R	3
EMAT	Student Teaching	S	R	15
EMAT	Student Teaching Seminar	B-	R	3
Total		2.63		42
Total		**3.20**		**81**

E* signifies an elective that satisfies a requirement of the major

- 65 hours experience as a University math tutor
- Volunteers as a free tutor at local middle school
- Received average student teaching evaluation from University supervisor and positive evaluation from mentor teacher

Dan

	Alternative Certification			
Prefix	**Course**	**Grade**	Required (**R**) Elective (**E**)	**Credits**
SPED	Special Education	B+	R	3
Total		3.30		3
EPSY	Intro. to Educational Psychology	B+	E*	3
EPSY	Educational Psychology 1	B-	E*	3
Total		3.00		6
MATH	Linear Algebra	A-	R	3
MATH	Abstract (Modern) Algebra	B+	R	3
MATH	Modern Geometry	A-	R	3
Total		3.57		9
STAT	Statistics 1	B+	R	3
Total		3.30		3
EMAT	Technology and Secondary School Math	A	R	3
EMAT	Connections in Secondary Math	A-	E*	3
EMAT	Teaching Methods	A-	E*	3
EMAT	Student Teaching	S	R	15
Total		3.80		24
Total		**3.47**		**45**

E* signifies an elective that satisfies a requirement of the major

- B.S. degree in Civil Engineering with GPA of 3.25
- 3 years experience as a Civil Engineer
- Received average student teaching evaluation from both University supervisor and mentor teacher

Second Interview Protocols

The interview protocols for the second interviews contained a combination of questions common to all participants and individualized questions.

Questions common to all second interview protocols.

- What are your career aspirations? Do you see yourself as a classroom teacher 10 or 15 years from now?
- When you first decided to major in math education, what did you think the program would be like?
- If you knew nothing else about them, how confident would you be that a graduate of UGA's math education program would be a good teacher?
- Suppose someone you cared about, like a child, had a math teacher who was prepared the same way that you were prepared. How comfortable with that would you be?
- Last time, you described for me a revamped preparation program for teachers that you might design if you were a dean of a college of education. [Participants' proposed program is summarized.] Thinking back to yourself as an undergraduate, how much confidence do you think you would have had in such a program, if you were in the process of going through it?
- I have a list of words here that I'd like you to look at. Please circle which words you think describe your feelings towards your teacher preparation, and tell me what prompts you to circle the ones you do. Are there any words that definitely do not describe you feelings towards your teacher preparation?
- In Chile, it's common for prospective teachers to work in the schools during the day, as observers or helpers, and to complete their formal education at night for several

semesters before graduation. What do you think of that type of preparation? How successful do you think this type of preparation would be in the U.S.?

- In Japan, some prospective teachers complete their student teaching in the first half of their fourth year, and student teaching often includes observation of non-mathematics classes, such as social studies or science. What do you think of this way to structure the preparation program?
- Did you take any electives at UGA beyond what was required for the math education program? What were they?

List of emotion words for second interview.

How I feel about my preparation to become a teacher.

Content	Hopeful	Dissatisfied
Enthusiastic	Pleased	Undecided
Annoyed	Relieved	Confident
Embarrassed	Nervous	Ecstatic
Confused	Anxious	Guilty
Optimistic	Disappointed	Discouraged
Regretful	Puzzled	Angry
Surprised	Apathetic	Happy
Excited	Satisfied	Proud
Doubtful	Peaceful	

Examples of individualized second interview questions.

- Last time, you described some of the things people need to know to be prepared to teach, such as what they're going to do when they go in on day one. You also said that "obviously you can't know all that" but that you needed some idea. Why can't you know all that? How close can someone be to being totally prepared for teaching?

- You said that if you had been in a field experience earlier in your undergrad., that you would have been more serious about your math classes and maybe appreciated your [mathematics education] classes more. Why is that?

- You said that during your undergrad., none of the classes talked about classroom management until the seminar after student teaching, and then only a little, and so you "had no idea going into this past year what rules to set." Why do you think that this topic was not addressed more? Where have you turned to learn about this topic since you began teaching?

- Last time, when we were talking about the [mathematics education] classes, you said that, while you can talk about teaching and various strategies, "until you really were in front of people it didn't make any difference." Why doesn't it make a difference? Do the [mathematics education] classes have value as they are currently structured? What should be changed about them?

- Last time, you told me about how you originally thought the program would be different math-wise, in that it would have more of a review of basic mathematical concepts. Are there other ways in which you thought the program would be different? Are there ways in which it matched what you thought it would be?

Third Interview Protocols

The interview protocols for the third interviews were very individualized.

Examples of individualized third interview questions.

- Since you are teaching at a school that is different from the schools you student taught or had field experiences at, or even that you went to, how useful have the student teaching and other experiences been for you in your position now? Could or should the preparation have been different somehow to prepare you for teaching here?
- In our last interview, you mentioned a few instances where you felt frustrated as an undergraduate. Sometimes you were frustrated that the math professors couldn't explain concepts in different ways, and sometimes you got frustrated with the amount of math homework that was required — you said you went into "survival mode" to just get through the classes. Looking back now, is frustration like that a good thing or a bad thing for a future teacher?
- I know we've talked about this quite a bit before, but now you've been teaching for a while, and so I want to ask you some of the same questions as before, to see if you feel the same way. How well prepared do you feel you were by your undergraduate program to be a teacher? What was beneficial? What was lacking?

Appendix B

Other Data Collection Instruments

This appendix contains the electronic surveys used in data collection.

Questionnaire about Teacher Preparation

Questionnaire about Teacher Preparation

1. Please provide your name.
2. Please describe the formal teacher preparation you received (institutions, degrees, certifications, approx. dates, etc.) prior to being a full-time teacher.
3. Please describe the structure of your preparation program (required math classes, pedagogy classes, field experiences, student teaching, etc.).
4. How typical would you say your particular experience in your teacher preparation program was? Please describe why you feel your experience was typical/atypical.
5. Please describe your teaching employment since graduating (years, positions, schools, grades/courses taught, non-teaching responsibilities).
6. Please describe any external programs that you participated in or support that you received as part of your preparation to become a teacher.
7. Please describe any formal training, apart from school or district sponsored professional development, that you've received since being employed as a full-time teacher.

Teaching Background Survey

1. Name:

2. What is your current age range?

   ◯ 20-22

   ◯ 23-26

   ◯ 27-29

   ◯ 30-35

   ◯ 36+

3. How would you describe your ethnicity?

4. For middle school, did you attend (choose all that apply):

   ☐ Public school

   ☐ Private school

   ☐ Home school

   ☐ Other

5. If you chose "Other" for your middle school education, please explain.

6. For high school, did you attend (choose all that apply):

   ☐ Public school

   ☐ Private school

   ☐ Home school

   ☐ Other

7. If you chose "Other" for your high school education, please explain.

8. Outside of your undergraduate program, what experience do you have working with youth as a tutor, camp counselor, coach, etc.?

9. In your current position, what extra-curricular responsibilities do you have besides mathematics teaching, such as coaching, club advising, department or unit head, etc.?

10. In your current position, how much professional interaction do you have with other teachers, and what is the nature/purpose of that interaction?