

REACHING STUDENTS IN A REMEDIAL COLLEGE MATHEMATICS COURSE: THE
ROLES OF A TEACHER'S CARE

BY

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DISSERTATION

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ABSTRACT

Caring is an important topic in the K-12 classroom setting, and it relates to the academic achievement of at-risk students. However, the K-12 caring literature tends to focus on relational aspects and not on subject matter. Moreover, little attention has been given to the communication and expression of teacher care at the collegiate level in the context of remedial mathematics courses.

In this study, an award-winning college instructor's care for her students is examined in the context of a remedial mathematics course. Interviews with the teacher and her students, research journal entries, fieldnotes, and audio recordings of classroom instruction were used to document the expression and communication of the instructor's care. These data also documented the students' interpretation of the instructor's care. The qualitative analyses focus on the teacher's care for students as people and her care for students' mathematical learning. The results show that many of the instructor's caring qualities led students to approach the instructor for personal and mathematical questions. The results also show that the instructor chose teacher-centered instructional methods that appeared to satisfy students' desire for mathematical guidance and reassurance. This case highlights a tension between problem-centered instructional methods advocated by NCTM (2000) versus the more teacher-centered approach that this caring mathematics instructor employed in order to meet students' perceived needs. This study illuminates specific ways in which a teacher's care is important for enhancing the mathematics learning of at-risk college students. Implications for teacher education, staffing of remedial college courses, and future research are discussed.

Para Mis Queridos Padres

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Peter Lu and Dr. Nathan Hearn: Every day that passes is the day that I get closer to seeing you again. Somewhere between right and wrong, there is a garden, I will meet you there.

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Personal Motto:

*You can sound the alarm
You can call out your guards
You can fence in your yard
You can pull all the cards
But, I won't back down
Oh no, I won't back down
Oh no,*

Eminem, "Won't Back Down"

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CHAPTER 1

INTRODUCTION

This dissertation focuses on the caring nature of an outstanding college mathematics teacher who is known for her work with at-risk college students. This study addresses the following questions:

1. *In what ways can a mathematics teacher be caring? How can such caring be developed?*
2. *How can a teacher's caring affect her interactions with students and promote general academic skills?*
3. *How can a teacher's caring affect her mathematics instructional methods?*
4. *How do students feel they benefit from a teacher's caring?*

Our educational community has made strides to encourage more at-risk students to enter the fields of mathematics and science. However, our efforts should not neglect the importance of helping at-risk students finish foundational mathematics requirements that enable them to graduate from college and pursue a variety of important careers. This is a difficult task because at-risk students often come to college with limited mathematics skills and a need for remedial classes. Understanding the role of remedial college instructors in helping students is crucial because those instructors are at the frontlines for helping at-risk students succeed academically. Examining the teacher's qualities (personality, relationships with students, or caring) can help one understand whether these qualities have a role in helping at-risk college students learn remedial mathematics.

Many terms are used to refer to the types of students who are in need of remediation. These students are sometimes referred to as "at-risk," "marginalized," "underserved," "underprepared," "disadvantaged," and "underrepresented." For the purposes of this dissertation, I selected the term "at-risk" to describe the students in this study because students in this study

are part of a recruitment and retention program specifically aimed at students who are at risk of not graduating from college.

Other researchers have used the term “at-risk” to describe students that have many of the same qualities as the students in my study. Using many terms, including “at-risk,” to describe students who have been underserved by educational institutions, Means and Knapp (1991) state that such “students come disproportionately from poor families and from ethnic and linguistic minority backgrounds” (p. 282) and are “regarded as least likely to succeed in school” (p. 282). In her study on at-risk students, Muller (2001) noted that students “at-risk of dropping out of high school are disproportionately African American or Latino, male, and in low-ability math classes” (p. 245). Unfortunately, students needing remediation often feel that they are blamed for their circumstances. For some people, the use of some of these terms (such as “at-risk”) might imply fault with the student or their parents. However, I want to clarify that my use of any of these terms in this dissertation is not intended to place blame on students or their families. On the contrary, this dissertation focuses on the role of teachers and ways they might more effectively educate students in remedial mathematics courses.

This chapter introduces the topic of this dissertation, specifically the caring nature of a remedial mathematics instructor at the college level. The first section below summarizes the prior research on college retention and recruitment of at-risk students. This brief review is presented to give context for the proposed research study and the background of the problem. The second section is the statement of the problem. This includes an explanation of the two primary neglected perspectives: viewing retention from a coursework perspective and the need to enlarge our views on caring at the college level. The section after that briefly describes the

research design for this dissertation study. A more in-depth explanation of the research design is in Chapter 3. The last section describes the significance of the study.

Prior Research on College Retention and Recruitment

A number of factors contribute to the retention and recruitment of at-risk students at the college level. Finances are important in obtaining a degree and, as a result, low socio-economic-status (SES) students are still underrepresented in colleges and universities (Bedsworth et al., 2006). Families with modest means have difficulty in gaining access to and graduating from college (Walpole, 2007). More recently, Chen (2012) also confirmed that low SES students generally have higher risks of dropping out than other SES groups.

At-risk college students have also traditionally been underserved in K-12 educational settings. For example, Cabrera et al. (2012), and with others (Fuller & Carpenter, 2008; Gándara, 2005; Valenzuela, 2002, 2005), argue that structural factors such as underfunded high schools and underprepared teachers limit Latino/a success in higher education. Low-income and minority students are less likely to have access to well-resourced schools and qualified teachers (Hill & Lubienski, 2007). Inequitable structures cause Latinos to pursue higher education at substantially lower rates than their white peers (Gándara & Contreras, 2009). Cabrera et al. (2012), McDonough (1997), and McDonough and Calderone (2006) claim that school counselors channel college information to students and that low SES and minority students have the least access to counselors. Additionally, college information appears to be distributed unevenly across race and ethnicity (McDonough & Calderone, 2006). Cabrera et al. (2012), citing other research (Contreras, 2005; Johnson, 2007; Swail, Cabrera, Lee, & Williams, 2005), found that, in comparison to white students, Latinos have to take “remedial courses at higher rates, score lower

on standardized tests, are underrepresented in Advanced Placement/honors courses, and have higher high school dropout and attrition rates” (p. 234). Research also shows that low income and minority students who take and receive credit for Advance Placement (AP) courses still fail state exams at a higher rate compared to their higher-income white peers (Dougherty et al., 2006).

As a result of the lack of academic preparation, at-risk students struggle in college (Bettinger et al., 2013; Epper & Baker, 2009). Two possible responses are: limit their access to higher education or meet their needs. Universities have made enormous efforts to meet the needs of at-risk students. President Barack Obama challenged higher education with the ambitious goal that 60% of U.S. adults should have some form of a college degree by 2020 (Stuart, 2010). With this aspiration and a growing national movement to increase retention and recruitment, Coppin State University (in Maryland) started a new plan to improve its graduation rate by 20% (Stuart, 2010).

Many of these efforts have been informed by Tinto’s Theory of Student Departure (1975, 1987). It is well recognized and widely used as a framework to study college recruitment and retention. It states that students come to college with different patterns of personal, family, and academic characteristics and skills (Pascarella & Terenzini, 1991; Tinto, 1975, 1987). One key idea of Tinto’s theory is that college students need to have fulfilling and worthwhile experiences in the academic setting (both informally and formally). More recently, Tinto (2005) asserts that more academic and social connections can make students more likely to succeed in college. Indeed, the lack of student integration and feelings of isolation have been found to be a primary reason for students from all demographics to leave college (Nagda et al., 1998). At-risk college students enter college with a number of attributes that do not necessarily “fit” the academic

system and, therefore, have a hard time integrating with college academics and finishing college. Some students may not know how or when to study. Others may have trouble seeking help due to academic or personal reasons. As a response to these needs, schools offer “free tutoring, learning assistance centers, and supplemental instruction” (Martorell & McFarlin, 2011, p. 437). Some students struggle with time management. Thompson and Geren (2002) argue that the transition from high school to college is difficult because of increased freedom and increased difficulty in academics. Finally, the level of academic preparation is an important factor in college persistence. In their study on why students drop out of college, Johnson and Rochkind (2009) found that the most common issues were students feeling unprepared for academic work. Despite this, Thompson (2008) asserts that colleges and universities have prioritized finding ways to retain students.

Approaches to Helping At-Risk Students

Colleges and universities have made tremendous efforts to recruit and retain at-risk students. Colleges have tried many different approaches to helping underprepared college students succeed academically. However, for the most part, approaches can generally be classified into two categories (Nagda et al., 1998). These two categories—mentorship and remedial coursework—have also been the basis of the majority of retention efforts in higher education (Tinto, 1993).

Mentorship

The first approach embodies the belief that certain institutional and structural factors (external to the individual student) fail to support at-risk students, leading to attrition (Nagda et al., 1998). The response is for the institution to provide mentorship. Through formal programs,

mentors can help with the transition to college. Mentors can get students connected to academic counseling, financial aid, and personal support (Kulik, Kulik, & Schwalb, 1983; Nelson et al., 1993). Stuart (2010) concurs and states that the methods appear to be widespread and range from “mandatory academic advising to providing extra help overcoming financial aid problems that prevent students from persisting to early career counseling” (p. 23). These formal programs usually involve pairing an undergraduate with a faculty member. This is one important way to build community and can be done in different ways. For example, “there are living-learning settings that give students a ‘home-base’ in the larger college environment and mentoring programs in which other students or faculty act as ‘expert’ guides and models” (Nagda et al., 1998). Coll and Stewart (2008) argue that research (Bishop & Walker 1990; Coll & Stewart, 2002) suggests that counseling services also have a positive impact on college retention.

For example, at the Lamar University’s (Beaumont, Texas) Student Motivation and Retention System, a college professor is paired with a freshman with regular one-on-one meetings (Bernier et al., 2005; White & Shahan, 1989). This relationship is aimed at providing the college student with skills and individualized support for dealing with the stressful events of college (Bernier et al., 2005; White and Shahan, 1989). Another program, called the Undergraduate Research Opportunity Program, has shown positive results in retention at the University of Michigan (Nagda et al., 1998). Generally speaking, the participants were compared to nonparticipants of the same race/ethnic group, and a significant positive effect on retention was found (Nagda et al., 1998). These programs that match faculty with students seem to be important because, as Pascarella and Terenzini (1979) claim, a lack of significant interactions between students and members of the college community is the single leading predictor of college attrition. This integration component is particularly important for under-represented

minority students at large universities (Nagda et al., 1998). For example, faculty contact enhances both retention (Braddock, 1981) and student academic performance (Nettles, Thoeny, & Gosman, 1986) for African-American students.

Remedial Coursework

The second approach to helping at-risk students addresses their lack of academic preparation and focuses on developing academic skills. Many students have poorly developed academic skills, and they may find traditional academic learning in college difficult (Astin, 1985), and that causes attrition (Boykin, 1994; Levin & Levin, 1991; Nagda et al., 1998). Students' lack of preparation can be resolved in a variety of ways. Hagedorn et al. (1999) avers that new policies should improve K-12th instruction. For example, policies that ensure that students take more math courses beyond Algebra II would help students in college (Long et al., 2009). Fine et al. (2009) concurs that initiatives aimed at encouraging high school students to master content are useful. Regardless of these changes, remediation coursework is often considered a necessary bridge between high school and college degrees (McCabe, 2000).

Institutions offer a variety of remedial courses and tutorial programs (Epper & Baker, 2009; Fine et al., 2009; Nelson et al., 1993). Remedial courses are usually offered in science, mathematics, and English, and they cover material that is typically taught in high school. These courses are not a substitute for regular general requirements for the bachelor's degree (Martorell & McFarlin, 2011). Since these courses do not count towards graduation, they often extend students' time-to-degree. Instructors in these courses often do not teach traditional college-level courses (Martorell & McFarlin, 2011).

Remediation coursework costs colleges \$3.7 billion a year (Bettinger et al., 2013; Wise, 2009), and budget cuts heighten the concerns for the effectiveness of remedial coursework.

Adelman (2004) found that 41% of college students enroll in remedial coursework at some point during college. Carefully considering the impact of remedial coursework is important because remediation has the potential to delay or prevent students from entering 4-year institutions (Long et al., 2009). Fine et al. (2009) maintains that students who are in remedial courses are at a greater risk of not completing degrees. However, as Johnson and Rochkind (2009) report, one reason at-risk college students drop out is that they are underprepared for academic coursework. Hence, remedial coursework can fill a need for a large group of students, but there is a need to teach remedial coursework better.

Mentoring and remediation approaches are not necessarily mutually exclusive. Some programs embody a hybrid approach. In many of the approaches, a recurring element is that at-risk college students have interactions with faculty (in remedial coursework) and/or in a mentorship capacity.

Given the importance and high cost of programs intended to help at-risk students, identifying ways to improve these programs is critical. After reviewing many articles on retention and recruitment efforts, I discovered that the research on remedial coursework is fairly sparse at the college level. Research on remediation programs has rarely examined either the type of instruction that at-risk students receive in remedial coursework at the college level, or the role of teacher-student relationships in that instruction.

Statement of the Problem

Two overarching limitations of current perspectives on helping at-risk students need to be addressed. First, research and programs tend to focus on the requirements for remedial courses as opposed to the specifics of what transpires in the classroom (e.g., teacher-student interactions,

the instruction, etc.). Given the importance of remedial coursework in the students' success of obtaining a degree, it follows that examining the instructor and the specifics of her instruction is also significant.

The second overarching problem is the need for more comprehensive views on caring. Currently, views on caring are centered on mentorship relationships (typically outside of the classroom) and focused on academic and professional pursuits (Cramer & Prentice-Dunn, 2007; Kardash, 2000; Pfund, Pribbenow, Branchaw, Lauffer & Handelsman, 2006). I advocate for advancing our traditional views of mentorship and the teaching of at-risk college students to include caring in and outside of the classroom for the whole person. The following sections examine each of these limitations and conclude with a call for a study of the influence of the instructor and instruction at the college level.

Research on Instructor and Instruction in Remedial Coursework

The lack of research on remedial coursework includes a dearth of research on the importance of the role of the instructor and his or her instruction in helping at-risk college students succeed in coursework. Chen (2012) claims, citing other research (Tinto & Pusser, 2006; Schuster, 2003) that the relationship between “faculty characteristics and student persistence/dropout outcomes has been largely neglected in prior research” (p. 489). The role of the instructor in remedial coursework is important because underprepared students in remedial coursework need the best instruction (Hagedorn et al., 1999), and the instructors' role and their instruction can serve as an anchor for students in remedial academics. Understanding how the instructor serves as an anchor is important in aiding underprepared students. Shepard et al. (2012) argues that both theory and practice show that meaningful relationships with educators help students achieve academic success in high school. This suggests that instructors at the

college level could have a powerful influence on students' success. Thomas' (1998) research also suggests this.

Instructor Research at the College Level

In the few studies that exist, caring at the college level has shown positive results. Thomas (1998) examined the role of nurturing in exemplary community college instructors who connected personally with nontraditional and underprepared freshman students in a classroom setting. Using an in-depth qualitative approach, Thomas (1998) concluded that both instructors in the study had intrinsic abilities that nurtured these at-risk college students. The instructors had a great reputation among students for being good and caring for at-risk college students and promoting students' self-esteem and confidence. The at-risk college students described Bonnie (one of the college instructors) as "patient, nurturing, accommodating, caring, loving, humble, respectful, and encouraging; all personal characteristics one might expect to find in someone who interacts with students one-on-one and who is particularly concerned with the welfare of the individual" (Thomas, 1998, p. 222). However, this research did not look at teaching and learning in the context of a specific content area. Investigating caring in a subject area (e.g., mathematics) may help one understand whether or not it makes an impact in students' learning. In addition, Thomas' research did not examine the caring nature in the context of instructional methods nor how care is communicated in classroom activities.

Caring and Instruction

A specific way to communicate care is through the subject matter and instruction style. This method of caring is important because one can see directly how the instructor tries to help at-risk college students understand the content. Investigating this phenomenon is also important

because “professors play a pivotal role in early identification of students at risk of failure” (Thompson & Geren, 2002, p. 398). Specific to high school teaching, Shepard et al. (2012) maintain that:

They [students] appreciate hands-on activities and one-on-one help, noting that teachers “sit right with you until you get it.” When students felt engaged, encouraged, and supported, they participated more fully and experienced success. (p. 52)

Despite the importance that students place on having caring and supportive teachers, there is a lack of research on classroom instruction in college remedial courses, including the role of caring in that instruction.

Need for Larger Perspectives on Caring

Limited View of Caring in Mentorship Relationships

The previously mentioned research on recruitment and retention programs conveys a general kind of caring in mentorship relationships (Cramer & Prentice-Dunn, 2007; Santos & Reigas, 2002). However, this is a limited view of caring because it is within the constraints of a mentorship relationship (i.e., weekly meetings), and this caring seems to be limited to assimilating in academic and professional life (Cramer & Prentice-Dunn, 2007; Kardash, 2000; Pfund et al., 2006). Cramer and Prentice-Dunn (2007), citing others (Santos & Reigas, 2002), claim that “faculty mentorship programs have also been positively associated with effective college transition, college self-efficacy and happiness in a higher education setting” (p. 771). Students who experience validation and nurturing (or caring) by faculty tend to become better learners and finish their program (Thomas, 1998). Regarding mentorship, Cramer and Prentice-Dunn (2007) argue that “successful mentorship of young adults requires adoption of the notion of ‘*cura personalis*’ or caring for the whole person” (p. 772).

Such mentorship should exist in the context of student-teacher relationships in teaching remedial coursework. Many at-risk students already come to college underprepared both academically and culturally. Based on Cramer and Prentice-Dunn (2007), caring for the whole student may help students adjust and perform well in remedial coursework. This is apparent in mentorship relationships (Santos & Reigas, 2002). Meyers (2009) also argues that demonstrating care, welcoming questions and input, and being aware of the successes and struggles of learners can influence students and their view of academics. These facets could contribute to student learning. Theoretical frameworks on holistic caring in a K-12 setting suggest that caring at the college level would also aid at-risk students (Baker, 1999; Foster, 1995; Gay, 2000; Irvine, 1990; Masten, 1994; McAllister & Irvine, 2002, p. 434; Noddings, 1992, 2005ab). As Bartell (2011) argues in relation to K-12 education, addressing gaps in learning requires moving past standardization and testing and concentrating on “students’ interests, cultural backgrounds, and concerns; it requires getting to know students well enough to engage them in learning and relating to students across cultural, racial, and socioeconomic lines” (p. 51). This approach has holistic caring undertones and should be viewed as a way to care for students as people. Wenzel (2009) and others (Bartell, 2011; Good & Brophy, 2000) state that an effective teacher is one who cares and creates and maintains strong relationships with students. In remedial coursework, caring teachers might be best able to serve at-risk college students.

Indeed, teachers are mediators between the students and the content material. Certain elements of a teacher affect the success of students. For example, teachers’ beliefs (Friedrichsen, 2002; Haney & McArthur, 2002), how teachers understand their role as teachers (Woolfolk, Hoy, Davis, & Pape, 2006), teaching orientation (Anderson & Smith, 1987; Magnusson, Krajcik, & Borko, 1999), and teachers’ beliefs about students’ abilities and motivations (Stipek, Givvin,

Salmon, & Macgyvers, 2001) can shape the success of students. Given that many characteristics of the teacher can affect student learning, it stands to reason that the teacher's caring is not any different. I am advocating for advancing our traditional views of mentorship and teaching at-risk college students to include caring in and outside of the classroom for the whole person.

Caring Relationships in a Classroom Setting

At the college level, mentor relationships help underprepared students succeed in college (Santos & Reigas, 2002). However, we need a greater understanding of student-teacher relationships in the context of a classroom for at-risk college students. Coll and Stewart (2008) report that the college students they studied had low amounts of interaction with faculty, and "this is problematic given the powerful role faculty can play in fostering academic and social integration in the institution" (p. 54). A greater understanding of the key parts of these one-on-one student-teacher relationships and analyzing how teachers care holistically for underprepared college students could point toward ways in which teachers can increase their effectiveness with at-risk college students.

Need for Research on Instructors and Instruction in Remedial College Coursework

Reflecting on previous statements (the importance of helping at-risk students in remedial coursework, the lack of research on care in a classroom setting, and the lack of research on instructors at the college level), I note a great need to conduct research on the role of a well-regarded remedial mathematics instructor at the college level and to examine the way she teaches and interacts with at-risk college students. Research in the area of caring, mathematics instruction, or even college level teaching cannot explain, in concrete detail, how a college mathematics instructor communicates care and how this care can help underprepared college students complete their mathematics requirements. The manifestation of caring—how care is

communicated—is important because it has the potential to help at-risk college students finish their remediation requirements and might also benefit them in future mathematics courses.

Therefore, this study examines the teacher’s caring nature, her communication of this caring nature, how she teaches remedial course material in a mathematics course for at-risk college students, and how these at-risk college students respond to the teacher’s approach and caring. A major focus of this research is to determine if and how students pick up on what I call “caring.” I am interested in the teacher’s expression of verbal and non-verbal cues that help foster a caring atmosphere and thus a fruitful learning environment. I examine the environment (the communication between the teacher and student, the specifics of material taught, student-teacher relationships, mathematical content, etc.) so that I know how the teacher articulates caring through the teaching of mathematical content. I want to understand what is going on with the teacher and the students in the classroom as teaching and learning exists in this particular classroom and course.

Research Design

Chapter 3 contains a more in-depth description of the research design which is introduced only briefly here. A case study of one teacher was used to study the complexity of teacher-student relationships, teaching mathematics to at-risk college students, and how care is expressed in the classroom. Using this approach allowed an integration of these aspects and a separate and holistic attention to each of them. This is an ethnographic study that utilizes standard data collection methods such as student and teacher interviews and classroom observations (e.g., field notes and audio recordings). The following subsection briefly describes why mathematics was selected as the subject area for the dissertation.

Mathematics Selected as the Subject Area

My review of the literature on remedial coursework found that prior research gives very little attention to the instruction of a specific subject matter. Remedial instruction in *mathematics* is particularly important to examine for several reasons. First, as noted by Parker (2005), mathematics is often considered one of the hardest academic subjects by students. Students need more remedial assistance in mathematics than in any other subject (Adelman, 2004; Bahr, 2007, 2008). As Long et al. (2009) point out, “Almost one-third of the nation’s college freshmen are underprepared for college-level math” (p. 1). Improving math deficiencies is also among the most pressing issues in community colleges (Bahr, 2008, 2010a, 2010b; Bailey, 2009; Biswas, 2007). Moreover, there is a high failure rate even in remedial mathematics courses (Adelman, 1995).

Second, researchers (Astin, 1985; Roueche & Roueche, 1994) claim that underprepared students who are not taught properly are likely to become disengaged from learning and college, and this may be especially true in learning mathematics. At-risk students may have difficulty learning in classrooms governed by typical, traditional means of teaching and learning (Carbo et al., 1986). For educators, examining instructional practices that enhance our understanding of “what works well” is important. Most of the time, however, the rate of successful remediation in mathematics is low (Bahr, 2007, 2008; Bailey, 2009; Bailey, Jeong, & Cho, 2008; Bashford & Slater, 2008). Lubienski (2007) argues that mathematics instruction can make a difference despite the difficulties that students may face. Recognizing what works well in instruction is key to understanding what helps underprepared students succeed in mathematics.

Third, remediation in mathematics is particularly important to study because mathematics serves as an important “gatekeeper” to many majors and high-paying occupations. Students’

choices about what and how much mathematics to take often impacts their choice of major and career.

There are other reasons why one should study mathematics remedial coursework. Due to the nature of mathematics, some students might have a poor attitude towards mathematics and this might contribute to math anxiety. (Math can be often viewed as an impersonal, intimidating subject.) Studies have shown mathematics anxiety to be a highly prevalent problem for students (Baloglu & Koçak, 2006; Jain & Dowson, 2009; Ma & Xu, 2004; Rodarte-Luna & Sherry, 2008). Scholars (Ashcraft, 2002, 2005; Ashcraft & Moore, 2009; Knowles, 2008) believe that underprepared college students' lack of mathematical performance may be more due to anxiety than lack of ability. Maloney and Beilock (2012) describe many ways to guard against math anxiety, many of which include the teacher helping students through it. A teacher's role in teaching mathematics might be more important because he or she can serve as a mediator between the content and the students. Rather than simply presenting and testing mathematical skills and knowledge, teachers of underprepared college students need to cultivate better attitudes and learning habits in mathematics.

Significance of the Study

According to Thomas (1998), the higher education community (e.g., administrators, faculty) is concerned about an increased number of under-prepared college students and the influence that instructors have on student learning and, ultimately, on students' graduation. In order to enhance hiring practices, administrators need to identify the qualities of instructors who are effective with at-risk college students. Based on the research previously presented, faculty forging caring relationships with students may be important to students' success in college.

However, empirical studies on instructor-student relationships in college, particularly during mathematics instruction, are lacking, and the results could have significant implications.

First, this dissertation expands research on teaching mathematics in remedial coursework from a caring perspective. Fine et al. (2009) avers that “remediation of incoming college freshman is a national concern because remediated students are at higher risk of failing to complete their degrees” (p. 433). While similar studies (Thomas, 1998) have been done in community colleges, they have not been done at 4-year institutions. The bulk of the research on remedial coursework has been conducted in 2-year institutions (without the context of caring) instead of 4-year institutions. Two-year institutions and 4-year institutions provide different educational experiences, so remedial coursework in mathematics can look different. The climate (e.g., research-based, larger classes) and resources available to students at 4-year institutions are different, and this can either hinder or help at-risk college students. This can also influence students’ learning experiences.

Second, even though there is research on helping at-risk students in 4-year institutions, the focus tends to be on formal mentoring relationships for undergraduates and not teacher-student relationships within teaching contexts (e.g., remedial coursework, learning labs, tutoring). Mentoring programs for recruiting and retaining underprepared students can be effective because they have well-established caring relationships between the professor and the at-risk college student. However, the context of a classroom can change the dynamic of caring relationships. This dissertation adds to the literature because the context of the caring student-faculty relationship examined here is within the classroom.

Next, the results of this dissertation contribute to the literature on caring. There are different types of caring, including caring about students’ mathematics learning, caring about

other student outcomes, and caring for students holistically. In addition, different types of caring are manifested differently. Mathematically, caring may mean that the teacher is concerned that students learn mathematics, do well on an exam, or pass a particular course. Caring holistically may mean being concerned with the student's general welfare. One form of caring might shape or reinforce other forms. However, the caring literature tends to be compartmentalized; I investigated the different types of caring discussed in the literature, and it is not clear whether the various forms of caring are reinforcing, disjoint, or intertwined. Therefore, one goal is to determine the different *types* of caring that exist in the mathematics classroom and how they might relate. In addition, the bulk of the caring literature that was reviewed centers on caring for students (even at-risk students) at the K-12 school setting. This study examines the ways in which caring relationships can be fostered in a college setting.

Studying a teacher's caring is important because it can be used as a springboard for improving student retention in college and graduation and helping traditionally at-risk students gain mobility with their college degree (Tinto, 2006). Improving remedial coursework can help underprepared students graduate and can help diversify the workplace. In addition, Gutiérrez (2012b) states that people need to practice mathematics to be able to participate in a democratic society.

Dissertation Overview

This dissertation contains eight chapters. This first chapter introduced the goals and rationale for this study. The next chapter will provide a greater, in-depth literature review on caring and other topics related to this dissertation. In Chapter 3, I describe in detail the research design for this dissertation study. Findings pertaining to the teacher, students, and classroom, are

presented in Chapters 4, 5, and 6 respectively. Chapter 7 provides a discussion on the results of the chapters, and Chapter 8 concludes with limitations and implications.

CHAPTER 2

LITERATURE REVIEW

The previous chapter discussed the challenge that provides the backdrop for this dissertation. That is, many at-risk college students must complete remedial mathematics coursework as part of their requirement to move forward into a major and finish their bachelor's degree. The current chapter discusses the relevant literature related to this dissertation study.

Prior research suggests that a teacher's caring nature can be helpful to at-risk students (Hackenberg, 2010; Muller, 2001; Valenzuela, 1999). Therefore, examining specific qualities that demonstrate a teacher's caring nature in working with at-risk students is important. The research questions of this dissertation are:

1. *In what ways can a mathematics teacher be caring? How can such caring be developed?*
2. *How can a teacher's caring affect her interactions with students and promote general academic skills?*
3. *How can a teacher's caring affect her mathematics instructional methods?*
4. *How do students feel they benefit from a teacher's caring?*

This chapter discusses previous literature on caring and research related to caring. It is comprised of several major sections. The first section starts with a brief overview of the research on teaching underserved students. The second, more extensive, section focuses on teaching mathematics to underserved students. Within that section, I discuss NCTM's (2000) *Principles and Standards*, along with research that exemplifies NCTM's perspectives. I also discuss general current perspectives in helping underserved students in math. Finally, I discuss college level mathematics teaching.

Although the research in mathematics education is comprehensive, I argue that scholars have generally ignored caring and student-teacher relationships in the research on teaching mathematics. Therefore, I examine research on caring that is outside of mathematics education.

Hence, the next major section starts with a review of the philosophical orientations on caring by the well-known founder, Nel Noddings. After this, I discuss empirical research on caring in K-12 education with a special focus on teacher characteristics and caring in the context of student-teacher relationships. Moving on, I examine the role of caring in teachers' instructional methods. Finally, I explore caring at the college level because of its relevance to this dissertation. In this review, I examine early works as well as students' and professors' diverse views on caring. I move to discussing students' views of caring in the context of immediacy behaviors in a classroom and present research studies on immediacy behaviors.

The chapter concludes by looking across the various bodies of literature that were presented to consider current perspectives that are missing, but essential to include in future research. I thereby set the stage for this dissertation study as a means of filling some key gaps in the literature on caring—namely research that is at the intersection of mathematics teaching, college-level remediation, teaching underserved students, and teacher caring as expressed in the context of nonverbal and verbal immediacy behaviors.

Teaching Underserved Students

Current literature identifies several general instructional approaches that can help struggling students in grades K-12 who have difficulty learning. These include cooperative learning, computer-assisted instruction, individualized instruction (Barley et al., 2002; Eisner, 1998; Slavin, 1987; Slavin & Madden, 1989) and peer tutoring (Barley et al., 2002). In addition,

Waxman et al. (2001) states that cognitively-guided instruction (direct teaching and modeling), culturally responsive teaching, and technology enriched teaching are also approaches that can help at-risk students. Instructional conversation (e.g., dialogue, questioning, sharing ideas) is also important (Waxman et al., 2001) and could be based on students' experiences and interests (Waxman et al., 2001). Jackson & Lambert (2010) discuss changes to instructional methods to help struggling students before, during, and after instruction.

Teaching Mathematics to Underserved Students

The area of mathematics also has approaches for helping underserved students. In this section, I discuss important aspects of teaching mathematics to underserved students. I start with a discussion on NCTM's (2000) *Principles and Standards*. Second, research is presented that exemplifies NCTM's philosophy. Next, I discuss general current perspectives in helping underserved students in math. I examine well-known scholarly work in the area of mathematics education that is focused on teaching at-risk students. I include what has been thought to be the most important considerations for a teacher who is teaching mathematics to underserved students. Finally, I discuss college level mathematics teaching.

NCTM's Promotion of "Mathematics for All"

Since 1989, the National Assessment of Educational Progress (NAEP) reports vast improvement in mathematics scores for traditionally underserved students (Ferie, Grigg, & Dion, 2005; Lubienski, 2007). However, a massive achievement gap remains for low SES and race/ethnicity groups (Lubienski, 2002, 2007). There are "large disparities between whites and students of color, and between well-off and low-income students exist [sic] in course-taking patterns; membership in mathematical (and scientific) fields; and various measures of

achievement and learning” (Gutstein, 2006, pp. 11-12). A vast amount of research focuses on ways to aid teachers in helping underserved students learn and develop proficiency in mathematics (Clarke & Shinn, 2004; Gutstein, 2003; Moses & Cobb, 2001; Lubienski, 1996; Slavin, Lake, & Groff, 2009).

NCTM (2000) cares about the mathematical achievement of all students and in their *Principles and Standards* advocates guidelines for teachers of underserved students. First, the document suggests that teachers should embrace the ideology that mathematics is for all. According to the *Equity Principle*, mathematics education requires “high expectations and strong support for all students” (NCTM, 2000, p. 11). Having high expectations is important because research indicates that teachers’ expectations, attitudes, and actions influence students’ academic progress (Ladson-Billings, 1994; Muller, 2001; Noddings, 1996). NCTM states that “All students need access each year to a coherent, challenging mathematics curriculum taught by competent and well-supported mathematics teachers” (p. 12).

NCTM (2000) envisions students being mathematically literate, and this gives students power. Teaching with “worthwhile mathematical tasks” can help students obtain mathematical power. According to Lubienski (1996),

Learning emphasizes students valuing mathematics, feeling confident in their abilities to do mathematics, solving mathematical problems, reasoning mathematically, communicating about mathematics, and constructing their own understandings through doing mathematics. (p. 2)

Typical teaching in mathematics does not emphasize these aspects. A considerable amount of mathematics teaching centers on traditional, rote and drill, teacher-centered approaches and relies on students memorizing a set of procedures (Lubienski, 1996). These practices may be indications of teachers having low expectations for students. In general, these types of exercises do not foster students to be mathematical problem solvers. Instead, it

encourages students to think that mathematics is repetitive. When students encounter a different problem, they do not know how to generalize from what they have learned to a new, complex problem. NCTM (2000) recognizes that a number of underserved students (low-SES students, non-native speakers of English, students with disabilities, females, and other minorities) have been victims of low expectations. Some scholars believe that teachers often have negative expectations toward minority students in regards to behavior and academic achievement (Oates, 2003; Weinstein, Gregory, & Strambler, 2004). Knapp, Shields, and Turnbull (1995) argue that minority groups receive disproportionate amounts of low-level, rote instruction. These approaches focus much more on the mastery of basic skills and less on higher-order skills (Means & Knapp, 1991). In addition, the curriculum is less challenging and more repetitive (Means & Knapp, 1991). “Teachers are typically more directive, breaking each task down into smaller pieces, walking the students through procedures step-by-step, and leaving them with less opportunity to engage in higher-order thinking” (Means & Knapp, 1991, p. 283).

However, there has recently been a greater push for mathematics teachers to have high expectations for students, which may include teaching with a focus on problem-solving. As a result of changes in cognitive research, Means and Knapp (1991) argue that disadvantaged students can learn higher-order skills while learning basic skills. A teacher can interweave a basic skill with a higher-order problem or skill. Lubienski (2007) concurs that students can learn basic facts while practicing higher-level problems. Means and Knapp (1991) argue that “it is time to rethink our assumptions about the relationship between basic and advanced skills and to examine critically the content and teaching methods that we bring to the classroom” (p. 289). Although there is this push for underserved students to learn mathematics through problem-solving, Lubienski’s (1996, 2007) research highlights potential difficulties with using a problem-

solving approach to teach mathematics to underserved students. For example, her students had trouble with the context of math problems, “approaching problems in ways that . . . did not promote engagement with, and abstraction of, the intended mathematical ideas” (pp. 251-252).

General Current Perspectives in Helping Underserved Students in Math

There is a vast amount of research on aiding underserved students in learning mathematics. Due to achievement gaps (Ferie, Grigg, & Dion, 2005; Lubienski, 2007), many scholars express concern about teaching mathematics to traditionally underserved students. Due to this large volume of research, in the following section, I only examine the most influential work in mathematics education (much of which focuses on K-12 education).

Gutiérrez (1996) focused on mathematics curricula and strong mathematics departments. These two elements have been used to help underserved students in mathematics achievement. More recently, Gutiérrez’ research has moved to issues of power and identity, with a strong focus on the teacher’s role in the classroom. Gutiérrez (2012b) has developed a framework regarding equity, and it has four dimensions: *Access*, *Achievement*, *Identity*, and *Power*. These are all important components, but the ones most associated with equity are *Identity* and *Power*. Identity can involve personal, cultural, or linguistic parts of a person and has taken on a larger role in equity research in mathematics (Abreu & Cline, 2007; Esmonde et al., 2009; Martin 2007). The other critical component of equity is *Power*, which concentrates on social transformations. Understanding these facets in underserved students can help shape instructional methods and curricula. This can promote mathematical achievement as suggested by Eric Gutstein.

Gutstein’s (2003) research on and teaching of mathematics for social justice exemplifies Gutiérrez’ (2012b) equity framework. Gutstein (2003) states that mathematics is a tool to

investigate and critique injustices (such as racism and discrimination). There are three goals of mathematics teaching for social justice. One goal is to have students develop a sociopolitical awareness. A second related goal is to have students develop a sense of agency so that these students can feel empowered to make a difference in this world because it “can be an important step toward achieving equity” (Gutstein, 2003, p. 40). The final goal of teaching for social justice is to help students develop positive social and cultural identities (Murrell, 1997 as cited in Gutstein, 2003). Reaffirming language and understanding the culture and cultural history of the students are ways to build positive identities (Murrell, 1977).

Others have focused their efforts on improving mathematics education with curriculum and problem solving strategies. Lubienski (1996, 2007) investigated how low- and high-SES seventh graders learn mathematics using a problem-centered mathematics curriculum. Results revealed differences in how each group of students responded. High-SES students displayed more confidence to make sense of mathematics on their own whereas the low-SES students often asked the instructor to “explain how to do it” or “tell me the answer” (Lubienski, 1996, 2007). Another difference is that the higher SES students found mathematical discussions “interesting” and “informative,” whereas the lower SES students complained and became confused when they were unsure of how to proceed (Lubienski, 1996, 2007).

College Level Mathematics Teaching

The push for “mathematics for all” extends to college level teaching of mathematics. For example, Uri Treisman is well-known in the area of helping undergraduate African Americans succeed in calculus. Bok (2006) asserted that “undergraduates who take quantitative courses taught in conventional ways often find the work difficult to understand and do not understand the underlying mathematical concepts well enough to apply them successfully” (p. 131). Traditional

college teaching is difficult for undergraduates, and many do not understand mathematical concepts well enough to generalize and apply them (Bok, 2006). The failure rate of first-year calculus students is strikingly high. As Treisman (1992) notes, “Each year, on average, 600,000 first-year college students take calculus; 250,000 of them fail” (p. 369). Aware of this in his calculus courses, Treisman investigated the study habits of Asian Americans (who were more successful in the course) and African Americans (who were more likely to fail; Treisman, 1992).

Treisman (1992) noticed that the Asian American students had constructed an “academic fraternity.” He discovered that Asian Americans worked in groups, whereas Black students studied alone and were isolated from each other and others in the class. When Black students had difficulty solving problems, they did not seek help. Instead, they became discouraged and did not complete their assignments and fell further behind. In comparison, when Asian-American students had difficulty, other Asian Americans in the class helped them understand what was wrong. After this observation, Treisman placed Black students in groups, and got positive results. “The grades of black students improved; their dropout rate fell substantially; and many more than usual went on to major in science and math” (Bok, 2006, p. 132). Since Treisman conducted this research, many other professors in various subjects have applied his methods and have reported similar results (Bok, 2006). Treisman’s commitment to his African American students’ success in college mathematics indicates that he both believes in and cares about these students.

Danny Martin focuses on the experience of African Americans’ beliefs about learning mathematics as a racialized experience and their struggle for mathematics literacy. Martin (2006) argues that, despite discriminatory experiences, some African Americans have been able to go back to school and take mathematics courses. Martin’s (2006) participants described their

mathematical experiences in negative ways. This included a lack of exposure to African American teachers, removal from the gifted track, and White teachers steering African Americans away from mathematics (Martin, 2006). This “conveyed a message that participating in mathematics was for others and not for African Americans” (p. 211).

Other Important Elements Neglected in Teaching Underserved Students

The aforementioned research indicates a wide range of perspectives on the best way to help underserved students. These scholars have focused on instructional methods, curriculum, and the student’s identity. Others suggest that the issues of caring and student-teacher relationships are also important, yet the literature discussed so far tends to ignore these issues. I would like to make a case that caring and communication have been overlooked in teaching remedial mathematics courses. A literature review of research in caring provides evidence that these elements are important to teaching remedial mathematical content to at-risk college students.

Caring

This section on caring is composed of several parts. First, the review presents the philosophical framework and foundational work on caring in education with an emphasis on Nel Noddings. Second, I survey the current caring research done in K-12 education settings. This includes a discussion on the specific characteristics of caring teachers and student-teacher relationships. Next, two relevant research studies exemplify the lack of caring teachers and student-teacher relationships, and I include an extensive discussion on these two pieces of research (Rolón-Dow, 2005; Valenzuela, 1999) because of their connections to this dissertation

study. Next, the review includes instructional methods that have been known as a form of caring. Finally, I review caring research at the college level because of its relevance to this dissertation.

Pioneers in Caring (Noddings and others)

Early pioneers in research on caring include Martin Heidegger (1926/1962) and Milton Meyeroff (1971). Another important pioneer of care theory, Carol Gilligan (1982), wrote the book *In a Different Voice*. Gilligan's (1982) work influenced Noddings' philosophy on caring. Noddings (1992) then expanded on Gilligan's work to include perspectives on education. In this way, Nel Noddings created a philosophical perspective on caring in education. There is now an extensive amount of research on caring, and many cite Noddings' philosophy of caring on education (Noddings, 1984, 1992, 1994, 1995, 1996, 1998, 2002, 2003, 2005ab) as their framework. Before examining education research on caring, the following serves as a brief introduction to the philosophy of caring in education.

Noddings' (1984) groundbreaking philosophical work is *ethic of care* and is widely used in research in education. It is centered on a teacher and a student. A key element is that the relationship is reciprocated between the "one caring" and the one "cared for." According to Noddings (1984), her view of care has the teacher initiate the relationship with students. To be considered caring, "one must regularly succeed in establishing caring relations" (Noddings, 2005, p. xv). After initiating this relationship, teachers should become completely engrossed and absorbed in the students' well-being. Teachers need to show signs of acceptance and confirmation to the cared-for student. Listening attentively and responding as positively as possible are basics of caring (Noddings, 2003), but she also states there is no formula for showing care. Teachers carry a lot of responsibility for helping students, and teachers need to be with students and do caring acts for them (Noddings, 1992). The relationship is reciprocated

when students demonstrate a willingness to reveal themselves. Reciprocity is an essential element of the caring relationship (Noddings, 2002). Both parties need to participate to be considered part of the caring relationship. James (2012) concurs with Noddings and notes that “a true caring relationship depends on a teacher’s ability to identify and meet students’ needs and is affirmed by students’ confirmation of that caring” (p. 166). Noddings (1984, 1992) believes that caring relationships are central in supporting students’ academic achievement and *all* success in education.

Genuine education must engage the purposes and energies of those being educated. To secure such engagement, teachers must build relationships of care and trust, and within such relationships, students and teachers construct educational objectives cooperatively. (Noddings, 1984, p. 196)

Noddings (1984) maintains that schooling efforts have focused on *aesthetic* caring.

Rolón-Dow confirms this perspective on caring.

Aesthetic caring focuses on attention to things and ideas concerning the technical aspects of teaching and learning such as standardized curricula, goals, and teaching strategies. Individuals who care aesthetically are committed to the school-sanctioned practices and behaviors believed to lead to educational achievement. (Rolón-Dow, 2005, p. 86)

Instead of focusing on curriculum and standardized testing, Noddings (2005a) argues for educating the whole child instead of only educating students to be proficient in mathematics and reading. One needs to remember that “students are whole persons—not mere collections of attributes, some to be addressed in one place and others to be addressed elsewhere” (Noddings, 2005a, p. 10).

Noddings’ perspectives on caring have impacted some pre-service teacher education programs (Goldstein, 2002; Knight 2004; Lake, Jones, & Dagli, 2004). Another related area of caring is Affective Teacher Education where the focus is on improving students’ character and

values. It is commonly found in programs such as moral education and character education (LeBlanc & Gallavan, 2009).

Noddings' Perspectives on Mathematics and Current Education

Although Noddings, to date, has not herself contributed any empirical studies on caring in education, her background as a mathematics teacher influences her views. Noddings cautions against the current movement in education to ensure that all students receive the same or a similar type of mathematics education and ensuring that students master a specific kind of knowledge without considering if students want to learn math or need to know math. This is a type of *aesthetic* caring that encourages everyone to learn math regardless of students' interests and needs. Noddings (1992, 1994) has argued that students should not be *required* to take math courses in high school (but considers statistics, probability, and business math to be exceptions).

I do not judge people's worth by their mathematical talent, nor do I believe that mathematics through calculus is somehow necessary for good citizenship. Lots of very nice people, even very good citizens, find mathematics difficult and unpleasant. Why should all students, regardless of their aptitude, interest, or plans for the future, struggle through algebra and geometry? . . . Surely academic mathematics is not essential for everyone—not even for all college-bound students. (Noddings, 2005b, p. 29-30)

Instead, she argues that:

We should not be so concerned with motivating everyone to do well in mathematics, but, rather, with giving everyone a chance to find out whether he or she is interested in doing mathematics. (Noddings, 1993, p. 156).

Authentic caring would involve giving students opportunities to find out if they like or are interested in doing mathematics. Instead of a uniform system, Noddings (1994) advocates for a variety of mathematics courses for students who have different interests. Noddings' views on mathematics also represent a critique of the current school system (including the curriculum). Noddings (1984) argues that schools are structured around *aesthetic* caring where the focus is on

things and ideas. Noddings (1992) continues to argue that there is too much emphasis on standardized testing and acquiring academic knowledge and believes that education is trivialized. Instead, students' learning should be centered around a "moral ethic of caring" that nurtures and values relationships.

Despite this, Noddings (1994) is aware that certain groups of students have not had access to mathematics and to better opportunities, and she wants educators to eliminate this inequality. As a teacher, Noddings (1994) claims she would encourage students to take as much math as is necessary to get into college.

Caring Research in K-12 Education

There is a great deal of research in K-12 education on the topic of caring, using Noddings' philosophy as well as other extensions of caring frameworks (e.g., Beauboeuf-Lafontant, 2002; Rolón-Dow, 2005; Thompson, 1998). This large volume of research on caring is conducted in many areas of education. The following is a sample of scholarly work conducted in the area of caring.

Improving Schools

Researchers have investigated the impact of caring in improving school culture and creating a sense of community (Beck & Newman, 1996; Dempsey & Noblit, 1993; Eaker-Rich et al., 1996; Walker, 1989). Beck (1992) argues for ethic care in educational administration.

Teacher's Profession and Caring

Some scholars have used the concept of care in preparing future teachers and aiding current teachers in their profession. For example, Elbaz (1992) explains that teachers' knowledge is important and categorizes it in three aspects: hope, attentiveness, and caring. Similar to Elbaz, Agne (1992) found that teacher beliefs are important, and advocates teacher belief systems that

emphasize caring. Collier (2005) confirms that belief systems serve as a catalyst for teacher efficacy and as a way to promote caring for students.

In conducting research with current teachers, Beach (1992) explored nurturing in early childhood teachers and found that female teachers focus on nurturing as the form of caring for students. Based on his ethnographic study, Noblit (1993) observed a power dimension in a teacher's care while interacting with students and in the teacher's instruction. While conducting research on the various ways that teachers care, Isenbarger and Zembylas (2006) explored the emotional work of caring in the teaching of one teacher. Results showed that this one "teacher's performance of emotional labour is related to her professional and philosophical stance about the role of caring in teaching and learning" (p. 120). James (2012), using a narrative inquiry approach, discovered that teachers' conceptions of caring are primarily shaped by their biographies.

A body of research also connects caring to teacher education programs. Owens and Ennis (2005), using previous literature on the ethic of care (Noddings, 1984), argued for incorporating the ethic of care as part of a pre-service teacher education program. Bartell (2011) classified specific practices that caring teachers engage in to form student-teacher relationships and classified these caring relationships into three categories: racial, cultural, political, and academic. Based on these categorizations and other research, Bartell (2011) drew on extensive caring literature to build a model of professional development to foster caring in mathematics teachers and argued that mathematics teachers need to know the importance of developing caring relationships with students.

Other Areas of Education

Some areas in education have little research on caring. For example, only a few scholarly pieces were found on caring while teaching a specific content area. For example, Lamme and McKinley (1992) created a caring classroom with elementary and preschool children using children's literature. Another example is studying caring in the context of racial/ethnic minorities. Nieto (1998) examined the importance of caring in the educational experiences of Puerto Rican students. However, research like Nieto's is rare.

Characteristics of Caring Teachers in Student-Teacher Relationships

The previous section demonstrates that there have been many studies about caring in the area of education. Much of the research generally describes characteristics of caring teachers in student-teacher relationships.

Agne (1999) states that the first and most important characteristic of master teachers is their care for students. Teachers' care for students fosters strong teacher-student relationships (Bartell, 2011; McLaughlin, 1991). James (2012) claims that "study after study reveals that the more personal the relationship between the teacher and student, the more caring a teacher is perceived to be" (p. 166). Based on interview data of families, schools, and volunteer agencies and using a grounded theory approach to generate a concept of caring, Tarlow (1996) discovered eight characteristics that describe the process of forging caring relationships with students. They are (a) time, (b) "be[ing] there," (c) talking or dialogue, (d) sensitivity, (e) acting in the best interest of the student and promoting student success at school, (f) caring as feeling, (g) caring as doing, and (h) caring in reciprocal relationships (Tarlow, 1996). The first three characteristics are important in developing relationships and supporting Noddings' framework of caring (Tarlow, 1996; Owens & Ennis, 2005). Noddings' framework advocates that teachers be completely

absorbed in students' well-being and be accepting and affirming of students. All of this requires taking the time, being there and talking with students.

Time, Being There, and Talking

Building relationships, at the most fundamental level, requires teachers to have time, to be there, and to talk with students. These characteristics allow teachers to make themselves available for students. These qualities or variations of these qualities are also confirmed in other research. McLaughlin (1991) avers that caring teachers talk to students outside of class. Teachers who listen to children's problems and feelings are approachable and encourage discussions (Neal, 1999; Thayer-Bacon et al., 1998). Mercado's (1993) results found that teachers being real, being perceived by students as authentic, and being honest and truthful about life, beliefs, feelings, and emotion are expressions of care. Approachability and creating opportunities for smooth communication are also forms of teachers' care (Mercado, 1993).

Sensitivity to Students, Acting in Student Interest, and Promoting Student Success at School

Teachers' sensitivity to students and their needs is also an important expression of care. One way for a teacher to be sensitive is to accept students and their viewpoints (Mercado, 1993). Teachers taking an active interest in students and their learning is also another important quality that expresses care. McLaughlin (1991) confirms that helping students with school problems and taking an interest in the process of student learning are elements of a caring relationship. In addition, teachers report that challenging students academically (Cogar & Raebach, 1989; Owens & Ennis, 2005) and encouraging student learning (Owens & Ennis, 2005; Rogers & Webb, 1991) are expressions of care.

A key component of promoting academic success and a distinguishable quality of a caring teacher is having high expectations for students along with warmth. Vasquez (1998) characterizes such a teacher as a “warm demander” because he or she will not lower standards for students and will reach out to students and provide needed assistance to reach higher levels of learning. Kleinfeld’s (1972) research with teachers of Eskimo and Native American students suggests that caring teachers demand academic excellence from their students.

The essence of instructional style which elicits a high level of intellectual performance from village Indian and Eskimo students is to create an extremely warm and personal relationship and to actively demand a level of academic work which the student does not suspect he can attain. Village students thus interpret the teacher’s demandingness not as bossiness or hostility, but rather as another expression of his personal concern, and meeting the teacher’s academic standards becomes their reciprocal obligation in an intensely personal relationship. (p. 34)

Having high academic standards is a manifestation of teachers’ care and equally important are teachers’ beliefs about students’ success. Other scholars argue that certain belief systems of the teacher are important when developing student-teacher relationships with at-risk students (Agne, 1999; Agne et al., 1994). Bartell (2011) states that teachers need to reject deficit theories that blame students and their communities. According to Collier (2005), caring teachers do not attach failure to the student but rather focus on finding effective ways to reach students. Caring teachers believe in the full potential of culturally and diverse students (i.e., that they are capable learners; Ladson-Billings, 1994).

Caring as Feeling and Doing

Teachers feeling or showing care, compassion, and empathy are important to students because these fulfill students’ needs for security and belonging (Dempsey & Noblit, 1993; Owens & Ennis, 2005). Teachers can express compassion and empathy in multiple ways. For example, teachers’ expression could include “caring as commitment, caring as relatedness,

caring as physical care, caring as expressing affection, such as giving a cuddle, caring as parenting and caring as mothering” (Vogt, 2002, p. 251).

Caring in Reciprocal Relationships

Teachers need to also realize that students can reciprocate care. Based on her research, Rabin (2010) asserts that caring teachers should assume that their students are caring and persist in their commitment to develop connections with students despite student resistance. Developing mutual trust and including students in decision making (Kohn, 1991; Owens & Ennis, 2005) are also signs of reciprocal relationships.

Other Important Qualities

Tarlow’s (1996) research provides an initial framework to view teachers’ characteristics in caring relationships. However, more recent research describes other important qualities of teachers’ care for students. For example, maintaining good classroom management (Ferreira, 2000) is also important to students because it is important to learning. Providing a safe environment is also vital to learning (Frank, 2001). Rabin (2010) asserts that caring teachers should “connect to students’ culture . . . connect students’ cultures to an academic level . . . recognize and confront racism” (p. 145). Rabin’s (2010) framework is similar to Ladson-Billings’ (1994) view on culturally relevant pedagogy. The difference is that Rabin (2010) emphasizes the importance of these caring perspectives in pre-service education programs.

Student and Teacher Perceptions of Caring Teachers

Students’ perceptions of caring may be different from teachers’ views. However, there are some similarities between what teachers and students perceive as caring. Quaglia and Perry

(1995) found that students, like teachers, view caring as encouraging success and positive feelings. Similar to findings about teachers, Quaglia and Perry (1995) discovered that students thought being available outside the classroom is characteristic of a teacher's care. Students also view teachers' sensitivity and showing concern for student learning as manifestation of teachers' care (Owens & Ennis, 2005; Rogers & Webb, 1991).

Like teachers, students view high expectations and warmth as a form of caring. Wentzel (2009), citing the work of Smokowski et al. (2000), documents qualitative research that suggests "academically successful inner-city ethnic minority adolescents value instrumental help from teachers but also warmth and acceptance coupled with high academic expectations" (p. 308). Similar to Eskimo and Native American students (Kleinfeld, 1972), the adolescents Smokowski studied viewed academic excellence and warm relationships with teachers as forms of caring. Suarez-Orozco et al. (2009) examined the differences of academic achievement between Chinese and Mexican students and concluded that students from different backgrounds have different cultural expectations of school or different views of caring relationships. More recently, Tosolt (2010) found that despite some agreement on caring behaviors (i.e., fairness), students from different backgrounds perceived teachers' caring differently.

Owens and Ennis (2005), using the work of Phelan, Davidson, and Cao (1991), reported that students communicated that "they value teachers who care and want teachers to recognize who they are, to listen to what they say, and to respect their effort" (p. 403). Students also perceive caring teachers as those who encourage dialogue and provide a safe place for learning (Owens & Ennis, 2005; Rogers & Webb, 1991). This suggests that the teacher's time, being there, and talking to students in honest and meaningful ways is crucial to fostering strong relationships with students.

Students reported some qualities that teachers did not mention as a part of their care. Students view teachers as caring when teachers treat students as whole people (Isenbarger & Zembylas, 2005; Quaglia & Perry, 1995; Vogt, 2002). When interviewed, students stated that teachers making school fun, displaying humor, and showing interest in the student as a person were forms of teachers' expression of care (Quaglia & Perry, 1995). Other scholars (Owens & Ennis, 2005; Rogers & Webb, 1991) also stated that students believed that making school fun is a form of care.

Strong Relationships as Indicators of Effective Teachers

Effective teachers are characterized by the ability to create and maintain strong interpersonal relationships with students (Bartell, 2011; Good & Brophy, 2000; Ladson-Billings, 1994; Noddings, 1992). The following summarizes the characteristics of caring and effective teachers who foster student-teacher relationships:

Those who develop relationships with students that are emotionally close, safe, and trusting, that provide access to instrumental help, and that foster a more general ethos of community and caring in the classrooms. These relationship qualities are believed to support the development of students' emotional well-being and positive sense of self, motivational orientations for social and academic outcomes, and actual social and academic skills. They also provide a context for communicating positive and high expectations for performance and teaching students what they need to know to become knowledgeable and productive citizens. (Wentzel, 2009, p. 301)

Additionally, Whitaker (2012) argues that:

One of the hallmarks of effective teachers is that they create a positive atmosphere in their classrooms and schools. . . . Effective teachers treat everyone with respect, every day. Even the best teachers may not like all of their students, but they act as if they do. And great teachers understand the power of praise. (p. 49)

Many points listed in the above passage explain why teachers in caring student-teacher relationships are important to students' success. A common element among many, if not all, the research literature on caring is that student-teacher relationships are a way for at-risk students to navigate the school culture or curriculum. For example, underserved students might feel

disconnected from school mathematics (Civil, 2007; Nasir, Hand, & Taylor, 2008), and caring can help students feel connected to mathematics and schooling.

Research on the Effects of Caring

As outlined in the previous section, much of the research on caring uses Noddings' framework, and much of it can be classified into characteristics of caring teachers and student-teacher relationships. This section reviews evidence regarding the benefits of caring for students.

General

A range of studies suggest some general ways in which caring teachers produce benefits for students. Caring behaviors may result in higher student achievement (Garrot, 2004; Cooper, 2004) and improvement in students' academic engagement (Brekelmans et al., 2000; Thayer-Bacon et al., 1998). Research suggests positive correlations between student-teacher relationships and student achievement and engagement (Cornelius-White, 2007; O'Connor & McCartney, 2007; Pianta, 1999). There is improvement in cooperative skills and student involvement (Goldstein, 1998).

Perceived emotional support from teachers has been related significantly to students' academic performance throughout the school-aged years (Chang, 2003; Crosnoe, Johnson, & Elder, 2004; Wentzel 1994, 1997). Levels of emotional closeness and the student's sense of security that are a part of student- teacher relationships help develop positive social and academic outcomes in children (Wentzel, 2009). From a psychological perspective, researchers argue that relatedness is a fundamental need (Baumeister & Leary, 1995; Ryan & Deci, 2008). This feeling of relatedness helps build positive energy in students (Ryan & Frederick, 1997) and contributes to their psychological well-being (Kasser & Ryan, 1999; Muraven, Gagné &

Rosman, 2008; Ryan & Deci, 2008; Ryan & Frederick 1997). Wentzel (2009) elaborates that a sense of belongingness and relatedness helps maintain a positive self-concept and promotes social and academic competencies. These elements contribute to an affective tone that needs to be present in student-teacher relationships (Hackenberg, 2010).

A previous middle school teacher and now a well-known researcher in the area of student-teacher relationships describes his experiences:

I watched my students' motivation for tough academic tasks increase far beyond expectations (most had dual diagnostic labels as "learning disabled" and "emotionally disturbed"), and their performance increased as well. . . . This was not because I was a great teacher or motivator. In retrospect, I believe my relationships with these students (most, but not all of them) "hooked" them in ways that enhanced their development in social areas and as learners. These relationships were resources. (Pianta, 1999, p. 4)

Although this is only one teacher reporting the effects he had on his students, his observations are consistent with other research on student-teacher relationships that demonstrates the effects these relationships have on students.

Other Effects of Teacher Caring

There are still other effects of teacher's caring. In a doctoral dissertation on students who dropped out of high school and returned, Bae (2008) claimed that, prior to leaving high school, participants did not feel that the "curriculum was relevant to their interests or needs and their teachers cared for them" (p. 193). These views are similar to Noddings' view that current education does not seem relevant to students. Participants disliked school, and they were bored and not interested in school (Bae, 2008). However, when students returned to get a G.E.D., they felt cared for. Bae (2008), along with others (Fine, 1991; Walter-Bailey, 2004), argues that students who feel unwanted or uncared for are more likely to leave school before graduation.

Unwanted and uncared for feelings in young children also have an effect on students' well-being and performance in school. In elementary school, students' anxiety and depression

have been related to negative relationships with teachers (Murray & Greenberg, 2000).

Researchers have also found that a lack of perceived support causes students in middle school emotional distress (Reddy, Rhodes, & Mulhall, 2003). Lynch and Cicchetti (1992) argue that relationships help with student's emotional experiences in the classroom. In Bae's (2008) study, the student participants felt that their teachers did not care, and she claims that at-risk students are especially in need of caring teachers.

Caring had an effect on my participants in their rebounding and returning [to school]. . . . And the majority of my participants appreciated their current teacher's concern about their academic needs and personal living as well. This shows how a caring relationship can play a critical role for students to recover. (Bae, 2008, pp. 193-194)

Valenzuela's work also substantiates Bae's (2008) claim about caring and dropping out. Valenzuela (1999) found that many students who were at risk of dropping out of high school did so because they felt that no one (e.g., a teacher, the principal) cared.

Benefits to Students in Mathematics

There are multiple ways of developing student-teacher relationships. However, one specific example of developing student-teacher relationships in the context of doing mathematics is the work of Hackenberg (2010, 2005). Her work is unique because it investigates caring in the context of mathematics teaching. Hackenberg (2010) coined the term *mathematical caring relations* (MCR) and defines the term "as a quality of interaction between a student and a teacher that conjoins affective and cognitive realms in the process of aiming for mathematical learning" (p. 237; see also Hackenberg, 2005). Her study explores the ways that a teacher intervenes during the students' mathematical activities and also the teacher's openness and ability to pursue the students' ideas using small scale teaching experiments. Instead of examining the personal interaction between the teacher and student, Hackenberg (2010) examines specific student-teacher interactions while engaged in doing mathematics. Much of this work is done in one-on-

one situations with one teacher and one student. The teacher's dialogue is focused on questions and comments that would push students' thinking and learning. Teachers are "making interpretations of students' current schemes and operations and basing interaction on those interpretations so that the tasks posed to students are sensible to them" (Hackenberg, 2010, p. 59). Bartell (2011) focuses on overall professional development models for mathematics teachers and believes that Hackenberg's research is promising for teachers to guide students' mathematical thinking. Specifically, students involved in this experiment used innovative ways to solve problems (Hackenberg, 2010). However, Hackenberg's work does not involve or consider issues of SES, culture, gender, race, etc. Demographic information was not part of the study nor were concerns regarding at-risk students addressed. One does not know how helpful or in what ways these interactions will be useful for underserved students in their learning of mathematics.

Unlike Hackenberg (2010), Muller (2001) studied mathematics and caring in a quantitative study. Muller (2001) examined the role of caring in the student- teacher relationships for at-risk students (African Americans, Latino students, and males in low-ability math classes). One result of this study is that students try harder to succeed (as reported by teachers) when they perceive that teachers care about students. The study reports that:

Students who are at risk of dropping out may experience more test score growth and attain higher levels of mathematics proficiency in the twelfth grade if they feel that teachers care about students when compared to at-risk students who report lower levels of teacher caring. (p. 250)

Caring Research that Influenced this Dissertation Study

After reviewing the literature on characteristics of caring teachers and student-teacher relationships, examining ethnographic research on caring and the results seemed important

because it helped shape this dissertation study. Specifically, Valenzuela (1999) and Rolón-Dow (2005) have done research that shows care or the lack of care in schools.

Valenzuela (1999), in her ethnographic research, demonstrates some teachers' lack of expressing care while other teachers express care in a personal way without considering content-specific teaching. Valenzuela (1999) found both institutional factors (e.g., the lack of school resources, an overcrowded student population, and the deterioration of buildings) and classroom factors (e.g., social and cultural distance in student-adult relationships) that are interwoven and lead students to say that "no one at school cares."

Students felt that some teachers did not care about them. Valenzuela (1999) noted that some teachers admitted that they did not know students in a personal way, and they had negative orientations toward students. For example, Mr. Johnson told his students in front of the entire class while the researcher was present:

The main problem with these kids is their attitude. They're immature and they challenge authority. Look at them, they're not going anywhere. I can tell you right now, a full quarter of these students will drop out of school come May. (p. 64)

A student outside of class responded, "Johnson's full of shit! . . . he's always got an attitude" (p. 65). Valenzuela reported, "Very few students said that they thought that their teachers knew them or that they would be willing to go to their teachers for help with a personal problem" (p. 63). There were examples of teachers' caring in this high school. There was a beloved Social Studies teacher who noted, "What's important is that they need to know that I am fair, that I will listen to them, that they can come to me and talk and deal with a problem" (p. 100). The following quotes describe another caring teacher, Ms. Novak.

Ms. Novak is the best teacher I ever had. The way she laughs at us makes us happy, you know, like she *really* likes us. I learn easier that way. (p. 101)

Now I see that she's just doing everything she can to make sure that we learn. . . . Even when I'm sick, I still come to school to be in her class because she makes you feel nice, you know, like you're wanted or something. (p. 101)

Another caring teacher was the band director, Mr. Sosa. He had unique ways of meeting students' needs. There were football players who came to practice malnourished and who fainted. Students were taken to the local hospital. Students did not have health insurance so Mr. Sosa obtained accident insurance for students. Additionally, he brought a huge bag of bean and meat tacos. In this relationship, food created a strong bond with students (Valenzuela, 1999).

A big part of the trust that I have been able to build has been because of this. At first, they were overly defensive with me. If you tell them something they don't like, they are ready to hit back. Now, I can go ahead and tell them to do things which they don't understand, but they will do them anyway. That's what I'm up to with them, but it has taken almost two years. (p. 112)

Valenzuela (1999) believed that it was Mr. Sosa's caring nature that helped push the band forward to the city championship title for 3 consecutive years, and the band also competed at the state level. In general, Valenzuela (1999) found teachers who did care and who had positive and clearly observable effects on students.

Valenzuela's (1999) work is relevant to this dissertation study for many reasons. First, the students in my research study are similar to those who participated in Valenzuela's study. Participants in both studies suffered from a lack of school resources (i.e., good teachers). More importantly, the students in both studies have had poor experiences in high school. In my study, students experienced what could be considered "verbal abuse" because their previous mathematics teachers told them they were dumb and stupid. I carefully read Valenzuela's work *prior* to piloting this dissertation, and I realized that a lot of caring was embedded in *how* the teachers spoke to students. Second, I asked myself how caring would be expressed verbally in a mathematics classroom in which students had poor experiences in mathematics. When I started

piloting my dissertation, I observed a sharp contrast to the negative comments made by some teachers in the Valenzuela (1999) study, as I observed a mathematics teacher who consistently showed care for her students.

Expanding Noddings' and Valenzuela's research, Rolón-Dow (2005) studied how race/ethnicity intersects with care in the educational experiences of Latina students. Using an ethnographic approach, he examined the ways in which race/ethnicity and caring were linked (Rolón-Dow, 2005).

A major finding was that teachers tended to assume that caring for students was the responsibility of families and their communities (Rolón-Dow, 2005). Some teachers blamed the parents without realizing that they, as teachers, could show care for students. Ms. DeAngelo, a teacher, interpreted the minimal parental involvement as a lack of caring, saying, "A lot of them just don't care. . . . They just don't care about their kids" (p. 93). Mr. Rosenfield, another teacher, stated that "some of the ones that succeed have parents at home who care enough about their education to get them motivated" (p. 94).

In general, in Rolón-Dow's (2005) study, teachers cared about students' learning of subject matter but not about students as people. A student participant recognized that teachers cared for students, "but this care was limited to pedagogical and academic concerns" (p. 95).

Most of the teachers, all they want to do is teach the kids and that's it. . . . But I don't really think that they actually care, care. . . . What I'm trying to say is they care about the kids' schoolwork, not their personal lives, like what happened at home. (p. 95)

This student's distinction is the difference between aesthetic/technical caring and authentic/relational caring (Noddings, 1984; Valenzuela, 1999; Rolón-Dow, 2005). Rolón-Dow (2005) argues that even recognizing this distinction in caring is limited because it still fails to consider race.

The second major finding of Rolón-Dow was that students' responses reflected the lack of caring and linked this lack to the condition of school facilities as well as to issues of race. For example, María said,

This school needs a lot, a lot of work. . . . They have a lot of roaches crawling out of the wall and it's disgusting. Like this one time this roach was crawling up the wall and it distracts the whole classroom . . . I feel like I'm in prison, it's nasty. (p. 98)

Girls also mentioned that the "racial/ethnic differences between them and their teachers affected the amount of care teachers offered to them" (p. 100). The students conveyed disappointment at the misunderstandings that occurred due to the differences between the teachers and them.

There were a few teachers who cared personally for the students. Teachers said that they needed to understand the community context in which the students lived. For example,

Ms. Lamar [a teacher] stressed the importance of treating students with patience and concern and being sensitive to where they came from while also not making assumptions about their lives or their homes. (p. 102)

Rolón-Dow (2005) claims these teachers demonstrated both aesthetic caring and authentic caring while also considering the context of the community. Rolón-Dow (2005) encourages teachers to get to know students well, to gain a historical understanding of students' lives, and to enhance teaching and learning. These contribute to building teacher-student relationships.

Caring in Instructional Methods

Several, general, current approaches used to teach underserved students have underpinnings of caring. Noblit (1993) discovered a caring elementary teacher, Pam, who used teacher-centered approaches for teaching. "It involved the teacher standing in front of the class, asking for answers to questions or problems that the children were to give for immediate and

public evaluation” (Noblit, 1993, p. 32). Instructional methods included many rituals, including quiet reading and chanting as part of the routine, the use of the blackboard, children giving answers or going to the board to do a math problem, going to the board to spell a word or write a sentence, and reciting material. A current well-known approach is the use of culturally relevant pedagogy (Ladson-Billings, 1995) and is focused on the academic success of students of color. Ladson-Billings (1994) argues that care is a key part of culturally relevant pedagogy. This might be because it incorporates students’ home and school cultures and also incorporates students’ cultural values, experiences, and perspectives into teaching (Gay, 2002). It embraces “student achievement but also helps students to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools (and other institutions) perpetuate” (Ladson-Billings, 1995, p. 469). Ladson-Billings (1994) explains that a characteristic of culturally relevant teachers is to demonstrate acts of civility and kindness. A caring teacher “assure[s] each student of his or her individual importance” (p. 66). After this pedagogy was introduced, many teachers and researchers have tried using this approach to teach various subjects, including mathematics. Explaining work and checking for understanding (Ferreria, 2000) and being flexible (Thayer-Bacon et al., 1998) are also other examples. Caring in facilitating new content material also provides meaningful learning experiences (Tomkovick, 2004). Other methods include clear instruction, opportunities for practice and feedback, and structuring time for real engagement in tasks (Brophy & Good, 1986; Darling-Hammond, 1998; Darling-Hammond & Sclan, 1996).

Caring at the College Level

Similar to the research on caring in K-12, there are also a number of contributions in the area of caring at the collegiate level. The first subsection below explores general contributions by

James McCroskey. Next, students' and professors' diverse views on caring and effectiveness are discussed. Since students view caring in the context of immediacy behaviors, a review on what immediacy behaviors look like in a classroom is provided. Finally, research on immediacy behaviors and caring is presented.

General Contributions

While Noddings' framework is used in the K-12 setting, McCroskey's framework had an important role in promoting the concept of "perceived caring" (McCroskey, 1992) in college level teaching. His beliefs on perceived caring are similar to those of Nel Noddings, but his work does not indicate that he was influenced by her work. McCroskey (1992) argues that teachers should communicate in a way such that students will perceive that instructors care about them. The basis of this perceived caring is founded on a teacher's verbal and nonverbal immediacy behaviors. The term immediacy refers to behaviors that demonstrate closeness or liking (Mehrabian, 1972). The three factors believed likely to lead students to perceive the teacher as caring about student welfare are empathy, understanding, and responsiveness (McCroskey, 1992). In an educational setting, a teacher's ability to understand and respect students' views is considered empathy (McCroskey, 1992; McCroskey & Teven, 1999). However, understanding refers to the teacher being aware of students' feelings—something less often discussed in the literature. Responsiveness goes beyond understanding and is displayed when teachers are attentive and react to student needs (McCroskey, 1992).

McCroskey's (1992) work on perceived caring has helped other scholars push forward in this area. For example, Teven (2001) examined the relationships among teacher characteristics and perceived caring. Teven and Hanson (2004) studied the impact of teacher immediacy and perceived caring in the context of teacher competence and trustworthiness.

McCroskey (1992) also pushed the field forward with the instruments he developed that use perceived caring as a concept. McCroskey (1994) developed the area of affective learning and a scale named *The Instructional Affect Assessment Instrument* (IAAI) that measures students' evaluations of their teacher and the students' affect toward the subject matter being studied in the course. Witt et al. (2004) argues "that students' emotional responses to the instructor, content, and learning environment could influence the quantity and quality of the information learned in the course" (p. 190) and is referred to as *affective learning*. In another study, McCroskey et al. (1996) showed that students' ratings on the IAAI related to their willingness to enroll in another class in the same subject matter. In addition, other scholars have proposed models to show relationships between affective and cognitive learning (Rodriquez et al., 1996; Richmond et al, 1987). More current research shows that affective learning does impact cognitive learning (Allen et al., 2006).

Students' and Professors' Views of Caring and Effectiveness

In college teaching, a caring environment can enhance professors' effectiveness and lead to student learning (Kim, Damewood, & Hodge, 2000). However, Meyers (2009) argues, based on previous research (Buskist et al., 2002; Feldman, 1988), that college teachers and students describe caring in different ways. Generally speaking, college instructors focus on instructional roles whereas students focus on personal roles, much like Noddings' (1984) distinction between aesthetic caring and authentic caring. Meyers (2009) maintains that faculty do not always express their care in ways that students recognize or understand. Faculty focus their caring on coming to class prepared (Meyers, 2009). In addition, faculty focus on their content knowledge and the clarity of communicating this knowledge, whereas college students focus on teacher immediacy (Meyers, 2009). Students view professors' expressions of care in terms of verbal and nonverbal

immediacy behaviors and the professor's personal role, which involves "professors' concern for students, availability, respectfulness, and willingness to answer questions and foster interaction . . . welcome student questions, encourage students, acknowledge their input and feelings about the class, and express interest in students as individuals" (Meyers, 2009, pp. 205-206). Research reveals that the "more personal the relationship between the teacher and student, the more caring a teacher is perceived to be" (James, 2012, p. 166). In their research, Buskist et al. (2002) found that college students place a greater emphasis on rapport than professors do. Feldman (1988) found that students valued the stimulation of interest in the course, the professor's availability and helpfulness, and the professor's speaking skills more than the items professors valued. Meyers (2009) claims that research on teacher immediacy "provides the firmest foundation for the idea that caring makes a difference in students' educational experience" (p. 206).

What do Immediacy Behaviors Look Like in a College Classroom

Kane et al. (2004) argue that building interpersonal relationships with students should not be overlooked in college. One way to foster these interpersonal relationships is through immediacy behaviors because they are "the overt forms of communication that enhances the closeness between students and faculty" (Meyers, 2009, p. 206).

Immediacy behaviors in the classroom are seen "when teachers move around the classroom and gain proximity to their students . . . sometimes it involves more teacher smiling, facial expressions of interest when students are talking, maintaining eye gaze with students, using a friendly vocal tone, or other behaviors that students associate with liking and warmth" (Knapp & Hall, 2010, p. 462). Verbal immediacy can include taking interest in the lives of students, communicating availability, asking questions and encouraging students to talk, using humor in the class, addressing students by name, having conversations with individual students

before and after class, and praising students' work, actions, or comments (Kearney & Plax, 1992; Meyers, 2009). Other key components include engaging in self-disclosure and using narratives (Downs, Javidi, & Nussbaum, 1988). Instructor self-disclosure is important to students, and students rated it positively (Sorensen, 1989). Overall, students not only view immediacy cues as positive but also have expectations that instructors will demonstrate personal warmth and approachability (Witt & Schrod, 2006).

In summary, Allen et al. (2006) claim a teacher can use certain cues that reduce the psychological distance between the teacher and the students and influence certain classroom behaviors. Specifically,

A modification of instructional communication behaviors increases the level of learning. The ability of a teacher to improve the outcomes of the educational environment by changing his or her communication behaviors represents a major shift in perspective for persons studying classroom communication. (Allen et al., 2006, p. 22)

Research on Immediacy Behaviors and Caring at the College Level

Lane (2010) concludes that the more one makes use of nonverbal immediacy behaviors, “the more others will tend to like us, evaluate us highly, and prefer communicating with us” and, additionally, that they contribute to “perceptions of approachability, responsiveness, and understanding” (p. 163). This might explain why research on immediacy provides insight into how teachers care and why research does not distinguish between perceived caring and actual caring. Based on their research, Wilson and Taylor (2001) suggest that immediacy behaviors are a way of building a “caring atmosphere in which students can excel” (p. 138). As a result of teachers' immediacy behaviors, a wide range of benefits (e.g., motivation, attitudes towards content, increased learning) to college students have been documented and are listed below.

Motivation

Teacher's immediacy behaviors have increased student motivation (Christophel & Gorham, 1995; Frymier, 1993, 1994). More recent research confirms this finding. Wilson (2006) found that students' perceptions of their professors' attitudes toward students accounted for student motivation. Motivation gives students the desire to engage in learning.

Student Attitudes Towards the Instructor and the Course

One direct result of the teacher's immediacy behaviors are positive student attitudes towards the instructor and the course (Christophel, 1990; Frymier & Houser, 2000; McCroskey et al., 1995, 1996; Rodriguez, Plax, & Kearney, 1996; Witt, Schrodtt, & Turman, 2010). Witt, Wheelless, and Allen (2004) found strong and reliable associations between immediacy and both students' perceived learning and their positive attitudes toward the instructor and the course. This is also known as *affective learning*. Student affect might seem relatively unimportant to some college instructors, but, ultimately, student attitudes may change their views on content material and impact their learning.

Increased Learning

Teachers' immediacy behaviors are linked to increased student learning (Christophel, 1990; Frymier & Houser, 2000; McCroskey et al., 1995, 1996; Rodriguez, Plax, & Kearney, 1996; Witt, Schrodtt, & Turman, 2010). Interestingly enough, more recent scholars have pushed forward with the area of students' affective learning. Additionally, Witt et al. (2004) found that teachers' verbal immediacy was correlated with students' perceived learning, affective learning, and performed cognitive learning. More recently, Allen et al. (2006) conducted a meta-analysis to test a model suggesting that teacher immediacy affects both cognitive and affective learning.

The results indicate that teacher immediacy behaviors caused a positive impact on affective learning which was correlated positively with cognitive learning.

Other Student Benefits

Some research also demonstrates other benefits that indirectly promote student learning. Copper and Simonds (2006) and Jaasma and Koper (1999) found that nonverbal immediacy behaviors are linked to promoting students' talking during class discussion and engaging in outside communication. This can be useful for study groups and relying on other students for help. Teachers' immediacy behaviors are linked to perceived instructor clarity (Chesebro & McCroskey, 1998, 2001). Being clear and concise could be crucial to student learning. Nonverbal immediacy has also been moderately correlated with perceived instructor credibility (Chamberlin, 2000; Schrodt & Witt, 2006). Professors' trustworthiness appears to be important to students. Trustworthiness is viewed as being approachable and available to students.

Benson, Cohen, and Buskist (2005) argue that immediacy behaviors are linked to building rapport. For example, verbal and nonverbal behavior such as eye contact, greetings, and smiling can create rapport. Results showed that increases in instructor-student rapport are associated with greater student enjoyment of the class, improved attendance and attention, a larger attendance to office hours, and increased study time. The study also included students identifying specific teacher attributes that led to the establishment of rapport. They are "encouraging, open-mindedness, creative, interesting, accessible, happy, having a 'good' personality, promoting class discussions, approachability, concern for students, and fairness" (Benson et al., 2005, p. 239). Interestingly, many of these attributes are some of the same ones used to describe the caring attributes of K-12 teachers.

Similar to K-12 Caring Research

There are a few studies on caring at the college level that demonstrate similar findings and benefits to those mentioned earlier in the caring literature in the K-12 setting. DeGuzman et al. (2008) studied Filipino college students' views of their teachers and their views of themselves as cared-for individuals. Results of this quantitative study divided college teachers' caring behaviors into seven groups: (a) being a facilitator, (b) communicator between students and parents, (c) promoting students' interest and enthusiasm, (d) redirecting student behavior, (e) recognizing student successes and behavior, (f) being a role model, and (g) critical friend. Students responded to teachers' caring behaviors with increased interest in their studies and much more focus on school tasks and goals (deGuzman et al., 2008). A final important result is that students obtaining higher grade point averages perceived their teachers as more caring (deGuzman et al., 2008).

In summary, Meyers (2009) argues that supportive relationships between faculty and students are "a conduit for students to master difficult material . . . instructors' purposeful demonstration of care can increase students' motivation and engagement and ultimately can advance their education" (p. 208). Personal relationships also help with learning new material through support and encouragement (Daniels, Cole, & Wertsch, 2007). In general, Meyers argues that care that is expressed and detected by college students "significantly correlate[s] with students' perceptions of faculty members, their academic engagement, their enjoyment of coursework, and even their learning" (p. 208).

Summary of Research

Prior sections reviewed the research on teacher caring and teaching mathematics to underserved students. In this section, I consider what is missing in the research in each of these areas.

Review of Caring Research in K-12 Education

As a pioneer in the area of caring in education, Noddings' prominent philosophy is linked to K-12 research on caring. K-12 research on caring comprises the bulk of the caring literature, and it indicates that caring is an important part of effective education. Research has revealed a variety of positive effects of caring (Hackenberg, 2010; Muller, 2001; Valenzuela, 1999). Studies have demonstrated that the teacher's caring nature is an important quality for an effective teacher (Agne, 1999; Wentzel, 2009) and for effective student-teacher relationships (Bartell, 2011; Good & Brophy, 2000; James, 2012; Ladson-Billings, 1994). Caring is also an important quality for teachers who strive to promote academic success with at-risk students (Bartell, 2011; Ladson-Billings, 1994).

However, my review of the literature shows that the research on caring is spread out across many topics, including various personal qualities of the teacher, the student-teacher relationship, and instruction. Most of the literature on caring reviewed in this chapter involves general caring approaches and is not directed at any specific content area. The literature seems to convey that caring is independent from teaching content. The teaching of math, in particular, tends to be portrayed as independent of the relationship between the teacher and students. There are only a few studies that specifically mention mathematics. A holistic study on caring that brings together these elements would give a fresh, new perspective and provide a more in-depth view of caring in teaching of subject matter.

Moreover, there are still important gaps in the research on caring. For example, teachers' views on what it means to be caring have been overlooked. Teachers' perspectives on caring are important because they can illuminate subtle but potentially important ways in which they care for students. Vogt (2002), who studied elementary teachers, argues that studying teachers' beliefs about caring is a beneficial way to understand teachers' views on the nature of their work. It can also help shape effective teaching (Agne, 1992). A few studies incorporate teachers' notions of caring (Rolón-Dow, 2005; Valenzuela, 1999). However, based on research in K-12 education, Wentzel (2009) states that "research on teachers' notions of what it means to be caring has been less frequent" (p. 308). Research on what teachers view as caring is important and possibly useful information to improve in-service and pre-service teacher education programs.

Review of Research on Caring at the College Level

Compared to Noddings, McCroskey's (1992) work is more prominent on caring at the college level. There are two general views on research on caring at the college level. The first approach is to explore caring in the context of teacher attributes and pedagogy. The second approach to explore caring is in the context of verbal and nonverbal immediacy behaviors. Both approaches demonstrate increases in learning (DeGuzman et al., 2008; Wilson, 2006).

With the exception of a few pieces, the caring literature on pedagogy and teacher attributes is centered on K-12 education and is limited at the college level. DeGuzman et al. (2008) argue that even though caring has been documented in the K-12 environment, caring implications have yet to be seen and understood in college teaching. More importantly, caring has not been researched in teaching most subjects matter, including mathematics. This is applicable to both K-12 education and college teaching.

The second approach common to the caring literature is in the context of verbal and nonverbal immediacy behaviors. Most of this research is quantitative in nature, and a number of them use meta-analysis (Wilson, 2006; Witt, Wheelless, & Allen, 2004) and study an assortment of disciplines. The strength of this type of research is that they reveal strong correlations between caring (with use of nonverbal and verbal immediacy behaviors) and affective learning. Some studies show modest correlations between caring and cognitive learning. However, a qualitative study on caring at the college level could add a greater understanding of how caring is expressed in a specific content area. As discussed in Chapter 1, conducting research in teaching remedial content in mathematics is unique because of its challenges (e.g., math anxiety, the importance of math as a gatekeeper).

College teachers and students describe caring in different ways (Buskist et al., 2002; Feldman, 1988; Meyers, 2009), and faculty may not always express or communicate care in ways that students understand or recognize. For example, Buskist et al. (2002) and Schaeffer et al. (2003) found that instructors emphasize instructional technique whereas college students do not. College instructors focus on instructional roles such as being the expert on content area. Buskist et al. (2002) noted that 42% of students ranked rapport as a top quality of instructors whereas only 7% of faculty ranked rapport as an important quality. Students focus on the personal role of professors by noting attributes such as warmth, approachability, and accessibility which, according to students, stems from verbal and nonverbal immediacy behaviors. Research that combines both instructional and personal aspects of caring is needed because, as Lowman (1995) argues, the personal role is most effective when it is accompanied by the instructional role. However, research on college teaching rarely combines these roles, and therefore, additional study is needed.

Review of Mathematics Teaching to Underserved Students

Members of the research community in the field of mathematics education have advocated many approaches for teaching mathematics in ways that will enhance equity (Gutstein, 2006; Lubienski; 1996; Martin, 2006; Treisman, 1992). Numerous studies deal with content-based approaches for teaching mathematics to underserved students, but little attention is given to the topic of caring (i.e., what it means to care, how caring relationships are created and maintained). Muller (2001), Hackenberg (2010) and Vithal (2003) are the only few studies that have even mentioned math and caring specifically. Hackenberg (2010) looks at small-scale teaching experiments with White children that focus on mathematical questioning. From an international perspective, Vithal (2003) looks at caring by pre-service teachers as they instruct young girls in a small group setting at a foster home. Vithal (2003) acknowledges that research in caring and student-teacher relationships is important in mathematics and is understudied.

Bartell (2011) argues that mathematics teachers can embody caring relationships and perspectives by taking issues of race (Martin, 2006) and political power (Gutstein, 2006) seriously. Although it is important to understand care in these contexts, I believe that these perspectives are not at the core of Noddings' definition of caring or her views on caring student-teacher relationships.

At the core of Noddings' (1984) caring relationships is "engrossment." This means that the teacher is to be exclusively absorbed with what students are feeling and recognizes the importance of students' experiences. Her perspective focuses on empathy and sympathy, and her view on caring stems from a psychological and emotional lens. More importantly, Noddings, along with others (Isenbarger & Zembylas, 2005; Vogt, 2002), advocates caring for the student as a whole person. Mathematics education scholars concerned with equity (e.g., Gutstein, 2006;

Gutiérrez, 2012a; Martin, 2006) tend to emphasize one facet (e.g., race, political power, cultural identity) of the student and consider this one facet as the most important characteristic of the student. This one facet may not be the most important for each student. This is why a holistic approach to caring might be more helpful to students.

Mathematics education scholars (Gutsetin, 2006; Martin, 2006, 2007) also tend to consider “caring” in terms of helping underserved students learn mathematics (which is a form of aesthetic caring). Noddings (1984), Rolón-Dow (2005), and Valenzuela (1999) argue that aesthetic caring is necessary but that it lacks a personal type of authentic caring that students need from teachers. Noddings (2005) advocates that schools should be concerned with developing and caring for students as whole people and not just caring about them learning mathematics.

This Dissertation Study

In reviewing these three bodies of literature, it is clear that more research needs to be conducted. A study that unifies caring at the college level, teaching mathematics to underserved students, and caring as expressed in the context of nonverbal and verbal immediacy behaviors is necessary.

My study is a unified study that examines the role of caring in teaching mathematics to underserved college students and includes both teacher and student perspectives. This study aims to examine authentic caring in mathematics teaching, unlike previous research done on aesthetic caring. I bring the area of caring and communication into the context of a mathematics classroom, and I incorporate caring at the college level because, at this level, research that includes attention to the content taught is lacking.

This study can provide important and significant understandings of ways to help underserved students finish their mathematics requirements (which often stand in the way of students' degree progress and college completion). Hence, this study, focused on a remedial college classroom containing disproportionate numbers of low-SES and underrepresented minority students, could help diversify the workforce. In addition, this study could help college administrators make better decisions about hiring teachers who are effective with underserved students. Furthermore, any at-risk programs in K-12 would benefit from knowing the kind of teachers who work well with this population. The results of this study can also help provide information on how to train future teachers in teacher education programs.

Conclusion

The previous chapter introduced the dissertation study of a caring instructor teaching a remedial mathematics course at the college level. The current chapter reviewed the relevant literature related to caring, teaching mathematics to underserved students, and the area of communication, with an eye toward what is missing in current literature and how this dissertation will fill current gaps. In the next chapter, I turn to the concrete details of how the dissertation study was conducted.

CHAPTER 3

METHODOLOGY

Chapter 1 introduced the topic of this dissertation study. The last chapter reviewed the research on caring. The current chapter explains the methods used to conduct this study. The research questions are to determine:

1. *In what ways can a mathematics teacher be caring? How can such caring be developed?*
2. *How can a teacher's caring affect her interactions with students and promote general academic skills?*
3. *How can a teacher's caring affect her mathematics instructional methods?*
4. *How do students feel they benefit from a teacher's caring?*

The methodological focus of this study (outlined in this chapter) is an in-depth analysis of a mathematics teacher, her teaching of mathematics to at-risk college students, and her interactions with these students in a Midwestern university campus in the context of a remedial mathematics course. By using a case study approach to examine both expression and perception of caring in greater depth, I illuminate how her “caring nature” plays a role in teaching mathematics to at-risk college students in a remedial program.

This chapter describes the methodology used to conduct this research study. The explanation for the methodology starts with an overall research design. Next, I discuss the selection and recruitment process of participants. After this, the research context is discussed with specific details on the setting and the program. Moving on, I describe and justify the methods of data collection (interviews, classroom observations). I also explain why examining multiple perspectives (i.e., the teacher's perspective, students' perspective) is essential to understand caring. Afterwards, the process of analyzing the data is explained for the three data sources. I provide specific details on how I analyzed the teacher interview data, classroom data,

and student interview data. Finally, data reporting methods for this dissertation study are presented. The chapter concludes with a description of how the teacher, student, and classroom data are reported in the subsequent results chapters.

Overall Research Design

This research consists of a qualitative case study that examines one college mathematics instructor's teaching that communicates both caring and subject matter in the classroom. The pilot data was collected in two courses. The first was an introductory course of Algebra in fall 2008 (curriculum for the course is discussed later), and the second course was in spring 2009 and entitled "A Mathematical Applications." The second course covers topics such as Euler circuits, linear programming, random samples, regression, probability, inference, voting systems, game theory, symmetry and tilings, geometric growth, comparison of algorithms, codes, and data management. The bulk of the data used in this dissertation was collected in fall 2009 in an introductory course of Algebra and with a few follow-up interviews in spring 2010. I used various forms of data collection: student and teacher interviews, observations, documents, and a personal/research journal of the researcher. All of these are standard repertoire data sources for qualitative research and are rich in data. Obtaining rich data can mean "writing extensive fieldnotes of observations, collecting respondents' written personal accounts, and/or compiling detailed narratives (such as from transcribed tapes of interviews)" (Charmaz, 2006, p. 14). As stated by Denzin and Lincoln (2008), "Qualitative research involves the studied use and collection use of a variety of empirical materials such as case study; personal experience; introspection; life story; interview; artifacts; cultural texts and productions; observational, historical, interactional, and visual texts" (p. 4). In this study, the different forms of data augment each other and add credibility to the findings. I selected the case study approach for designing

the study because it has been shown to be the best method for qualitatively examining the instructional practices and the caring nature of a teacher. This includes the way the instructor teaches math and the way she connects and responds to students. More specific reasons for selecting this method follow.

Teacher Selection/Recruitment Process

This dissertation describes a case study that tells the story of a caring teacher. A teacher for this study must have one important quality: students need to perceive the teacher as caring. Students have their own constructed meaning of caring that could help them learn mathematics in this classroom. Ultimately, I want to learn if a student's perceived caring from the teacher can help motivate him or her to learn mathematics.

The students of the teacher in this study, Karen, think that she is caring. Karen and I crossed paths in 2006 when I worked as a tutor for the Summer Bridge Program for at-risk college freshman students. My exposure to Karen during the first 2 years was limited since I did not work directly under her as a tutor. We only spoke on occasion (e.g., encounters out in the hallways). However, my interest in her teaching and her relationships with students came in the summer of 2008 when I was an instructor for the program. She was a mentor, collaborator, and co-instructor for the summer so we spent many hours working together grading, constructing examinations, creating curriculum materials, and other teaching-related activities. I noticed from my observations that she had a caring nature because of how she spoke to students and how she taught. I recruited her for the dissertation study when I came to wonder how her caring was expressed in the classroom. My opinions about her as a caring teacher were strengthened by her students' opinions about her during the summer component of the program and the fall 2008

semester. In addition, her high scores on student evaluations and teaching awards strengthened my opinions about her caring nature.

The pilot study has shown that caring at the college level is an important quality. Caring seems to play a more critical role with at-risk college students because they tend to have poor skills in mathematics, and the results of the pilot study point to an emotional dimension crucial to their success or failure. This study can help the education community (administrators, researchers, teachers, and others) understand and help at-risk college students in mathematics.

Research Context

The study was conducted in two mathematics courses that are part of a special program for recruiting and retaining at-risk college students. One course “A Mathematical Applications” and was taught in spring 2009 and spring 2010, and the other course is listed as “Pre-Algebra” and was taught in fall 2008 and fall 2009. In this section, I describe the research setting.

University Setting

The study was conducted in a large Midwestern university. It is located in a rural environment in the midst of many farming communities. The university offers a wide range of disciplines in undergraduate and postgraduate programs. The university is highly ranked in many academic fields including engineering and computer science.

Retention and Recruitment Program: The Summer Bridge and Transition Program

Students applied to the university. Those students who qualified for the program had their applications funneled to this program’s office for review by the program director and staff. Admittance to the program was based on high school records, placement exam scores for those participating in the summer portion, and personal interviews. The students and the courses that

were utilized in this research study were part of the Summer Bridge and Transition Program of the College of Liberal Arts and Sciences at the Midwestern University. The program began in 1986, and it provided academic and personal support to at-risk college students for their freshman and sophomore years. After the first 2 years, students entered a major and had a home department where they received mentorship. Each year, roughly 100 students were allowed into the program, and 50 were asked to attend the summer component. I worked as a math tutor for several summers in the program and as a math instructor for one summer. The summer component is a 5-week residential session at the university and known to many as an “academic boot camp.” During the summer, these students took special courses and activities that oriented them to college life. Students took remedial Mathematics and English courses. More recently, Chemistry had been added to courses the students could take over the summer. Students also learned the location of important buildings (e.g., libraries, administration offices, college dorms) on campus.

In the all-year (Transition) program, all students have one-on-one weekly mentoring with graduate advisors. During the school year, the program offers special remedial classes in English and Mathematics to help bridge the gap students have in these subjects to prepare them for their regular courses at the university level. Generally speaking, the whole program has special teachers who only teach remedial English and Mathematics courses in the summer and fall; these teachers report to the director of the program rather than the academic department. The teacher in this study falls into this category. In addition, with the assistance of other academic units, (e.g., Psychology, Classics, Educational Psychology), the program offers special sections of these courses. These special sections have smaller enrollment and sometimes meet for more hours per week than the regular university section in order to help students individually.

Mathematics Courses During the Summer

The summer mathematics courses focused on helping students learn mathematics skills that should have been attained, but were not, while in high school. There were two courses, and each course had two sections. The first course, or the most basic course (which I tutored and taught), covered order of operations, signed numbers, algebraic expressions, ratios, basic word problems, polynomials, factoring, quadratic equations, and graphing. The second (more advanced) course during the summer covered fractions, exponents, solving linear equations, solving and graphing inequalities, factoring, and algebraic expressions. This second course reflected more of the curriculum in the Pre-Algebra course.

The Classroom and Students

Karen, the college instructor, kindly allowed me to be a participant observer in any and all of her mathematics courses at any time. She has had an open door policy to all her classes and to her life. Although she allowed me to be an observer in all of her classes, I did not observe all of her classes for practical and logistical reasons. I observed the Pre-Algebra course in fall 2008 and a Mathematical Applications course in spring 2009 for pilot work. This pilot work is not directly part of the dissertation data for several reasons. First, although I was present every Tuesday and Thursday for Mathematical Applications, I conducted very few observations in the Pre-Algebra course (fall 2008) because I did not receive Institutional Review Board (IRB) approval until November. Second, in the Mathematical Applications course, I experienced technical difficulties with the recording equipment so several class recordings are missing. Third, I was still trying to determine the research design during the pilot. Therefore, data collection was not consistent.

The vast majority of student and classroom data collection took place from August 25, 2009 to December 14, 2009 (for two sections of the Pre-Algebra course) and supplemental student interviews were collected in various courses from January 20, 2010 to May 5, 2010. I was present every Tuesday and Thursday for fall 2009 with a few exceptions. The supplemental interviews collected in spring 2010 were from students in A Mathematical Applications course or the Algebra course. Without any reservation, the teacher and I can claim that the students in these courses had limited mathematical knowledge. The following are real mistakes that students made while enrolled in the Pre-Algebra course (see Figure 1).

$x \times x = 2x$	$\frac{2}{3} + \frac{3}{5} = \frac{5}{8}$
$\frac{a+c}{a} = c$	

Figure 1. Students' misunderstandings.

In addition, students struggled with solving multi-step problems in mathematics. This is documented in the classroom data in Chapter 6. For example, some students did not know how to factor trinomials, factor by grouping, or find the greatest common factor.

In fall 2009, there were two courses (Pre-Algebra and Algebra) offered. Classroom data was collected in Pre-Algebra because there were two sections offered of the course. This gave me the opportunity to decide on the best possible section for collecting data. In addition, the Pre-Algebra course had a larger pool of possible participants to interview.

For the rest of the dissertation, I use AM (the morning section) and PM (the afternoon section) to refer to these two sections of the Pre-Algebra course. For collecting classroom data, I observed both AM and PM sections of the Pre-Algebra course for the entire semester but ultimately decided to focus primarily on the AM section for this dissertation, and I collected

audio recordings of the AM section only. The AM section had 30 students, and the second section (PM) had 20 students. I consulted with my initial advisor,¹ a committee member, and the instructor of the course. All said that either section would work for collecting data for this dissertation. The AM section had more students and more classroom interaction. Since there were more students who were willing to talk in the morning section, I believed that section would have a greater number of students who would want to interview and participate in classroom activities.

Hence, although I had collected classroom data for two sections, ultimately, I only report on the AM section. Based on my observations of Karen's various classes, the chosen section was typical in terms of the type of students she had and the type of instruction she implemented.

The AM section took place in a traditional classroom in the Mathematics building on the university campus. The PM section took place in a different building with a similar set-up. The classrooms were set up in a conventional way. There was a chalkboard in the front of the classroom with the teacher's desk, no computers (or any other form of modern technology) for the teacher or the students, an overhead projector, and student desks in rows facing the front of the room. The instructor taught at the front of the classroom using the chalkboard. I, as the participant observer, sat with the students closer to the front of the classroom. This allowed me to take notes from the board, see the instructor, and hear conversations students may have had while at their desks. On exam or quiz day, I would sit next to the instructor in front of the classroom next to her desk facing students.

¹ My initial advisor retired before the completion of the dissertation. Throughout this chapter, when I refer to my advisor, I mean my initial advisor.

Karen maintained full responsibility of the teaching duties and tasks with only a few exceptions. A few times she went to the bathroom, stepped out in the hallway, or went to make photocopies. During such times, I was left overseeing the class while they took a quiz or test. There were days where she was absent due to illness, and I would do a session on homework review. However, while she was present in the classroom, I never taught a lesson or tutored students on the side.

Role as Researcher

I was primarily a researcher when I was in the classroom. Administrators of the program asked that I not teach. Instead, I served as a grader or substitute when needed. This was initially a disappointment because I thought this would narrow my possibilities of getting to know students, hinder my access to them, and limit my relationship with them. However, after fall 2009, I realized that the lack of teaching or tutoring opportunities I had with students did not limit my access to them. With a few exceptions, most students whom I asked to interview agreed to do accommodate me.

After being in the classroom as a participant-observer, I found this role to be liberating. I did not worry about students' misunderstanding of material because of my instructing. I did not want to be perceived as an expert or as a person students could go to for mathematical content-related questions. My focus was solely on the teacher and the student learning. The goal for me was to be as unobtrusive as possible. The focus was on acquiring as much data as possible about the class rather than participating in it. I realize that helping students would have allowed me to get data, but I might have missed important data involving the teacher's working with other students, and it would have skewed my perspective on classroom dynamics. In evaluating the

overall situation, for the purposes of this dissertation study, I discovered that the costs of not tutoring and teaching students were worth the benefits.

A role that I did have from time to time was that of an assistant. As an assistant, I recorded grades, helped students get caught up when they came in late or missed class (I gave them lecture notes), helped pass out papers, and arranged seats for students taking exams out in the hallway. On the days in which Karen was absent, I occasionally gave a homework review. This is something that I did not expect when I started the study. Fortunately, I was well received by the students.

A few unusual situations occurred during the data collection process. First, a student who was interviewed in fall 2009 was taking a math class in spring 2010, making her eligible for a follow-up interview. However, this student was enrolled in a course that I was teaching. A potential conflict of interest had surfaced, so there was no follow-up interview with this student. This student was not interviewed in a follow-up interview. Second, students who were part of the pilot period (fall 2008 and spring 2009) were students that I had taught the previous summer. This created an unusual situation because I did not want them to feel obligated to agree to an interview because I was their former instructor. However, this provided an opportunity for me to gain entrée and access to them because of our relationship during the summer. The pilot data was not part of the analysis.

My position was both multifaceted and complex because of my roles as the researcher, an assistant to the teacher, a former teacher and tutor of the summer program, and being a member of an underrepresented group like many of the students in the course. These different roles caused my position to be intertwined, interconnected, and disjointed all at the same time. This was also an unexpected result that emerged during the course of the study

Data Collection

Interviews, observations, and documents are particularly useful for this research study because they create a close-up and in-depth picture of the students' and the teacher's experience regarding learning and teaching mathematics. Bromley (1986) states that case studies:

get as close to the subject of interest as they possibly can, partly by means of direct observations in natural settings, partly by their access to subjective factors (thoughts, feelings, and desires) whereas experiments and surveys often use convenient derivative data, e.g. test results, official records. (p. 23)

This methodology created result chapters that demonstrate a rich and detailed view of one particular teacher, her teaching, and her students. The audio recordings of the classroom observations provide a record of her teaching, how the communication took place during the mathematics instruction, and what the communication was about. Additionally, interviews present students' thoughts and feelings and can augment the analysis from classroom observations (from audio recordings).

The purpose of collecting from different data sources is to create "breadth and depth," "understanding [of] the case in its totality," and an "intensive, holistic description and analysis characteristic of a case study" (Merriam, 1998, p. 134). Another reason for collecting these different forms of data for this study is for the purposes of triangulation (which I describe in greater detail later in the chapter). Data sources include:

- Audio recordings of class instruction
- Classroom observations (fieldnotes of the classroom instruction that cannot be captured on audio recordings)
- Semi-structured interviews with the students
- Semi-structured interviews with the teacher

- Documents (student notebooks and teacher handouts)
- Researcher/personal journal

Tables 1 and 2 provide a summary of all the data sources. Specifically, the tables explain the type of data collected, the purpose of the data, and when the data was collected. The following subsections describe each data source in more detail.

Table 1

Summary of Data Collection

Research activity	Data collected	Purpose of collecting this type of data	Time frame for data collection
Classroom observations	Audio recordings of instruction and fieldnotes	To examine instruction and events that took place in the classroom	Daily: during the entire course of the study
First student interview	Audiotaped, individual, short interviews (15-45 min.)	To examine students' reactions to the teacher's teaching and the course	Throughout the fall 2009 semester
Second student interview	Audiotaped, individual interviews (20-45 min.)	To examine students' reactions to the teacher's teaching and the course	Throughout the spring 2010 semester
Documents	Handouts given to students such as quizzes, tests, and student notebooks	<ul style="list-style-type: none"> • Handouts: to learn about the types of problems that students encounter • Student notebooks: to understand how students record mathematical material from the board 	Daily: During the entire course of the study
Researcher journal	Short logs of dissertation activity	To serve as an extension of fieldnotes, to record issues with which I struggled as a researcher, to record daily dissertation work (e.g., committee meetings)	Daily: during the entire course of the study

Table 2

Summary of Teacher Data Collection

Research activity	Data collected	Purpose of collecting this type of data	Time frame for data collection
Dialogues with teacher	Short, informal interviews	To examine teacher's reactions to and impressions of student learning, student engagement, and student interaction with the material that occurred during that day	Occasionally: after class sessions
1 st teacher interview	Audiotaped, in-depth interview (1 hour 42 min.) audiotape	Background history/timeline of the teacher's life	Summer 2009
2 nd teacher interview	Audiotaped, in-depth interview (58 min.)	To examine teacher's attitudes and beliefs regarding teaching mathematics	Summer 2009
3 rd teacher interview	Audiotaped, in-depth interview (1 hour 14 min.)	To follow up on previous topics	May 2010
4 th teacher interview	Audiotaped, in-depth interview (52 min.)	To follow up on previous topics	May 2010
5 th teacher interview	Audiotaped, in-depth interview (37 min.)	To examine her evolution as a teacher	June 2010
6 th teacher interview	Audiotaped, in-depth interview (54 min.)	Member Checking to verify portrait	June 2010
7 th teacher interview	Audiotaped, in-depth interview (1 hour 16 min.)	To follow up on previous topics	July 2010

Classroom Observations

Observations are an important part of qualitative case study research and generate a “description that attempted to rescue the meanings and experiences that have occurred in the field situation” (Denzin, 1989, p. 31). In this study, the field situation is a mathematics classroom

in a large university setting. Fieldnotes and audio recordings are used to depict classroom events such as what happened during the instruction of the lesson in the classroom. One reason for conducting observations is to detect patterns in the students' or the teacher's behavior of which they may not be consciously aware or be able to articulate (Corbin & Strauss, 2008). For example, the teacher was unaware of her hand gestures. In addition, Lofland et al. (2006) describes "observational notes" as reports observed in the "field." Table 3 shows the number of observations and the total hours of observation during the course of the entire study.

Table 3

Time and Number of Classroom Observations

Course	Hours
Pre-Algebra (<i>Pilot</i>) fall 2008	14 observations and fieldnotes 14 class sessions \times 2 hours for each session = 28 hours
Mathematical Applications (<i>Pilot</i>) spring 2009	31 observations and fieldnotes 31 class sessions \times 2 hours for each session = 62 hours
Pre-Algebra fall 2009	AM Section 29 observations and fieldnotes 29 class sessions \times 2 hours for each session = 58 hours PM Section 29 observations and 23 fieldnotes 29 class sessions \times 2 hours for each session = 58 hours
Mathematical Applications spring 2010	26 observations and no fieldnotes 26 class sessions \times 2 hours for each session = 52 hours
	Total number of observations: 129 Total observation hours: 258 hours (including pilot work)

Table 3 shows the study-collected data from two courses: Mathematical Applications and Introduction to Algebra. Table 3 also shows research hours in pilot work and follow-up observations collected after the semester in which the main dissertation data were collected.

Lincoln and Guba (1985) state that observation in an extensive period in the field helps ensure credibility of the findings. Creswell (1998) and Creswell and Miller (2000) suggest eight different procedures to ensure credibility in the findings, and one of these procedures is “prolonged engagement and persistent observation in the field.”

In addition, even though I did not have formal categories or codes established, I believed I established saturation. During pilot work, I established two general categories (Caring Mathematically and Verbal Affirmation/Caring, Appendix A) when gathering more classroom data, and, over time, found fewer new insights. “Reaching saturation” does not mean “I keep finding the same patterns.” Instead, Glaser (2001) explains that:

Saturation is not seeing the same pattern over and over again. It is the conceptualization of comparisons of these incidents which yield different properties of the pattern, until no new properties of the pattern emerge. This yields the conceptual density that when integrated into hypotheses make up the body of the generated grounded theory with theoretical completeness. (p. 191)

One way to capture the classroom observations is to use audio recordings. The purpose of the audio recordings is to provide evidence that is used to examine student engagement; student reactions to, impressions of, and thoughts about the teacher’s instruction; and students’ mathematical understanding based on the communication and interpersonal interactions that the teacher had with the students. The audio recorder was placed in the front of the room to capture the teacher’s instruction and students’ responses to the instruction. The beginning of the study included a lot of practicing and a lot of mistakes with the tape recorder and microphone. Even though there were recordings of classroom instruction throughout the pilot work, those recordings were too few and not consistent throughout the semester. This dissertation includes 30 days of fieldnotes, but only 29 audio recordings of the AM classroom instruction (Pre-Algebra). Although the course was scheduled for two hours, the recording time ranged in length from 24

minutes to 2 hours and 1 minute (*Mean = 1.30 minutes, Standard Deviation = 0.35*). The recorder was turned off early for quiz and test time, which accounts for some of the shorter recording times. Although, on occasion, I wished I had the audio recording of the afternoon class, I did not see a significant *need or a strong reason* to audio record the lesson a second time every day for an entire semester.

Transcription Process (Classroom Data)

I started listening to and transcribing the classroom data on May 28, 2010. During this process, I took some general notes in my journal that I thought would be helpful later during the analysis. As I listened to and transcribed the audio recordings, I pictured myself in the classroom and thought about how events happened and pictured the instructor teaching in front of the room. I started with the first class session and moved on to the next session and so on. Although I listened to each class session, the entire class session was not fully transcribed. I transcribed only those instances or incidents that were worth categorizing (more on how I determined this is below). I refer to these instances as episodes or classroom examples in the remainder of the dissertation. Coding incidents is also standard practice in Grounded Theory approaches and should be done when considering observational data with fieldnotes (Charmaz, 2006; Charmaz & Mitchell, 2001). I listened to each classroom recording twice and identified episodes that seemed potentially relevant to the aims of the study and then transcribed those episodes. During the first round of transcribing, I labeled classroom episodes with sketchy, loose codes. According to Grounded Theory approaches, initial, provisional codes are common practice, with practice progressing towards having codes that fit the data (Charmaz, 2006).

The second round of listening and transcribing started on July 26, 2010. The second round of hearing the classroom data was very helpful because it corrected mistakes. I found

errors on who said what and the order of comments and events. I also found more relevant episodes to transcribe. During the second round, I aligned the fieldnotes that were aligned with transcribed episodes. This was done to create a more complete account of the classroom episode. This process created one electronic record of a classroom episode. This is how I made the decision regarding what to include from the fieldnotes. For example, I gave a full transcription of the first day of class using both the fieldnotes and the audio recording to describe the first day of class. As noted, I heard the audio recording first and then examined it to see if any further data in the fieldnotes would help improve my understanding of the transcribed episode. I looked for events that were only documented in the fieldnotes that needed analysis. I found only a few of these. They were difficult to analyze because they were stand-alone items. The records shown in this dissertation contain both the transcription and fieldnotes when applicable. Most of the final classroom episodes consist of the audio recording and the math problems (which all came from the fieldnotes). According to my journal, I continued to look for events in which the teacher was caring for students in any way during the second round. I also continued to label classroom episodes with sketchy, loose codes during the second round of transcribing.

Many factors helped me determine what was relevant to transcribe. First, I transcribed episodes that demonstrated Karen's potential to show caring. Examples included significant moments in her teaching, her communication, and her actions towards students. These examples also included students' responses to the teacher and her teaching. I included episodes I considered relevant that demonstrated the instructor's interaction with students personally or mathematically, and episodes that showed how Karen helped students mathematically.

Second, I transcribed episodes that struck me emotionally or that surprised me. For example, I was surprised that college students were asking if $\frac{9}{6}$ needed to be simplified. My

astonishment at this made me think it was worthy to be transcribed. Also, this episode regarding simplification was also mentioned in my journal. This indicated to me that this incident was important.

Third, my experience with the data helped me determine what was relevant. When I started the transcription process for the classroom data, I had a large number of hours of observing. I had also conducted several short and long interviews with the teacher. I already had conducted the first and second sets of student interviews. This experience of being engaged with the data provided a scheme to help see repeated patterns across other sources of data. Serendipitously, I unintentionally reviewed the teacher, student, and classroom data together. By accident, I was seeing the same ideas across the classroom data and in what the instructor said in the second interview. In short, I brought with me the knowledge I had learned from both the teacher interviews and my experience being in the classroom to help determine what needed to be transcribed. For example, when I was listening to and transcribing observation #1, I noticed that the teacher was acting like a coach. She was talking about her ideas about homework and telling students to be quiet. All of this was already discussed in a previous interview with the teacher. Furthermore, there were notes in my journal and the fieldnotes that told me “this event happening is important.”

Finally, while writing the results chapter on the classroom data, I showed classroom episodes were shown to a committee member for feedback. Classroom episodes included important mathematics topics, teaching, and interpersonal dialogues with students. Overall, I transcribed what appeared to work for students in the classroom, and I also reported on common day-to-day events that happened in the classroom without commenting on effectiveness. General events included “run-of-the-mill” or basic day-to-day operations: reviewing homework,

preparing for a test, and starting new lessons. I picked these general events because they build a picture of the instructor's classroom teaching.

My coding system does not cover everything. Despite the large number and wide range of episodes transcribed, some situations and conversations with the instructor that were not transcribed. For example, as noted in my journal, I realized that on observation #22, I did not record all of her positive feedback for the students. Also noted in my journal, on July 26, 2010, I did not transcribe every instance in which a student came up to the board to do a math problem, nor did I capture every instance in which the instructor asked students to do a step from a multi-step problem. Not all student behavior (e.g., students arriving late, cheating, all of students' misunderstandings of mathematics) was represented in the classroom episodes. I also noted in my journal that I am aware of the fact that I did not record every teacher/student interaction (either mathematically or interpersonally) nor did I record each time the instructor checked students' answers. It was too hard to capture *every* single instance. All class periods for an entire semester were recorded and can be transcribed, if necessary.

Classroom observations do not record all the ways in which Karen cares for students. She met students at coffee shops on Monday morning at 8 am outside her regular office hours. She continued to go even when students did not show up. Previously, she would spend countless hours on the phone tutoring students. She made a lot of photocopies of lecture notes for students who joined the class late. In the past, one student missed a lot of class during the semester. Karen spent the entire summer teaching the mathematics material to this student. In this way, the student could make up the semester and get a passing grade. She spent a lot of time creating and grading tests. At times, she made two versions, and for each version, she counted the number of steps to complete a problem. She would even count the number of sign (+ or -) issues in both

exams. She did this to make the exams fair, and this is because she cared about making sure each student had the same and equal opportunity of doing well on the exam. In fall 2011, she developed her own homework exercises from scratch without using any textbooks or handbooks. She did this on her own initiative to help future instructors of the course and to help students save money on textbooks.

Fieldnotes

The second way to depict classroom observations is through the use of fieldnotes. Fieldnotes document information on students' interactions, the mathematical content on the board, and my impressions of and reactions to events in class. In general, the fieldnotes are used to record events that cannot be heard on audio recordings and when additional information is needed to understand what is discussed on the audio recordings. The fieldnotes are also a record of the class as an event, that is, what took place and the interpretation of the events that took place. According to Erickson (1986), the most distinctive element of qualitative research is the emphasis on interpretation. Therefore, including my interpretation (as part of the fieldnotes) is an integral part of the analysis. In addition, in Grounded Theory, researchers concur that an interpretation of what is being studied is brought to life through fieldnotes (Charmaz, 1995, 2000, 2006; Guba & Lincoln, 1994; Schwandt, 1994).

Stake (1995), who is considered an expert in case study research, claims, "Rather, we emphasize placing an interpreter in the field to observe the workings of the case, one who records objectively what is happening but simultaneously examines its meaning and redirects observation to refine or substantiate those meanings" (p. 8). Fieldnotes in this study are important because they provide a starting place for analysis and interpretation. The purpose of fieldnotes and the motivation for this particular structure is to determine what happened during

the instruction and to help the analysis (and my subjective understanding). Fieldnotes of the classroom observations can help shape the story about the caring nature of the teacher, the students' reactions to and impressions of both the teacher and the methods she used to teach mathematics. Fieldnotes also shaped the researcher's understanding of how this caring nature helped students complete their math requirement.

Process for Fieldnotes

I did not learn about the meanings that students and the teacher had all at once. Instead, I learned about these meanings through a continual process in which I built new insights and understandings upon prior insights and understandings. I accumulated 30 observations and 30 fieldnotes in the morning (AM) class and 29 observations and 23 fieldnotes in the afternoon (PM) class.² Generally, the fieldnotes for this study averaged five pages in length (including mathematical content). I did not have any problems taking notes with students in the classroom. They did not seem to notice me taking notes or care about my presence.

Before collecting classroom data in fall 2009, I read Emerson et al.'s (1995) "Writing Ethnographic Fieldnotes" as a way to guide my understanding of how to write quality fieldnotes. The following guidelines helped structure my fieldnotes. First, fieldnotes were written in a systematic way. My goal was to get as much down on paper in as much detail and as quickly as possible, including my own interpretations. Many fieldnotes were written in the third person to report what I saw the teacher and students doing and saying. Everyday occurrences, unexpected events that stood in contrast to what I was accustomed, and events that generated strong emotional reactions within me, students, or the teacher were recorded in the fieldnotes. I

² I did not take fieldnotes in the afternoon class during exam days and review days because most of the content was the same as the morning class.

documented my own activities and emotional responses because they shaped the process of observing and recording.

As part of the fieldnotes, I documented student, teacher, and researcher activity that was not captured on tape. This included math content on the board and students who came late to class. I spilt the pages in my fieldnotes into three columns. I recorded the written mathematics material on the board in column one. I recorded my observations of the teacher and the students in column two. I recorded my impressions in the third column. According to Patton (2002), “Recording and tracking analytical insights that occur during the data collection are part of fieldwork and the beginning of qualitative analysis” (p. 436).

With a few exceptions, the audio recording was on at all times. In addition, I documented phrases or comments verbatim made by the teacher or students that I thought would help prod my memory later. These were reflected in column two. I typed the hand-written fieldnotes into an electronic file the same night that class took place or early the next morning. This process was done to help with the analysis. I did this when I had a block of concentrated time. Typing the fieldnotes produced a more complete record because it included recalling both details that came to me later and events that occurred when the tape recorder was off. For example, if the teacher and I had a conversation out in the hallway, I wrote this up as part of the fieldnotes. In the electronic file, I made a distinction from data collected that was recorded in the classroom and everything else (i.e., details recalled at a later time). There was a section labeled “not part of original fieldnotes.” In addition, as I was typing the fieldnotes, I pictured myself in the classroom and thought about how the events happened. I also pictured the instructor at the board doing the math. This helped create more complete fieldnotes.

One limitation with writing fieldnotes was that I occasionally graded papers in class for the instructor. This made it difficult to record what was happening in the classroom and the mathematics instruction on the board. Second, composing fieldnotes was difficult because there was too much going on mentally with me. I felt bombarded with impressions and stimuli (Personal Journal, 10/8/08). I seldom recorded the time in the fieldnotes because elapsed time was not important to the aims of this study. However, if concerns of time did become relevant, elapsed time could be determined from the digital recording.

During the course of data collection, I always felt a tension regarding what was considered significant and should be written. At times I forwent the observations for the mathematical content on the board and vice versa (Personal Journal, 10/14/08). However, the fieldnotes collected during the pilot work did help guide me through the process of writing up fieldnotes in the subsequent semesters. For example, fieldnotes during the pilot work indicate that Karen's communication (verbal and non-verbal) plays a role in being effective in teaching mathematics because it is indicative of her caring for students beyond mathematics studies. She greets students every time she enters the classroom in the morning, and she greets students if they walk into class late (yes, she will stop lecture and say "hi"). She also greets students as they hand in tests, quizzes, or homework to her. She maintains a great amount of eye contact while she is teaching mathematics. (She does not talk if she is not facing students; while working on the board, she tends not to talk.) She acknowledges students when they speak by nodding or addressing them with their names, she smiles a lot, and she ensures that her writing on the board and on paper is very clear and easy for students to read and understand. These initial observations suggest that these techniques are an outward demonstration of Karen's caring and

that the use of her techniques also provide an environment that is conducive to learning mathematics.

Interviews

The second source of data for a case study is interviews (Yin, 2003). Stake (1995) claims that “two principal uses of case study are to obtain the descriptions and interpretations of others” (p. 64). Descriptions and interpretations of others can be obtained from interviews. The interviews helped clarify and add meanings to events that occurred in the classroom. In this study, there is a description (or analysis) of the reactions and impressions that the students had to the teacher’s instruction. The interviews aided in creating the description (or analysis). The student and teacher interviews augment other data sources and inform the researcher and the analysis regarding the overall aims of the study. This, in turn, informs future analysis. Regardless of the type of interview, my role as the interviewer was “to listen, to observe with sensitivity, and to encourage the person to respond” (Charmaz, 2006, pp. 25-26). The interviews in this dissertation had a conversational style.

Semi-Structured Interviews with Students

I designed a series of interview questions based on the goals of this research study and piloted them in fall 2008 and spring 2009. The interview questions were not organized in any temporal order. With a few exceptions, the first set of interviews (for the dissertation study) were conducted in fall 2009, and the second set of interviews (for the dissertation study) were collected in spring 2010. Initially, the goal was to interview each student twice in the same semester, but this was not possible. The goal of the first interview was to investigate the reactions and attitudes that students had towards the instructor and her teaching. The questions paid particular attention to their beliefs towards mathematics, Karen, previous mathematics

courses (including high school), and previous teachers. The second set of interviews probed similar themes and allowed me to check consistency with the first set of interviews. For example, I asked those students who thought of the instructor as caring during the first semester if they felt the same way the second semester. Another purpose was to deepen my understanding of the students and their perspectives of the instructor and her teaching. The following describes a general approach that I took during both sets of student interviews.

Pilot Student Interviews

Interviews conducted during the pilot study (fall 2008) shaped future interviews. In order to get my “feet wet” and to get grounded in the study, I interviewed a student (Pilotss#1) twice as part of the pilot work along with other students in the course. The following is an excerpt from the first interview:

Interviewer: I want to get back to you liking Ms. Karen as a teacher. What do you like about her?

Pilotss#1: It seems like she really cares. She comes in and is so nice . . . I just really like nice, friendly, teachers because if you just come in. . . . She starts her day, or she starts talking about her grandchildren [and] stuff. Also, she gives a lot of examples. . . . That’s good because if I get stuck in my homework I know I can look back at my notes and say, “Ok, she did this one and looks like the one in the book.” I just copy. She also takes her time explaining. She uses a lot of hand motions, like emphasis that’s good, too. She will underline the word, and I will do it, too, in my notebook . . . underline the word, I will do it in my notebook.

I: You said she cares. Why do you have that feeling? What makes you think that?

Pilotss#1: I feel she cares because I go to her office hours every Wednesday . . . Maybe that’s why I think she cares. We did establish that relationship because I do go to office hours. Well, another way she shows she cares is because I remember one time when Pilotss#2 was like, “Ms. Karen, I didn’t finish one point whatever homework,” and she was just—”Ok, many people didn’t get a chance, it was kind of difficult, we will make it due another time.” . . . She made it due some other time. I do know other people do have difficult questions like him. That’s really nice of her because that’s extra time she’s

going to be grading their papers that she could be moving on to another lesson.

I: Do you think she cares besides mathematics beyond what you learn in mathematics?

Pilotss#1: Yeah, I think she cares. If we have a problem outside of mathematics, like, it was any other thing, she is a teacher from Bridge so I think she does have that ability to help us with whatever because, like, I don't think that Transition Program would have chosen any of the professors they did in Bridge if they didn't feel like they could help us out in academics, social, anything.

My initial reaction to this interview and other fieldwork during the pilot work was that one of Karen's strengths as a teacher is her ability to communicate both mathematically and relationally to students. From Pilotss#1's comments in this transcript, Karen's relational communication inspired this student to learn mathematics (or at least helped prepare her to learn mathematics) every day in the classroom. The notes and the emphasis of gestures with words seemed to be helpful for the student, and the relationships that Karen built with students played a role in helping them learn mathematics.³ All this information helped me realize that the questions were appropriate for future student interviews.

Approach to Student Interviews: The Participant as Ally

The student interviews were conducted in the spirit of the "participant as an 'ally'" (Witz, 2006) approach. This approach is part of the essentialist framework, which is further discussed in the Data Analysis section. The interviews were conducted in such a way that the researcher worked with the participants (in this case, the students) as allies. Students become allies when they know that the researcher is sympathetic and empathetic to the students' world. One way to be sympathetic and empathetic is to be "respectful, nonjudgmental, and nonthreatening" (Merriam, 1998, p. 85) and "to care very much that [the] person is willing to share with me what they are

³ This was only an initial analysis and needs more data to strengthen the claim.

saying” (Patton, 1990, p. 317). In the same manner, I, as the researcher, needed to believe that the students were sympathetic to this research study. This may mean that the researcher needs to speak the students’ language, talk in their tone, speak the way they speak, and, if possible, talk about things they talk about.

Using words that make sense to the interviewee, words that reflect the respondent’s world view, will improve the quality of data obtained during the interview. Without sensitivity to the impact of particular words on the person being interviewed, the answer may make no sense at all—or there may be no answer. (Patton, 1990, p. 312)

The researcher needs to become “one of them.” This means that I need to “fit in” with the students, which can include aligning my interests and values with theirs. The following are some sample questions from both interviews. It provides a general sense of questions and the full list of questions are in the appendix. General sample questions for student interviews included:

- Do you feel you are any good at math? Do you enjoy math?
- What do you think about mathematics? What is mathematics for you?
- How is it going for you this semester in this mathematics course? What have you found helpful?
- Did you understand how these topics differ from those you have seen in other math courses?
- Did you know you would be learning this kind of stuff when you registered for the course?
- Would you be able to tell me anything that struck you about the course? Did anything “click” for you? Did you get anything out of this course that made math a little different than before?
- What did you think about Karen’s teaching style?
- Was there anything she did to help you learn math better?

Interview Process with Students

On the first day of class, Karen talked about the study and introduced me to the entire class. She did this in the morning and afternoon sections. Afterwards, I spoke to students in both sections for a few minutes about the study. All students were given consent forms along with an explanation of the research, and all students were welcomed to participate in the study. Those who agreed to be interviewed were interviewed; each interview was audio recorded. I had a hard time collecting consent forms from a few students. At the end, everyone was compliant with turning in the consent form. The goal was to interview as many students as possible. Therefore, I also directly spoke to those students who were unsure about interviewing. The purpose behind asking everyone to interview was to learn different perspectives. This included a wide range of students and, students who were athletes, students who dropped the course, students who were freshman versus sophomores. Getting more students and more variation among them could help validate the results.

Although one student did ask for an email interview, I kindly requested that the interview be face-to-face. For consistency purposes, all interviews were conducted face-to face because I believe that no other method (e.g., email, phone) would yield a more conversational approach for learning about these students and the teacher. Also, I did not have IRB approval for any other method for conducting interviews. Interview locations with students included rooms in the residence halls and lounges, the basements in university buildings, gyms, students' apartments, and the student center. Most started at 4:00 p.m. and continued to be scheduled until 10:00 p.m. Interviews were scheduled both weekdays and weekends.

At the beginning of each interview, I asked students for permission to record the interview, and I also talked about myself for a few minutes. During our informal interactions, students were very curious about my life. They would ask me lots of questions about movies,

girlfriends, boyfriends, school, and classes. I also knew that there might be some hesitation about the interview (since many were freshman and new to college) so I took the first few minutes and talked about myself. For example, I told students that I lived in a dorm and that I was a student like them. Most students connected to this and responded with similar information, giving me the opportunity to follow up with questions. This was my way of building rapport with students, and Charmaz (2006) believes that this is important for obtaining subsequent interviews. This “building rapport” also encouraged the student to be an “ally” to the dissertation. The interviews ranged in length from 15 to 49 minutes (*Mean = 28.45 minutes, Standard Deviation = 7.8 minutes*).

I did not take any notes during the interviews with students. I documented impressions and thoughts in the personal journal after the interview. This gave me the opportunity to give my full attention to the student, maintain eye contact, and concentrate on what was being said (Charmaz, 2006).

A total of 36 students (29 females and seven males) participated in the first round of interviews. Of those 36 students, one female and one male were recruited from courses in spring 2010, and the remaining 34 interviews came from the Pre-Algebra course in fall 2009. These two new participants had relevant perspectives to include with those students from the Pre-Algebra course. These two students added unique perspectives to the study. The female was a senior student taking math in her last year as a student. The second student was a male who was not asked to be a part of the summer program. However, when this student enrolled in the class, he needed a lot of remediation. Table 4 shows the number enrolled in the course compared to the number of students interviewed in the first round.

Table 4

Students Enrolled in the Pre-Algebra Course Fall 2009

Students	Pre-Algebra AM enrolled (at the end of the semester)	Number of students interviewed 1 st round (from AM section)	Pre-Algebra PM enrolled (at the end of the semester)	Number of students interviewed 1 st round (from PM section)
Females	17 students: • 13 AA • 1 Indian • 2 Latina • 1 African	15 students: • 12 AA • 1 Indian • 1 Latina • 1 African •	17 students: • 11 AA • 1 African • 5 Latina	13 students: • 9 AA • 1 African • 3 Latina
Males	8 students: • 7 AA • 1 White	2 students: • 2 AA	5 students: • 4 AA • 1 Latino	4 students: • 3 AA • 1 Latino
Students	Pre-Algebra AM enrolled (at the end of the semester)	Number of students interviewed 1st round (from AM section)	Pre-Algebra PM enrolled (at the end of the semester)	Number of students interviewed 1st round (from PM section)
Total	25 students: • 20AA • 2 Latina • 1 White • 1 Indian • 1 African	17 students (68%): • 14 AA • 1 Indian • 1 Latina • 1 African	22 students: • 15 AA • 1 African • 6 Latino	17 students (77%): • 13 AA • 4 Latino • 1 African

The second round of interviews proceeded in a similar way to the first set of interviews. For example, the location, approach, and questions were similar to those in the first interview. Follow-up interviews were only conducted with those who were interviewed in fall 2009. A total number of 16 students (13 females and three males) participated in the second round of interviews. Additionally, one female student participated in a third and fourth interview. This

female student was a special case because I had access to her after the main data collection took place. At the time of the third and fourth interview, I wanted a more in-depth understanding of the participant. For example, I wanted to know if there were any long-term benefits of having this caring instructor or taking the remedial mathematics course. During and after the analysis, these interviews revealed no new concepts or material. Therefore, I grouped all second, third, and fourth round interviews as follow-up interviews. This makes for a total of 18 follow-up interviews. The third and fourth interviews are included in the following calculations. These follow up interviews ranged from 18 to 45 minutes (*Mean = 29.46 minutes, Standard Deviation = 8.2 minutes*).

Table 5

Interviewees in the Second Interview Categorized by Gender and Ethnicity

Student	African-American	African	Indian	Latino/a	Total
Female	9	1	1	2	13
Male	3	0	0	0	3

Table 6

Breakdown of Student Interviews

Course and section	Qualifiers	Number of interviews		
		All participants	Male participants	Female participants
Mathematics Applications — Spring 2009	1 st Interview Round	8	2	6
	2 nd Interview Round	2	1	1
Pre-Algebra —Fall 2009: AM section	1 st Interview Round	17	2	15
	2 nd Interview Round	N/A	N/A	N/A
Pre-Algebra—Fall 2009: PM section	1 st Interview Round	17	4	13
	2 nd Interview Round	N/A	N/A	N/A
Mathematics Applications and Algebra - Spring 2010	(1 st round) New students to the study	2	1	1
	Follow-up interviews with students from previous fall 2009 semester (second round)	18 ⁴	3	16
Total interviews conducted		65	12	53
Total number of interviews used		54		
Total number of interviewees		36	7	29

Transcription Process

⁴ This number represents a female student who participated in a third and fourth interview.

A total of 36 student interviews from the first round were part of the dissertation study. A transcriptionist transcribed 27 interviews, and I transcribed nine interviews from the first round of interviews.

For the second round of interviews, I used 18 in this dissertation. These interviews were not fully transcribed but only partially transcribed due to the large volume of interviews already collected and repetition in what was already said during the first set of interviews. Only segments that directly related to the instructor, her teaching, and mathematics were transcribed.

Semi-Structured Interviews With Instructor

I conducted seven long and in-depth interviews with the instructor. One main purpose of this type of interview is to get “beneath the surface of ordinary conversation and examine [. . .] earlier events, views, and feelings afresh” (Charmaz, 2006, p. 26). The interviews ranged in length from 37 minutes to 1 hour and 42 minutes (*Mean = 64.7 min, Standard Deviation = 19.6 min*). The following questions provide a general sense of the types of questions asked, and the full list of questions is in the appendix. Sample questions included:

- How long have you been teaching (particularly these courses)?
- How did you get into teaching mathematics?
- You have been teaching for a couple of years. Where are you in terms of your teaching philosophy?
- What do you think are the needs of at-risk students? How do you try to address those needs?

Approach to Teacher Interviews: The Participant as Ally & Co-contemplator

The approach to the teacher interviews is similar in concept to the student interviews; they “will appear to be guided conversations rather than structured queries . . . although you will be pursuing a consistent line of inquiry, your actual stream of questions in a case study interview is likely to be fluid rather than rigid” (Yin, 2003, p. 89; see also Rubin & Rubin, 1995). These

guided conversations can encourage the teacher to become an ally. As students become allies to the research, the teacher can also become an ally when she knows that the researcher is sympathetic and empathetic. This type of approach was used for both the short and in-depth interviews (although the approach was used differently). This type of open dialogue can happen when the participants realize that I am genuinely interested in them as people and interested in their worlds. This type of rich and open dialogue occurs differently in the two kinds of teacher interviews.

For this type of research, using semi-structured in-depth interviews for the teacher is beneficial for several reasons. First, in-depth interviews examine the deeper motivations, worldviews, values, and past experiences that shape the teacher's understanding of mathematics and can shape her perspective on student comprehension of the material. Johnson (2002) states that in-depth interviews should be used when "personal matters, such as an individual's self, lived experience, values and decisions, occupational ideology, cultural knowledge, or perspective are involved in the research" (p. 103). Charmaz (2006) explains that in-depth interviews are used to get at the interpretation of a participant's experience. Additionally, the types of aims in this study (qualitative analysis of students' reactions, impressions, and responses to the teacher) need to be connected to the approach of the interview. These elements (the teacher's development as a caring teacher and her ways of interacting with at-risk college students) can be connected to larger aspects of the individual (that is, her self-understanding, her understanding of how she sees the world). In other words, short, semi-structured interviews do not allow deeper insights of the teacher to emerge. Second, the interview provides space where having the teacher as an ally and a deeper level of co-contemplation can flourish.

During Summer 2009, the first and second interviews were conducted at Karen's home. The interviews gave me insight and a deep understanding of what the instructor was like before she started teaching at-risk college students and how she is today. The goal of the first in-depth interview was to get acquainted with the instructor and her life up to this point. The initial interview also helped cultivate Karen as an ally because I wanted her to understand that I was sympathetic and empathic to what she had to say about her experiences. The second interview focused on how the instructor sees her students and how students see her. It also focused on her attitudes and beliefs about mathematics instruction. This included her attitudes and beliefs about teaching remedial mathematics to at-risk college students.

The remaining five long and in-depth interviews took place during Summer 2010 in Karen's home. The third interview was a follow-up on previously discussed topics such as church, family life, and her childhood. The fourth interview was also a follow-up on previously discussed topics, including her mother's death, teaching at Parkland, and her faith. Follow-up interviews helped correct details and provided a deeper awareness of the teacher's feelings and inner thoughts. The fifth interview focused on her evolution as a teacher. The sixth interview was a member-checking meeting in which Karen, as the participant, reviewed my interpretation and analysis as presented in a portrait. Although one audio recording of our member-checking meeting was done, subsequent member-checking meetings were not audio recorded. There was no apparent need or strong reason for doing so. My advisor and I discussed any corrections needed, and I made changes electronically later during the course of the write-up of the portrait. The seventh interview focused on her experiences as a teaching associate, her faith, and her college education.

After each interview, my advisor helped me prepare the protocol for subsequent interviews. For example, on June 29, 2009 and July 6, 2009, we prepared for the second interview. On 7/6/09, at a meeting with my advisor, I had a script and protocol questions prepared for the second interview. We went over my ideas that were part of the script; my advisor gave me new suggestions for both content and the type of questions. This preparation format was typical for subsequent interviews with the teacher.

Interviews with the teacher were conducted in a semi-formal manner. We usually went to lunch or dinner first. Afterwards, we returned to her home where we sat either in the front room or her kitchen to conduct the interview. I prepped her a little before each interview so she would know the topics for discussion. For example, in the first interview, I told her that the results chapter on her would be a biography, life story/history, and a memoir of her life. She was not familiar with portraiture, so on May 26, 2010, we sat at a local coffee shop, and she read a portrait from another dissertation. Although this segment of our meeting was not a formal interview and not recorded, she responded with a lot of “wows” while reading the text. Everything I told her and everything she read was well received.

During our first interview, Karen was curious about the format of the questions so I told her that these interviews were going to be done in a conversational manner and be about her life. Besides agreeing to the study, she also confirmed being an ally to the research project because she said that I should feel free to ask her anything off the record that would help me. Throughout all of the interviews, her demeanor remained the same. She was really positive, smiling, and talkative prior, during, and after each interview. During the first interview, she verbally depicted a timeline of her life up to the present. This, of course, was a direct response to the words I used such as “biography,” her “history,” etc. During all of our interviews, once the recorder was on,

she went full speed ahead, and I asked clarification questions between the segments of her speaking (Journal, May 26, 2010). By the third interview, I noticed that she was becoming more reflective. For example, at the end of the third interview, she made a comment about the influence her dad had on her. These reflective comments were not present earlier in the interviews (Journal, May 17, 2010). Her reflection helped with the analysis and the development of the portrait.

Impressionistic Short Interviews with Teacher

I also conducted shorter, semi-structured interviews after each class session during the semesters in which I collected classroom data. They explored the teacher's impressions of how things went and allowed the teacher to comment on specific events that occurred in the classroom. They served as a comparison, allowing me to compare what I had observed with her account of the events in class. The purpose of these short interviews was to understand her impressions of how the class understood the material for that particular day. The teacher's general and overall impressions of students' understanding of the concepts, including reactions to specific events that happened in the classroom, were of particular interest. Each of these short interviews took approximately 5 minutes or less. Although conducted during the course of the study, I do not use any of these as part of the analysis. However, some are used in the fieldnotes and classroom episodes to provide a more complete account of what happened in class. The following are sample general questions for impressionistic short interviews. Sample questions included:

- How do you feel it went?
- What areas were troublesome for the students?
- Did you sense a reaction of surprise (from the students)?

- When a student asked X, did you understand what he or she was getting at?

Documents

Since document collection is appropriate for case study research and should be part of data collection (Yin, 2003), I collected key documents for this study. The documents I collected were of two types. The first type of document consisted of handouts given to the students and the pre-written lecture notes (that were only given to me) for the Mathematics Applications course. I did not receive any pre-written notes for the other courses. These documents included the syllabus and other handouts from the teacher. The second type of document was student notebooks. Notebooks were collected from a few students who handed in consent forms. One reason for collecting students' math notebooks was to ensure accuracy of my fieldnotes that contained mathematical material presented in class. I compared what I copied from the board to what the students copied from the board into their notebooks. I found very few discrepancies.

This type of data collection has several important purposes. One important reason is to help develop a picture of the mathematical content covered in class. For example, the handouts that students received were helpful because they served as an organizational outline of the topics covered during the course of the semester. The student notebooks could help demonstrate what, if any, mathematical content stood out to them. Additionally, the notebooks indicated the content, what helped them learn, and what struck them about what the instructor taught and how she taught the mathematical content. During the interviews, many students spoke about note taking (from the board) as helpful.

These handouts and notebooks augmented the other forms of data, specifically my fieldnotes. First, documents are considered to be stable, unobtrusive, and objective (Merriam, 1998). Second, documentary data can be good sources because "they can ground an investigation in the context of the problem being investigated" (Merriam, 1998, p. 126). In my study, I

examined how the instructor aided students in their learning of mathematics. Students' notebooks could indicate whether notebooks were used to help with their learning. Third, documents fit Dexter's (1970) criteria for collecting data; documents can have "better data or more data or data at less cost than other tactics" (p. 11). In this study, collecting notebooks was important and particularly useful because they could convey, to a certain extent, the impact of the teacher's methods on the students. The notebooks also grounded future interviews and helped me examine how the teacher's style impacted students' learning. The notebooks reflect the mathematics topics taught in the class, personal thoughts and ideas on what helped students learn mathematics, and inner feelings towards mathematics or the teacher, which are subjective in nature (Merriam, 1988). For example, Pioltss#1 said she underlines material in her notebook that the instructor underlined on the board. In addition, like the handouts, student notebooks are objective, and collecting them is unobtrusive.

Researcher/Personal Journal

Throughout the entire dissertation study, I kept a personal journal that started in fall 2008. It reveals the journey of the past few years of my life as a researcher. It records both the mechanics of conducting research and also the natural, messy, spontaneous parts of conducting research. The mechanics involved the standard components of research such as documenting personal meetings with the committee members (including my advisor), other university personnel (e.g., the director of the remedial program, the member of the Institutional Review Board for the Protection of Human Subjects). Also, it has recorded informal interactions with people (i.e., the teacher and students) involved in the study. This journal also contains notes on meetings and phone calls with the instructor. For example, on September 14, 2008, we had a meeting to discuss data collection and an orientation for the Pre-Algebra course. Journal

documentation includes impressions that struck me during or after the interviews with the teacher and students. I also noted details that I felt were important parts of the observations that were not part of the original fieldnotes. For example, I noted any insights or thoughts that came to me three or four weeks after an event. The journal also served as evidence to support when and how I worked on the dissertation. For example, it documents my thoughts and ideas on the process of transcribing the classroom data. This includes how I made decisions on what to transcribe. The spontaneous and unplanned parts included expressing any problems that occurred with the dissertation (e.g., issues with the tape-recorder, paperwork issues with the Institutional Review Board) and how I solved them. I also wanted to express any personal thoughts and feelings on the first day of data collection and the last day I recorded classroom data. The journal also contains notes I took while reading related work.

Office Hours

Throughout the course of the study, I attended Karen's office hours. There was no set schedule for visits, and most were unannounced.⁵ Ultimately, my goal was to occasionally drop in to see if I would learn something different about Karen. Instead, I saw consistency between her interactions with students in office hours and in class. The one-on-one interactions that took place between the teacher and the students during office hours mirrored the interactions the teacher had with students during normal class sessions. Specifically, the instructor was warm and friendly and answered as many math-related questions as she was asked. Many times, she would stay past her regularly scheduled office hours. In addition, students had similar patterns of the type of help they needed. Some students came to get help on specific questions on their

⁵ The following are the dates that I went to office hours: December 14, 2009, February 8, 2010, February 15, 2010, February 24, 2010, March 1, 2010, March 3, 2010, and March 10, 2010.

homework. Other students would sit there and do their homework. For them, this time would be like a study hall in which they did homework.

Explanations and students' misunderstandings discussed during office hours were used in a whole-group lecture during class time. In addition, my journal noted that on September 10, 2009 (classroom observation #10) in the classroom, I became aware that she was using the same statements or discussions with students during her office hours as in class during lecture. A second example was on October 1, 2009 (classroom observation #12). The instructor was using a technique in class that she used during office hours (Personal Journal, 6/19/2010). I know this because the instructor said, "This is the technique we used during office hours." Although I did not attend office hours regularly, my journal noted that, during class time, she mentioned the same question that came up during office hours and answered it a second time during lecture. Techniques she used during office hours would ground her for teaching course content to the entire class. She discovered these techniques from her one-on-one interactions that she had with students during office hours. Regardless of the type of one-on-one interaction, her interactions had a quality that helped students (as mentioned in all of the results chapters). Although I recorded events that took place during office hours, my observations of the office hours are not part of the formal analysis of this dissertation. The data gathered during office hours was not comprehensive or systematic.

Informal Interactions

I concur with Glaser (2002) that "all is data." However, I did not have approval from the IRB to use informal interactions/conversations for purposes of research. I had countless informal interactions with students. For students, the first casual interaction was meeting two students in November 2008 at a local grocery store. Other casual interactions included seeing students at the

performing arts center, mingling at coffee shops, eating at fast food places, and hanging out in the dorms. I believe that these informal interactions eased tensions during our interviews.

Additionally, by the end of the semester and subsequent semesters, students felt so comfortable that they were asking me for an interview for their coursework.

Informal interactions with the teacher included going to family outings, family birthday parties, helping her move out of her house and into a new home, having a garage sale, and attending and speaking on behalf of the instructor at a formal retirement party in the Mathematics Department. All of these informal interactions helped foster a helpful working relationship because she knew I was vested in her. I believed that this helped her become a “participant as ally” to the research. In addition, these interactions also let me know how she cared for students outside the classroom. For example, we had a family birthday for her at a local restaurant. During this outing, we had a chance encounter with a student and the student’s family. I was able to see how she spoke to the student (outside of the classroom) and to the student’s family. If I did not have these informal opportunities, I would not have a feel for who she (the instructor) is as a person outside of the classroom.

Examining Multiple Perspectives is Essential to Understand Caring

To understand caring in a classroom setting, one should examine it from the teacher’s and the students’ perspectives. This type of understanding gives one a holistic view of caring. The first perspective is the students’ views on learning mathematics from this specific teacher and on her method of teaching. The second perspective is the teacher’s views on her caring for student learning and her own instructional methods.

The first perspective examines the students’ views on the teacher. This includes students’ thoughts, impressions, and ideas on her teaching style and her caring. An important goal is to

understand the students' perspectives on the teaching methods and the teacher's communication. This also includes the degree and extent to which the students were engaged in mathematical discussions and activities, and the type of engagement students had with each other, students' impressions about their interactions with the teacher, whether or not the students felt that the instructor had an impact on their beliefs about mathematics, and students' responses to how the teacher was able to encourage them to do well in their quantitative requirement or mathematics course requirement. Specifically, one can learn about these perspectives from the classroom observations and the student interviews.

The second perspective is the teacher's view on her own teaching, her caring, and student learning. The collected data (interviews and observations) aid the analysis. Understanding the teacher's background on how she got started teaching mathematics is important. Understanding her philosophy about mathematics, teaching mathematics, and teaching mathematics to at-risk college students is important and contributes to the goals of the dissertation. Knowing how the teacher addresses the at-risk college students' needs, knowing her perception of the extent to which at-risk college students understood certain mathematical concepts, knowing the teacher's impressions of student engagement and their reactions to her teaching, and knowing the teacher's impression of what helped or hindered at-risk college students' learning of the mathematical content are all part of the goals of this research study. A teacher's caring is manifested in the classroom through her communication, instructional style, her treatment of students, and the relationships and connections she makes with these students. Recognizing and understanding how this care is expressed in the classroom is a goal of this research study. In addition, the teacher's caring is possibly developed as a result of deeper motivations (or inner aspects of the

teacher) that are grounded in her philosophy of mathematics education. The teacher's perspective is primarily discovered from the teacher interviews and from classroom observation.

The data in these two perspectives needs holistic examination. One way to examine the data collected is to understand the teacher's deeper inspirations and intuitions and how they are connected to her values, philosophies, feelings, impressions, and personal ideals. Similar techniques can be applied to students. The data can be examined for students' feelings, their deeper inspirations, and their impressions of their world.

Data Analysis

In this section, I discuss the methods I used to analyze the various forms of data I collected. The first section explains the essentialist approach used for the teacher interviews. The second section begins with some general principles and remarks on the methods used to analyze the classroom data. Next, I explain the specific intricacies encountered when coding the classroom data through examination of the participant interviews. Finally, I describe in more detail the analysis of the student interviews and student documents.

Essentialist Approach (Overall Framework for Teacher Interviews)

This dissertation utilizes the essentialist approach (Witz, 2006; Witz et. al., 2001) for investigating fundamental, essential, and inner aspects of individuals:

The essentialist methodology is distinguished [from other forms of analysis] by the fact that the investigator attempts to develop a personal subjective understanding of the phenomenon of interest in different individuals by way of sustained attempts to share, empathetically and sympathetically, the individual's feelings, state of mind and past experience, both during the interview and in many re-hearings of the tapes afterwards. . . . The investigator attempts to get at the essence of the phenomenon in the individual, as that phenomenon is subjectively felt by the individual, by feeling that same essence intuitively himself or herself, as part of the (investigator's) self, and then communicating it to the reader. Thus, the methodology involves, first, deep intuitive understandings which one then "feels" as distinctive qualitative new aspects, or as a kind of nature, entity

or “essence” in oneself. The methodology involves, secondly, considerable conceptual and imaginative shaping and development of these aspects or entities, as well as literary techniques to communicate them to the reader so that they may become objects of discussion. (Witz et al., 2001, pp. 197-198)

My understanding, as a researcher, and having my own personal interpretation of the teacher’s fundamental and essential inner aspects (the participant’s self-understanding) helps infer Karen’s thoughts regarding teaching mathematics to at-risk college students. We can use the essentialist approach and this subjective understanding in two specific areas to understand the teacher’s inner aspects. The first area is the interviews themselves (as discussed in the protocol section). The second area is data analysis. Both the participant’s understanding of herself and the investigator’s understanding of the participant is complex and deep and “cannot be classified or reduced by pre-existing fashionable categories, and should be understood, as a whole, as it exists in a particular person” (Lee, 2006, p. 35).

Subjective Understanding of the Participant (Teacher Interviews)

One of the most crucial elements of the essentialist approach is that the researcher establishes a subjective understanding of the participant. Witz (2007) uses the terms “awakening to and articulating” to explain this subjective understanding. Specifically, the researcher becomes conscious of the participant’s experiences and feelings. These subjective understandings are unique to this specific participant and cannot be arranged into “pre-existing categories.”

My subjective understanding of the participants is impacted, shaped, and informed by “direct and spontaneous utterances and nuances or unusual verbal and facial expressions, besides their objective remarks, in an atmosphere in which the participants are able to talk freely about her or his feelings and experiences” (Lee, 2006, p. 37). My subjective understanding incorporates the participant’s overall states of mind. By establishing a subjective understanding of the teacher’s state of mind, I can see how her inner aspects influence her motivation for

teaching at-risk college students as well as her style of teaching. Knowing the states of mind of the students helped me understand their view of the teacher's motivation for teaching mathematics to at-risk college students as well as their perspectives of the topics covered in the course. More importantly, this type of understanding cannot take place without the researcher's sympathy and empathy towards the participants. A key idea is that the researcher tries to re-experience the phenomena just as the participant experienced it. Being with the participants in informal experiences can help with this. Participants are more likely to offer stories and feelings when the researcher is compassionate and sensitive. Through the use of this approach, I was able to answer the research questions in this study.

Analysis of Teacher Interviews

Many practices helped with analyzing the teacher interviews. As the data were being analyzed, it was important that I immersed myself in the data to develop my subjective understanding of it. I listened to the interviews and read the transcripts of the interviews during the analysis to aid in the process. Corbin and Strauss (2008) also concurred that with time and immersion, the researcher gains insight and sensitivity. While I listened to the tapes, I placed "emphasis on the stories people tell and how these stories are communicated—on the language used to tell the stories" (Merriam, 1998, p. 157). This included the manner in which things were said, fluctuations in voice, and other aspects that reflected the person as a whole. When analyzing stories told by the participants, this is one way that I tried to be sympathetic and empathetic to the teacher. Inner aspects, such as the core and wholeness of the person, played a role in the phenomenon under study. My goal as a researcher is to understand each person as a whole and to promote a deeper subjective understanding via the different types of data collected over an extended period of time.

To fulfill my goal of acquiring a deeper, more sympathetic understanding of the teacher, I engaged in several specific practices during the data analysis. First, after every long interview, I recorded notes in my journal in the hope that they would aid the analysis. Second, my advisor relentlessly guided and helped me with analyzing the teacher interviews. We examined significant excerpts as a way to analyze the data from the interviews and do the write-up. Some excerpts we examined spoke about the inner being of the teacher or were about significant, life-changing events that could possibly have shaped her life or her teaching. For example, on June 29, 2009, our analysis indicated that math served as a stabilizer in her life and gave her confidence while everything else in her life was chaotic. Math plays a huge role in her life as does being a math teacher. Our mutual analysis helped find the important elements that “glue” together the results chapter on the instructor. These meetings are also recorded in my journal. Table 7 is a sample of content we found relevant from the first and second interviews.

Table 7

Analyzing Teacher Interviews

Date	Idea
10/10/09	Karen enjoyed math at a very young age. The first time she knew she wanted to teach was when she taught others in her class.
10/10/09	At a very young age, she had relationships with teachers. She had a strong relationship with her father. He encouraged and believed in her.
10/10/09	She has a very long history of teaching. Her student teaching experience was very powerful (very good teacher; the very beginning of the “natural” experience; natural from day one).
10/10/09	Religion plays a major role in her life. Family problems made life difficult for her (e.g., liquor, parents’ divorce).
10/10/09	Graduate school was a way for her to “enter” teaching remedial college mathematics.

10/10/09	Karen started teaching for Bridge program when it started in 1986. At a later point, she got involved in the full-year program.
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(continued)

Table 7 (continued)

Date	Idea
10/10/09	Being a mother is very important to her. The adoption process occurred close to the time that she started teaching in the program. In a way, she is the mother of a program and an adopted child. Her son's being black helped her students not see her as potentially racist.
10/10/09	Karen feels that part of her job is providing emotional support for students. Nurturing students is part of her job. Karen "nurtures" students in many ways. Her students have traditionally had low self-esteem in regards to mathematics. The students are immature scholastically. She cares for everyone (even the disrespectful ones).
10/10/09	Verbal affirmation: she is a public servant to students (e.g., she spends long hours on the phone helping them with mathematics).
10/10/09	When in the classroom, teaching comes naturally for her. Problem solving is very important to her. Immature in scholastics—homework talk; she asks students, "Do you know why I assign homework?" She sees the needs of her students.
10/10/09	Karen realizes that the African-American culture is noisier. I found this comment interesting because she sees this in this classroom as well.

Third, I constructed a biographical time line of the teacher, and this served as an anchor to analyze significant events in her life. This shaped the analysis, and this technique also served as a way to write-up the portrait. For example, I noted that 1981 was an important year for the instructor because her mother died and also because she started as a full-time associate in the Mathematics Department.

General Principles of Data Analysis and Grounded Theory

Case research involves both interpretation and coded data even when there are large amounts of data. The following principal guided the analysis.

The critical characteristic of grounded theory type research is that the investigator is faced with a large amount of relatively uncategorized data (tape footage of ongoing behavior, interviews, fieldnotes), and she wants to discover aspects in these data that indicate structuring or organization or some kind of “stable” aspect that is “inherent” in the object studied (individual, interaction, classroom, school, etc.). The concept that emerges should be something that is an identifiable intrinsic aspect in the individual or interaction or social group. (Witz, 2007, p. 249)

In this study, data for this project was examined for instances (a particular kind of phenomenon) that may be related to major goals of the research. These instances were then also connected to larger concepts (fundamental, essential, inner aspects of individuals). As Denzin (1998) stated, “Clearly simplistic classifications do not work.” Neither the classification system used nor the process of coding the data was simple. Although this focus on deeper aspects required a more organic and subjective approach to the data analysis, principles from grounded theory were useful for coding and analyzing the data.

The following explains both the process of grounded theory and the general guidelines used in this dissertation study. Glaser and Strauss (1967), who founded the original methodology for grounded theory, stated that an integral part of grounded theory is to build theory from the collected data. Analysis should start while the researcher is still engaged in gathering data and should, in some way, shape the ongoing process of gathering data (Creswell, 1998). While gathering the data, researchers begin to recognize patterns that may become themes or categories for later analysis. Charmaz (2006) explains the process of coding these patterns:

Grounded theory coding consists of at least two main phases: 1) an initial phase involving naming each word, line, or segment, of data followed by 2) a focused, selective phase that uses the most significant or frequent initial codes to sort, synthesize, integrate, and organize large amounts of data. . . . Later, you use focused coding to pinpoint and develop the most salient categories in large batches of data. (p. 46)

Coding was used in this study because there was a large amount of data (classroom observations, audio records, and interviews) collected that needed to be organized, managed, and analyzed in a convenient manner (Corbin & Strauss, 2008). The process of coding was used

because it made searching the data easier. Coding started at the same time as the transcription process of the student and classroom data, and was an ongoing process even when the results chapters were written (Stake, 2008). I also made comparisons among the codes and identified any patterns in the data and the codes. For the purposes of this study, I used a term or a short phrase, a “code,” as a way to demarcate an idea or an interpretation of classroom events as suggested by Corbin and Strauss, 2008.

As I listened to and transcribed the classroom data, I took a “bottom up” (inductive or intuitive) approach. This means that I let the data (from the interviews and classroom) form the categories instead of examining previous research on caring. I examined the caring literature only after the study was conducted.

Another part of the analysis is called axial coding, which refers to a “set of procedures whereby data are put back together in new ways after open coding, by making connections between categories. This is done by utilizing a coding paradigm involving conditions, context, action/interactional strategies, and consequences” (Strauss & Corbin, 1990, p. 96). Axial coding may include examining and dividing the categories into primary categories or subcategories (Charmaz, 2006). Axial coding was completed after coding each set of interviews and observational data. I reassembled the teacher, student, and observer codes in new ways (Table 8). Table 8 shows “Caring about students’ mathematical learning” and “Caring about and communicating with students as individuals” as the primary categories with the rest of the codes acting as subcategories. Each row shows codes that come from different data sources with similar, but slightly different, meanings. A Final Code is a code where at least two codes from different data sources have similar meanings. A Final Code indicates an important finding because it shows consensus among the teacher, observer, and student.

Table 8

Interview and Observation Codes

Final codes	Teacher codes	Observer codes	Student codes
	Theme: Caring about students' mathematical learning		
Final code	Diagnosing	Assessing prior knowledge	
Final code	Teaching incrementally: little successes	Scaffolding	Scaffolding
Final code	Checking for understanding	Checking for understanding	Student work
Final code	Coaching	Coaching	<i>Nurturing</i>
Final code	Scholastic immaturity	Discipline	
Final code	One-on-one interaction	Teacher availability and approachability	Teacher availability and approachability
Final code		Administration	Administration
	Mathematical immaturity		
			Repetition to aid understanding
			Persistent to student learning
			Different solutions
			Board writing/note copying
		Real-life context	
		Student involvement	
		Clear directions, Direct instruction	
		Clarifying learning Objectives	

(continued)

Table 8 (continued)

Final codes	Teacher codes	Observer codes	Student codes
	Theme: Caring about and communicating with students as individuals		
Final code	Nurturing	Building rapport, teacher approachability	<i>Nurturing</i>
Final code	Humor/silly	Building rapport, teacher approachability	Personal story, personality, teacher availability and approachability
Final code	Verbal affirmation, believing and confidence, little successes	Verbal affirmation, teacher availability and approachability	<i>Nurturing</i> , teacher availability and approachability

By examining data to create useful categories and theories, performing analyses that shaped ongoing data collection, and examining data in larger categories, I was able to build a theory regarding the impact of caring on student learning. This coding process was necessary because this study did not begin with any pre-existing codes from previous research studies. Instead, categories or themes were created from the data. I used general knowledge of terms (e.g., scaffolding) in the field of education to describe repeated patterns in the classroom data and student interviews. Instead of using pre-existing categories and applying them, my method shows a finer grain of detail of what happened in the classroom.

The goal for this study was to create categories from patterns that emerged after careful study of all the data. In order to successfully establish useful categories and theories, however, I needed to use as much data as possible from the various sources. “Interviews and field observations, as well as documents of all kinds (including diaries, letters, autobiographies, biographies, historical accounts, and newspaper and other media materials)” can be used for research approaches in grounded theory (Strauss & Corbin, 1994, p. 274). All of these data can

help strengthen any possible theories developed. Additionally, I examined all data systematically and across the data sources to validate or raise questions about the categories and findings.

As shown, grounded theory is useful for approaching research projects that do not rely on a pre-existing framework. Generally speaking, in qualitative research, there is no consensus on the use of frameworks (Corbin & Strauss, 2008). However, for this research study, a pre-existing framework was not used for a variety of reasons.

First, this study examined deeper aspects of caring for at-risk college students and teaching them mathematics. Studies of teachers' motivations to care and perceptions of caring have been relatively rare (Wentzel, 2009). Pre-existing frameworks cannot and do not account for the teacher's deeper inspiration for teaching a particular group of students. Therefore, examining deeper aspects and motivations for the teacher's caring for at-risk college students without a pre-conceived framework can provide a fresh perspective as to why teachers are inclined to teach this particular group of students.

Second, selecting a theory or framework that explains all the aspects of caring would be difficult since pre-existing frameworks only account for specific, independent facets of teaching. As described in Chapter 2, the current research on caring tends to focus on only one factor, such as teacher characteristics, student-teacher relationships, or teaching mathematics, but not on a combination of these factors. Based on my review of the literature, I am not aware of any pre-existing frameworks that include a combination of these aspects: caring, caring at the college level, and teaching remedial mathematics at the college level.

Third, since there is little quantitative and qualitative research on caring in a mathematics classroom (as stated in Chapter 2), there are not many theories to use to support this dissertation study. Yet, the lack of a pre-existing framework should not be seen as a deterrent from

completing the study. By employing grounded theory, this study can help develop theories on the impact that a caring nature can have on helping at-risk college students in mathematics.

General Remarks on Analyzing Classroom Data

Since I did not apply any pre-existing frameworks to my data analysis, I would like to make some remarks on my process for data collection and analysis. Consistency was one important aspect of the data collection. To help achieve consistency I made several unannounced visits to the classroom in addition to the regular observations I conducted. I wanted these extra visits to be random so I could observe the instructor as she is. I wanted to check for consistency in her instructional approaches and her interactions with students. My recorded visits were on September 20, 2009 (Algebra), February 1, 2010 (MA Algebra), February 17, 2010 (Algebra), April 20, 2010 (Algebra), May 2, 2011 (Mathematical Applications), and May 3, 2011 (Pre-Calculus). In addition to visiting on unannounced dates, I sporadically observed the two sections of the Pre-Algebra course (the morning and afternoon) in fall 2010. No fieldnotes, interviews, or recordings were taken. I went to these classes because I wanted to see consistencies in her teaching and her interactions with students. I found consistency across the days, courses, and semesters I observed.

Another important goal for my research was to mirror the guidelines suggested in grounded theory through which coding develops as part of the data collection process. Corbin and Strauss (2008) state that “analysis is a process of generating, developing, and verifying concepts—a process that builds over time and with the acquisition of data” (p. 57). Charmaz and Henwood (2008) concur that early data analysis should inform subsequent data collection. This allows the researcher to define and follow leads in the data and to refine tentative categories. The initial analysis after collecting pilot dissertation data in fall 2008 (Pre-Algebra) and spring 2009

(Mathematical Applications) helped shape further analysis. In December 2009, I presented the initial analysis (based on observational data) to my dissertation committee, suggesting that the teacher's communication is what anchors students in their learning of mathematics. At the committee meeting, I presented an incomplete list of teaching practices. This list helped guide the initial process for determining codes, and these came from the pilot data.

After this list was composed in December 2009, I employed theoretical sampling. The main purpose of this type of sampling is to help explain the data and to continue with analysis the researcher has initiated (Charmaz, 2006). More specifically, "theoretical sampling involves starting with data, constructing tentative ideas about the data, and then examining these ideas through further empirical inquiry" (Charmaz, 2006, p. 102). This is the basic process that I followed for collecting data for this dissertation. As an additional benefit, theoretical sampling and saturation contribute to constructing robust codes (Charmaz, 2006).

Specific Intricacies of Coding Classroom Data: Three Data Sources

In this section, I discuss the particular challenges and characteristics of coding classroom data for this project. The process of coding the classroom data was highly complex and multifaceted. Ultimately, I examined each of the three data sources for repeated patterns and built three disjointed sets of codes. I took three data sources and used those to analyze the classroom data. The following are the general steps that I took to analyze all the data sources. After this list, I provide a more in-depth explanation.

1. While transcribing the classroom data, I *attempted* to create two sets of initial, provisional codes. The first set (researcher codes) was based on my impressions of recurring themes related to the research questions, and the second set of codes derived from my recollection and impressions of the teacher interview data. For example, Karen said that she was coaching students (Interview #2). I tried to use the concept of "coaching" to organize or think about the classroom data as I transcribed it. At this stage, I did not have a finalized set of teacher codes.

2. I coded teacher and student interviews before the completion of analyzing and coding the classroom data.
3. As I progressed through the transcription process, I coded the classroom data using what the teacher and students said during their interviews (from Step 2). I realized that what participants said in their respective interviews could be mapped to classroom episodes. For example, the teacher used the term “*diagnosing*” in the teacher interviews as an action she performs in the classroom.
4. I assigned Final Codes to the classroom data.

The fundamental idea behind this process was to build the terms or codes I would use to analyze classroom data out of ideas that the participants discussed during the interviews. This process took the form of a comparative method (Charmaz, 2006; Glaser & Strauss, 1967) because I compared one set of data (interviews) with another (classroom observations). This allowed me to see similarities and differences between the two sets. However, I did not want to limit my analysis to what the teacher and students had to say. In addition to the participants’ terms, I also wanted to code the data using my own terms as the researcher. The final result, then, was three interlocking but different sets of codes. All three sets of codes (the teacher’s, students’, and mine) continued to evolve even as the chapter on classroom data was being written. This process of constant evolution is important to note because it allows each act of coding and analysis to provide greater insights into the object of study.

Despite the comparative nature of my methodology, I also wanted to retain some independence between the three sets of codes in order to test for validity and consistency. I decided that for each piece of classroom data, when appropriate, I would label it with teacher codes, students’ codes, or my (researcher or observer) codes. Again, the classroom data was analyzed from three different sources: the researcher observing the classroom, teacher interviews, and student interviews. My codes and coding of the classroom data were independent of the teacher coding and the student coding. I *first* conducted and coded the teacher and student

interviews. This means that what the teacher and students had to say about the instruction that took place was already documented in their respective interviews. The teacher and student coding are independent of each other because each data source was coded at a different time. Thus, all three sets of codes were not swayed by the other participants in the study.

Table 9 shows an incomplete list of the initial and rough teacher and researcher codes (without definitions) that I created during the first and second rounds of the transcribing process of the classroom data. At this point, I had not heard the students' interviews so their codes are not reflected in this table.

Table 9

Initial Codes for Teacher and Researcher

Term	Researcher code	Teacher code
Interpersonal	√	
Coaching	√	√
Very clear directions	√	
Real-life context	√	
Group work/collaborative learning	√	
Administration	√	
Student involvement	√	
Clear definition/directions	√	
Checking for understanding	√	
Little successes/scaffolding	√	√
Mathematical coaching	√	
Assessing students' prior knowledge	√	

(continued)

Table 9 (continued)

Term	Researcher code	Teacher code
Verbal Affirmation	√	
Discipline/maturity	√	√
One-on-one student interaction		√
Humor	√	√
Diagnosing		√

Teacher Codes

For the teacher codes, I searched the long interviews thoroughly so I could gather all the terms, concepts, actions, and roles that are part of the instructor's teaching (Journal, 10/28/10) and her understanding of how she cares for at-risk college students (Journal, 4/16/11). I decided to focus on these elements because they appeared to be the most relevant to her teaching and the classroom data. I realized that I needed a definition for each of her terms or codes (e.g., mothering, coaching), so I examined the context of the interview from which it was taken to help define the term. I also examined the teacher's interviews to find "in-vivo codes" (Cobrin & Strauss, 2008), using her words for both the codes and the meaning she assigned to those terms as the definitions. The uses of participants' words are known as in-vivo codes because they serve as "symbolic markers of the participant's speech and meanings" (Charmaz, 2006, p. 55).

Table 10 lists the terms and ideas I initially found in interviews with the teacher. After developing a set of codes from these teacher interviews, I was able to use it to analyze the classroom data. For example, in the first interview, we talked about mothering. While I coded the classroom data in step 3, I looked for instances in which Karen was acting maternally.

Table 10

Teacher Codes Identified in Each Interview

Interview	Code
Interview #1	1. Mothering (nurturing)
Interview #2	1. Mothering (nurturing) 2. Coaching: “I am there for them.” 3. Being positive or verbal affirmation 4. Crazy/silly (humor) 5. Scholastic immaturity (listening/homework) 6. Mathematical immaturity 7. Believing in students
Interview #3	No codes
Interview #4	8. One-on-one interaction
Interview #5	6. Mathematical immaturity 7. Believing in students 9. Diagnosing 10. Little successes 11. Teaching incrementally
Interview #6	7. Believing in students 9. Diagnosing 10. Little successes
Interview #7	No codes

Table 10 shows the codes identified in each teacher interview. The first column shows the interview number. The second column shows the teacher codes identified in each interview. Each code is assigned a unique identifying number. This was an ongoing and evolving process even as the chapter on the classroom data was being written. From the interviews, I gathered 11 terms. However, the final list of teacher codes consists of 12 terms. In addition to the interviews, codes (such as “checking for understanding”) were also discussed off-the-record or during informal conversations. This is where the 12th term came from. During one of my meetings with Karen, we discussed all of her terms (Journal, 12/20/2010). During this meeting, she provided

“loose” definitions using descriptions of what she did in the classroom (Journal, 12/20, 2010). She had difficulty with the term “coaching” (which was surprising). She defined this term using ideas from her definition of “verbal affirmation.” Additionally, a “mock” coding session was done with the instructor. We found that her way of categorizing her teaching was her motivation for helping students learn. After developing a set of codes from these teacher interviews, I was able to use it to analyze the classroom data. For example, in the first interview, we talked about mothering. While coding the classroom data in step 3, I would look for instances in which Karen was acting maternally.

Researcher Codes

For my codes, after doing the initial coding of the classroom data, I created definitions for the initial terms I used. This, too, was an ongoing and evolving process even as the results chapter on the classroom data was written. On the first day of creating definitions, I used dictionaries (specifically, *A Dictionary of Education* and *The Greenwood Dictionary of Education*) for generic terms such as “discipline” and “communication.” On the second day, I used specialized education and encyclopedia resources for other more specific words (e.g., scaffolding). This process helped orient my thoughts about these terms. However, in keeping with the spirit of grounded theory, the process of exploring and being immersed in the classroom data determined the codes and definitions.

Challenges

The main challenge during the coding process was selecting a single word to represent an entire group of classroom episodes that might contain minor variations between one another. Very few episodes fit precisely into a code, yet using too many codes would eliminate any sense of pattern. Addressing this issue speaks to the “properties and dimensions” of the coding process

(Corbin & Strauss, 2008). For the most part, I used my general knowledge about education and other fields (e.g., Speech Communication, Psychology) to help select a word to explain the entire code. A word was selected that would best capture the spirit of the majority of the classroom episodes and would be understandable to both the educational community and to the general public. I also selected a word that would give readers a basis for discussions and shared understandings.

A more rigorous session of coding using the researcher codes took place in April 2011. During this coding process, I refined the codes for greater usability. Overlapping terms were collapsed into a single code, and episodes that had thus far not fit into any code were given new codes.

Student codes

For the student codes, I examined all the student interviews from the first round and second round to help guide the analysis on the classroom data. The analysis consisted of 36 interviews for the first set of interviews and 18 interviews for the second set. There were a total of 54 interviews. As I listened to all of the interviews, I wrote down any comments that I felt were particularly relevant to the research questions. Keeping with the spirit of grounded theory, to get codes I took “segments of data apart, [and] name[d] them in concise terms” (Charmaz, 2006, p. 45), and I stuck closely to the data. I decided to code only aspects related to teacher caring because they were the most relevant to the classroom data. I was looking only at specific comments about her teaching at this time, as this was my main focus for analyzing the classroom data. I made a label for repetitive responses. For the purposes of the classroom data, I dismissed student comments that were not sufficiently specific because they did not depict what the instructor did in the classroom (e.g., “Karen makes me want to come to class”). I also had to

discard some comments that were hard to pull into one code or that were stand-alone comments that could not be associated with any classroom events (e.g. “Do the problem next to her on the board”).

The codes ultimately used for the student interviews showed similarities to the researcher codes, teacher codes, and fieldnotes from classroom observation. For example, in the student interviews, I heard many students mention dimensions of the teacher’s personality. Initially, I dismissed comments on her personality. However, after I examined the researcher codes, I discovered that I, too, used facets of Karen’s personality. Therefore, I decided to be more consistent among all three sets of codes and more inclusive in order to achieve a greater breadth of responses from the students. This is an example of how multiple coding sessions and the use of three data sources resulted in a more finely tuned and comprehensive list of coded elements.

Final Coding of Classroom Data

Grounded theory was also influential during the coding of classroom data. After creating teacher codes and student codes (based on responses from interviews), I attempted to make sure that the codes within each data source were sufficiently distinct from one another. For example, I wanted to ensure that there was a distinction between “coaching” and “scholastic immaturity” for the teacher codes. I went through this process for each set of codes. After completing this process, I “froze” all three sets of codes so that I could examine and apply these codes to each classroom episode. Some codes, such as “mothering” and “coaching” (from the teacher codes), were closely related, and these made coding classroom data difficult because their properties and dimensions were similar. Grounded theory helps address this issue, however, since questions or concerns about codes come from the data itself instead of from applying theoretical frameworks (Charmaz, 2006). In my process, if a code did not match a classroom situation well, I did one of

the following: (a) Changed the definition, or (b) Added a new, unique term or code for the situation. The process for coding the classroom data, then, was similar to that used to code the student interviews and included the following steps: (a) I transcribed selected episodes from the class verbatim, (b) I created three sets of codes (using interview data and observation data) and applied codes to classroom episodes, and (c) I refined the codes while analyzing classroom data. The final process resulted in Table 9. It shows all the findings.

The key point to take away from Table 9 and the description of the process I used to construct it is how the three different data sources overlapped and influenced one another. Overlap among the three data sets arose, in part, from the multi-step process I used to refine these codes. Also, a number of codes did not overlap with the other two sets of codes. Examples include codes such as “real-life context” and “student involvement.” Classroom observations also shaped the final set of codes. As I was coding the classroom episodes, I kept altering the definition to fit the classroom episode. Tinkering with the definitions was difficult because I kept referring to classroom episodes to help define them. For example, I kept asking myself what the distinction was between “one-on-one interaction” and “teacher availability.” Throughout this process, I had to examine carefully and closely the classroom episodes and how to define terms. I did this process first with the teacher codes, then with the student codes, and finally with my codes. In short, my work with the classroom episodes illustrates not only the codes themselves but also the process I used to determine the best codes to use.

There is a danger that I might constantly change the codes with each review as my own thoughts and definitions might change over time. To ensure the validity of the codes, a few minor coding sessions occurred after periods of being away from the classroom and student data. For example, I would put away the classroom and student data when I was on vacation. When I

came back, I would recode one or two categories to ensure that, over time, I would get the same or similar coding results. I did this without looking at previous coding. For example, this process was done in January and February 2012. No drastic changes resulted from this recoding of classroom data and student data.

Analyzing Student Interviews (Student Chapter)

The students' codes used for the analysis of the classroom data helped ground the analysis for the remaining student interviews used specifically for the Student Chapter. Recall that, for coding classroom data, I only coded specific, direct comments that students had on the instructor and her teaching. While coding all the student interviews for the student chapter, I kept and used the student codes (e.g., Approachability, Availability) from analyzing the classroom data. I also tried to code, as much as possible, almost every comment a student said about the teacher and her teaching as well as comments about events that were not directly observable in the classroom.

Once the transcription process was completed (Fall 2011) for the first set of interviews, I combed through each interview to find passages in which students talked about the instructor, her teaching, an appreciation for the course and/or mathematics, or anything else that would be remotely connected to the teacher's caring. This included the effects that the course had on the students and the impact the instructor had on the students overall or on the students' learning. I recoded every piece of data that was already coded to confirm earlier coding results. For the second round of interviews, I only transcribed segments that focused on what students stated about the instructor, her teaching, the course, mathematics, or anything that would be remotely connected to the teacher. I did not make a new set of codes for the second round of interviews. Instead, I coded students' responses (from subsequent interviews) in the same coding system that

I used for the first set of interviews. I felt there was no need to develop a new coding scheme since the comments were similar in nature independent of whether the interview was the first, second, third, or fourth interview.

As I coded the student data in both sets of interviews, I broke apart the passages line-by-line to include as much as possible about what was helpful for students. For example, I would code “funny and nice” under the instructor’s “personality” code. The instructor’s comments about her family would be coded under “personal stories.” I coded “notes on the board” under the “note taking” code. “Reviews the homework” would be coded as “repetition” and “group activities” as “student work.” The following guidelines were only used for analyzing the student interview data. Grounded Theorists considered this line-by-line coding and is the first step in coding (Charmaz, 2006). This can be a useful tool because content could have been easily dismissed when using a general theme approach (Charmaz, 2006). In addition, Charmaz and Henwood (2008) maintain that this approach lets the researcher take “bits of data anew, dissect them, and label them” (p. 6).

Although I realize that the context of passages is important, I chose this approach for several reasons. First, students spoke about different aspects of Karen, and I wanted to include as much as possible. One can see how students are aware of different attributes and aspects of Karen and her teaching. Second, most of the student responses varied greatly in one passage. A single student response presented several different issues related to the teacher and her caring. I needed to break down the students’ quotes to determine which important facets of the teacher were relevant to students.

Analyzing Student Documents

Student handouts and notebooks were collected to check the accuracy of my fieldnotes but were ultimately not analyzed for several reasons. First, very few student documents and notebooks were collected, making it difficult to draw conclusions. Second, I did not follow any specific students (during the course of the dissertation study) to say anything about their schoolwork (specifically their notebooks). Third, I do not believe the content in the documents would have aided the goals of this study. The notebooks collected did not reveal anything about their reactions to the teacher specifically. The notebooks tended to look identical to the instructor's notes on the board (including material that was underlined), and, therefore, the notebooks could not be used to examine student thinking or achievement. Although I cannot make any claims about student achievement, students unexpectedly spoke about the importance of note taking even though I did not ask them about note taking. The students talked about note taking and board work, stating that it was helpful.

All Data Sources and Analysis

Although I discussed each type of data collected in separate, earlier sections, the plan was to examine all the data rigorously and, as a whole, to create a portrait of the teacher, the classroom data, and the students. The purpose of describing each data source separately was to explain what kind of information was collected from each source. However, the analysis and the case is written as a whole because a case study has a "holistic description and explanation" (Merriam, 1998, p. 29). Merriam (1988), an expert in case study research, states that "a qualitative case study is an intensive, holistic description and analysis of a single instance, phenomenon, or social unit" (p. 27). This case study was written so that it produced a holistic description of one college instructor teaching mathematics to at-risk college students. This

holistic picture is intricately created using the multiple sources of data collection. Each data source both augments and creates another piece of the picture.

Triangulation

Triangulation of different sources of data (student interviews, teacher interviews, classroom recordings, and fieldnotes) is important and was done in this dissertation study because it adds validity and credibility to the study's findings. In qualitative research, triangulation is usually used for alternative meanings and accuracy (Stake, 1995). There are many ways to triangulate the data; such methods include using multiple researchers, using multiple sources of data, or using different methods to corroborate findings (Denzin, 1970). Yin (1993) believes that the multiple sources of data should, in some way, "converge, so that data should triangulate over the 'facts' of a case" (p. 67). More recently, Yin (2003) suggested that "a major strength of case study data collection is the opportunity to use many different sources of evidence" (p. 97). More recently, other qualitative researchers concurred that use of multiple methods helps secure "in-depth understanding" (Denzin & Lincoln, 2008). My research follows the spirit of this passage:

The combination of multiple methodological practices, empirical materials, perspectives, and observers in a single study is best understood, then, as a strategy that adds rigor, breadth, complexity, richness, and depth to any inquiry. (Flick, 2002, p. 229)

The reason for using different sources of data in this particular study is to triangulate the data. For example, the teacher and student interviews document similar findings in the classroom data. I, as the researcher, can corroborate findings from the interviews and classroom data. The analysis and the conclusions can be more accurate and more convincing if they rely on all of the different sources of data and if the different forms of data document similar findings.

There is also another way to triangulate the data. One can triangulate the data with other researchers; this is known as “investigator triangulation.” Specifically, Stake (1995) defines this term as “other researchers taking a look at the same scene or phenomenon” (p. 113). In order to triangulate the data with other investigators, I shared the data with the Ph.D. committee members. As previously mentioned, the teacher interviews and analysis was shared with my advisor. Responses from the students’ interviews, classroom episodes, and results from coding the data were shared with another committee member for input. Discussing the analysis and different interpretations of the data with other researchers improved the quality of the study.

Member Checking

Member checking is a process in which the participants review the researcher’s interpretations, analysis, and the data itself (Merriam, 1988). This activity goes beyond professional courtesy; it is an important element of qualitative research because it adds credibility and validity to the study. This activity is also a way of confirming facts and evidence that is part of the analysis and the final write-up (Schatzman & Strauss, 1973; Yin, 2003). For this study, Karen was asked to examine transcripts and drafts of the results chapter devoted to her. As previously mentioned, one such meeting was audio recorded. Overall, the meetings went well, and Karen made few and minor corrections. For example, on December 20, 2010, Karen reviewed the first sections of the portrait, and she read it line by line. She made a few, minor corrections to the text about the things that happened in her life. She said that it was a “good representation of my young life” (Journal, 12/20/10). Another meeting took place on March 19, 2011; there were a few minor corrections needed on the portrait. In a later informal conversation, we were discussing the order of events that took place in her life. After she spoke extensively about how she distanced herself from her father, I found it interesting that, of her own accord,

she said that she was becoming her own person. I said “bull’s-eye.” I told her that was the title of the section I was writing in the portrait. On March 21, 2012, I conducted another member-checking session with Karen. In this session, two-thirds of the portrait had been written. We found minor, factual errors to correct. However, overall, she said that my “representation was accurate.” For example, she verified that teaching remedial content to students in large courses was an opportunity for her to reflect on the best ways to teach basic skills. Ensuring that the transcripts and results capture an accurate representation of the teacher’s interpretation of what happened in the classroom and the teacher’s interpretation of teacher/student communication is important to the validity of the study. In the summer of 2012, Karen read the entire and completed portrait and approved it with minor corrections. Although students are members of the study, the logistics of being in contact with them to review their transcripts the next school year made it difficult for them to review the results chapter. I, therefore, did not have member-checking sessions with students.

Writing the Results

There is no standard method for reporting data (Wolcott, 1990; Yin, 2003), and it can be an ambitious process (Charmaz, 2006). This dissertation contains three chapters that present results from three different perspectives. For the teacher interviews and analysis, a portrait was used to present the results (Chapter 4). Due to the style and distinctiveness of portraiture, a greater, in-depth explanation is provided below. The write-up of Chapters 5 and 6—the Students and Classroom Data Chapters—are far more conventional and therefore explained here in less detail.

Teacher Portrait

One results chapter is devoted to the teacher. As I wrote the portrait, I reviewed and kept the transcripts to guide me. Portraiture is a means to communicate complex aspects of a case (Lee, 2006), and my focus was Karen. Lawrence-Lightfoot (1997) describes portraiture as “a method of qualitative research that blurs the boundaries of aesthetics and empiricism in an effort to capture the complexity, dynamics, and subtlety of human experience and organizational life” (p. xv). Witz et al. (2001) and Witz (2006) developed the art of portraiture:

The individual case portrait is the basic unit of understanding in the investigator and also the basic unit in communicating this understanding to the reader. In part this reflects the fact (or rather, my experience) that the physical, mental, and spiritual aspects of the human being show an absolutely extraordinary unit . . . The portrait then tries to point to the source(s) of this unity, or the inner unit . . . which pervades the person and is responsible for the more outward manifestations of the person as a unity. (Witz, 2006, p. 258)

Witz (2006) claims that the researcher recognizes essential aspects of the person (as illustrated in the *Essentialist Approach* section earlier) and also claims that the best way to articulate these inner, essential aspects of a person is in the form of portraits.

Therefore, the method for writing up the inner aspects of the teacher was to write a portrait that could communicate who Karen is as a person and how she interacts with students. The goal was to have the portrait be an integrated narrative. The skeleton of the portrait was structured using the timeline of her life that highlights the sequence of important events. Although facts are important to include, the portrait is not just a narrative of events. Portraits go beyond pieces of information. This is why the timeline was also used to organize how she feels now about her past experiences. It was also used to organize my understandings of her now and helped further develop other passages from the interviews. Portraits have detail and depth and should be evocative and insightful. The portrait provided insights that depict the kind of caring

Karen has and how she expresses that caring about her students and about teaching math, and these are a part of the portrait.

Important excerpts from the teacher interviews are selected because they illustrate the core, inner aspects of the instructor. Her feelings, inner thoughts, and motivations are the basis of the portrait. The main emphasis should be on her, her way of unfolding, her way of being, and her becoming more mature. Her point of view and her voice are part of the portrait and need to be present to the extent possible. Passages from the teacher interviews bring out the meaning that “teaching” and “caring” have for the instructor.

Additionally, as the researcher, I tried to give meaning to the excerpts by evoking the person or a feeling for her way of being. This comes as a commentary after each excerpt. Generally, the commentary includes “This is how I read the quote” or “What do I see in this excerpt?” and amplifies and draws attention to certain parts in the quote for the reader. Unfolding or unpacking the quote gives the most powerful impression and can be achieved using excerpts that evoke a feeling, emotion, or thought in the reader. This helps the reader experience what the participant is experiencing. This is the general characteristic or heart of portraiture.

Portraits show the states of mind in various periods of the life of the participants, specifically, the feeling that Karen has now about events in the past. The only guide back to an event is that feeling that is evoked in the passages. The analysis after the quotes gives a sense of that feeling. I wrote about when things started for Karen or when her first memories of a particular event started. I also wrote about her perceptions and how she experienced events. In addition, when appropriate, context was provided for the quotes.

The portrait is composed of strands, which help develop the instructor’s story, and connecting one strand to another strand is also part of the story. The way a strand was

constructed was by grouping major excerpts that showed change or growth. I also grouped events that were part of a chain of dependent events that led to a specific outcome. For example, Karen's losing her teaching position at the local high school led her to get a Master's degree. I also grouped events that came from the same period of time. A "theme" emerged from each grouping of excerpts, which also became the title of a section. Each new strand has to be in accord with the previous sections and the strands that follow. One can see how the instructor bloomed into a larger whole person in each strand, and how she became more caring. One can see the shape of the seed (in this case, caring) blossoming in her. These strands help build a larger perspective of the whole person. Ultimately, the strands in the portrait make a picture of an evolution of how the instructor became who she is today.

Student Results Chapter

Based on interview data, the second results chapter is focused on what students had to say about Karen and her teaching. Although the interviews covered much more material about the lives of students, the chapter focuses on what students thought about Karen and her teaching. Once the student interview data were analyzed and coded, the major findings emerged, and these were the main emphases in the student results chapter. I included two categories: Caring for Students Mathematically and Caring for Students as People. As suggested by Charmaz (2006), I included these two categories as a way to provide an organizational context for the reader, and these are used as headings of sections in the chapter. This organization helps the reader understand the structure of the analysis (Charmaz, 2006). The chapter also examines the frequency of the student codes, discusses the similarities, gives exemplars of the codes, and shows the relationship among the codes (Corbin & Strauss, 2008).

Classroom Data Results Chapter

The third and final results chapter is designated for the classroom data because it is important to examine the data of the entire class. This chapter presents the major findings or repeated patterns in what happened in the classroom. Presenting the major findings is beneficial for several reasons. First, examining all the data (teacher's codes, researcher's codes, and the students' codes) in one section provides the opportunity for development of the "big picture" of the classroom. Since the focus of the study is on both the teacher and students, it is important to examine data in their natural setting (which is in the mathematics classroom). Second, examining instructional methods is an important aim of this research study, as these reveal expressions of teacher caring.

Conclusion

Goals for this study include examining how caring is expressed in a mathematics classroom and the impact a teacher's caring has on her mathematics instruction and on her students. These goals are best achieved through a qualitative methodology, which allows an in-depth investigation of the role that caring can play in teaching remedial mathematical concepts to at-risk college students. This chapter explained the reasons for this methodology as well as the specifics about the data collection and analysis. Student and teacher interviews, classroom recordings, and fieldnotes were selected to learn more about the teacher's caring in the classroom. In addition, data collection and analysis was messy and unpredictable. The data were analyzed with a focus toward the overall goal of this study, which is to examine caring in the context of a mathematics classroom for at-risk college students. Improving mathematics education for at-risk students can help them obtain a college degree, which can enhance their

financial and other opportunities. Obtaining a college degree allows at-risk students to contribute to the workplace and to society.

CHAPTER 4

TEACHER PORTRAIT

This chapter presents a portrait of the teacher who teaches remedial mathematics content to at-risk students in a special university program.

In the classroom, Karen consistently has a smile and cheerful attitude. As a life-long teacher, her dedication and heart for service are apparent in the impact she has on her students. She was born in 1956 in a small rural town in Illinois. Her family included a younger sister and younger brother. Growing up, she had a very active lifestyle that involved softball, skiing, and other outdoor activities. Excelling in elementary school paid off for her because she got a taste of college while she was still in high school, taking Calculus at the university. Unfortunately, her family experienced upheaval, and this contributed to her parents' divorce when Karen was in college. Despite a troubled family life, she went on to college and pursued a Bachelor's Degree in Math Education in a mathematics department at a research university. This would allow her to teach high school mathematical content. Soon after, she also pursued a Master's Degree in mathematics. While pursuing this degree, she was a teaching assistant for the mathematics department (usually for introductory Calculus sections). After graduation, Karen continued as a teaching associate in the math department at this same institution where she received her Bachelor's and Master's degrees. She continued as a teaching associate for 30 years, and she continues part-time in this role even though she has officially retired. During her career, she won several teaching awards at the college and university level. This includes winning an award in the Mathematics Department, a campus award, and an award from the college. In addition to teaching full-time at a research university, she taught part-time at a local community college. There she served as a resource teacher in a learning lab. As a teaching associate, she has taught a

number of mathematics courses such as Business Linear Algebra (for business majors), Calculus for Business, Pre-Calculus, and College Algebra.

Being a member of a local interracial Protestant church is one of her important activities outside of teaching. She also enjoys going to garage sales, movies, and reading novels during the summer. One of the most important and life-changing events occurred over 20 years ago when she decided to be involved in the Bridge Summer Program and the Transition Year-Long Program. She started in the Bridge Program in the summer of 1986 and, a few years later, shifted to teaching full-time in the year-round Transition Program. The mathematics courses in this program are *A Mathematical Applications*, *Pre-Calculus*, *Pre-Algebra*, and *Algebra*. The other life-changing event was the adoption of her son, Nick. Now that Nick has grown up, he has his own family. Karen's extended family includes a granddaughter and her step-grandson.

I met Karen in April 2006 when I was applying to be a tutor for the Bridge Summer program. She interviewed me and offered me the position. I did not have any interactions with her during the academic year. The following spring I reapplied for the same tutoring position and was offered the position a second time. Again, I was not assigned to assist Karen in her classroom; I was assigned to another instructor. In the summer of 2008, Karen informed me that an instructor was needed to teach the basic mathematics course for the summer. Karen offered the position to me, and I accepted with the condition that she would teach the same course and that she would coach/mentor me throughout the summer. Little did I know that it would be a life-changing event for me as a mathematics instructor and as a graduate student. In the early part of the summer, we spent many hours preparing lesson plans, handouts, and curriculum materials for the entire summer. Over the course of the summer, we spent time both creating tests and quizzes and grading them together to make sure we were grading fairly and consistently. She put forth

incredible effort making comments on papers. Our classes would play math jeopardy competing against each other. My informal interactions with her students throughout the summers made me aware of how caring she was to her students and how this caring affected her students' learning. At this point I began to think about the role that a teacher's caring might play in teaching mathematics to students who are underprepared for college mathematics. After my first summer instructing with Karen, I approached her with the idea of conducting my dissertation research in her classroom and on her teaching. Within seconds she agreed and has remained steadfast in her commitment to my dissertation study throughout the years.

Preview of Portrait Karen's portrait mainly focuses on her deep caring for teaching at-risk students in a special university program aimed at recruiting and retaining underprepared students. She had a love of mathematics at a young age. Two major aspects illustrate her deeper motivation. One is her natural ability at teaching and at helping at-risk students. The other is the gradual growth in her teaching practices which are based on her deeply rooted values.

Natural to Teaching and Math

Along with a few other students who were tracked into the highest class in grade school and junior high school, Karen had signs very early in life that she loved math and teaching. These signs started while learning Algebra in sixth grade. Karen was very fond of her sixth grade teacher. The class had done very well in mathematics, and the teacher thought they were ready for Algebra, so the teacher brought in a set of algebra books. "Personally, I loved it, and I think most of us in class loved it. I loved math from that year in sixth grade and just thought it was, you know, it made sense. I liked the fact that it was black and white, that there were answers to

every question” (Tape 1, page 1). Karen happily recalled an experience from her sophomore year in high school that showed her ability in mathematics and also her pursuit in teaching mathematics.

[1] We were seated by alphabet, and so Sofia S. sat in front of me, and she would ask me questions all the time. And when I would answer them, um, she, would say “I understand it so much better when you explain it.” And at that point, I remember thinking to myself, this is what I want to do. I want to teach math, and that's it. (Tape 1, page 1-2)

This already shows some of Karen’s personality traits today. Karen finds herself in the position where another classmate needs help in math, and she helps her spontaneously. She did not think anything of it. Karen realized, from what the student said, that she was able to explain the subject matter well. From then on, Karen knew that she wanted to help others learn. Karen was good at math, and helping Susie came naturally. Helping students learn created a spark in Karen that drew her toward the teaching profession.

The summer after her junior year of high school came another experience that suggested that teaching mathematics might be in her future. Karen was asked to teach a young man in high school from a wealthy family. This student had failed math and was unable to be on the swim team. Someone in her neighborhood knew the family and gave them her name. Without hesitation, she accepted the assignment to teach the entire course to the young man, and he received a B and was able to continue swimming.

[2] I had never taught anything of that magnitude, you know, to teach an entire course to somebody that was just a couple years younger than me. I remember not hesitating, never questioned whether or not it would work, and it never occurred to me how wealthy these people were and how upset they could be if their son didn’t make it, and so all summer I went over every day. (Tape 1, page 2)

Karen did not vacillate. She never thought of the difficulties; even now she is not put off by the difficulties students may have in her classes. It never occurred to her that it might be risky: the young man might have failed the course again, and his wealthy family might have

gotten upset if he did not pass. She acted naturally and spontaneously. Today she still acts in the same manner as she expressed in [2]. When a Bridge/Transition student walks into the classroom, she is aware that she might be dealing with a complex student for one semester. She does not hesitate, nor does she think that she might not be able to help students get closer to understanding mathematics. She does not think of the risks, and she teaches wholeheartedly: “That’s it.”

After this, she tutored Chemistry in high school because that was the greatest need. As a senior in high school, she had an experience that made her aware that when a student has a need for teaching, the desire to fulfill that need came naturally to her. At that time, she was in a program called Senior Leaders in Physical Education. If you were a Senior Leader, it meant you got to help teach the class. One day, when she was scheduled to teach swimming, she was ill with terrible cramps, but she taught despite her condition. The teacher found out about this, and she said, “I can’t believe that you were over there teaching them a few minutes ago,”

[3] and I thought, well, of course, [I taught] because I wanted to—I mean, I don’t know how to explain this, but it just came naturally to see that there was a need there for somebody to learn how to swim, and that was my job, and I wanted to teach them how to swim regardless of how I felt, and so it just came naturally to see what the need was and if, I had the ability, to then just go and meet that need. (Tape 2, page 10)

The teacher’s comment made Karen become aware of her commitment to teaching and to the students. No one asked her to teach the students swimming while she felt ill. Karen did not think about herself; she understood that there was a need, and she felt the need to help others. Today, the students in her college mathematics classes are her focus, and she is devoted to them. The life of teaching seems to be a natural part of Karen.

Proud Person Begins to Feel Forgiven

Up to this point, Karen appeared to be a typical student in school who started realizing more and more that she had aptitudes in mathematics and teaching. She had many successes: she taught Algebra to a wealthy young man, and she assisted in teaching swimming in high school. Her experiences began to form her into a caring person. Despite this, she had bumps in the road. Her successes should be seen as one part of a larger picture, while the other parts of Karen's family life had difficulties. Although Karen did not recognize it right away, her family was having troubles, and these troubles contributed to her being uncomfortable as an adolescent. However, a few years later, a religious experience helped her develop into a more whole person. While she does not remember a specific moment when the family troubles started, she became aware of them by age 15. She remembers it as "night and day, from the time I was 14 to 15" (Tape 6, page 9). She remembers her dad being gone a lot and her mom's drinking. These were some of the factors that made family life difficult for her. As she reflects now, "I called them yuppies because they were into some things that you think were kind of hippy-ish things, and, uh, free sex and that kind of thing, you know; we had pornography in our house, very loose moral household" (Tape 1, page 7). She explained later that outwardly they looked more like yuppies.

Karen's parents drank a lot, and she played a role in their drinking. "When I was a teenager, I was very good at being a bartender for them" (Tape 1, page 7). Karen eventually began to drink herself; she was "drinking when [she] was 12, and could drink in [her] parents' presence" (Tape 3, page 6). On her own, she brought up her drinking during the first interview when she was discussing her family problems. She learned that drinking "was a great escape at the age of 12" (Tape 1, page 7-8). Drinking became an integral part of her life. She drank almost every night until she would fall asleep. Looking back, Karen believes that she was a young

“functional alcoholic.” Her drinking appears to have been motivated by a desire to escape family problems: “No, I really kind of want to not be feeling anything for a while” (Tape 3, page 3).

Realizing that drinking had been influential for her, I followed up on it during subsequent interviews. During these interviews, I wondered if she was aware of her drinking. When she was young, she did not realize how much she was drinking. “I didn’t think anything of it when I was 12” (Tape 6, page 9). “at 15, I would say I did not realize that I had a problem” (Tape 3, page 19). Now she feels that it was at 16 when she started becoming aware of her drinking problem.

[4] I could drink—I had older friends, and I went to this college in Indiana, to visit them all the time. And I would go to a fraternity party and spend the night there, and I could stay up all night drinking beer—I could probably drink 24 beers and not pass out. I realized at that point that was not good, but I was not going to stop drinking. . . . So yeah, I think by 16, my drinking was way out of control. That’s when I went into bars and would come out and drink and drive. I knew that was wrong, but I wasn’t going to stop myself, because how else was I going to get there? I couldn’t tell my parents, “I’m going to be drunk later, could you drop me off?” although they might not have minded. (Tape 3, 19)

As is common among many teenagers, a rebellious streak in Karen was emerging. At this point, Karen was becoming more independent with little parental supervision.

[5] They watched me drink, and they didn’t have any problem, but they thought I was just social drinking. They didn’t have a clue how much I was drinking—they didn’t very often see me get drunk—they did once or twice, but they didn’t know the extent of my drinking. (Tape 6, page 10)

Despite her drinking lifestyle, she realized that drinking and driving was wrong. She had an inkling deep down that her life had become problematic. However, she shrugged it off.

Although the family was plagued with many problems, Karen had good, fond memories of her father. As a child, they spent endless hours playing sports; he taught her how to mow the lawn, they made snowmen together, etc. Her father believed in her and believed she could do anything.

[6] When I wanted to learn how to ride a motorcycle, he took [me]—I was 15, and he took me out in the country and then he started visiting with his friend whose house we

went to and I said, “When are you going to take me out there?” and he said, “Well, go ride it.” . . . And so, you know, he thought I could do anything. (Tape 1, page 3)

She can remember how her father continued to encourage her to be independent. A year later, “When I got my driver's license and, there was a snowstorm; he said, ‘Why don’t you take off and go an hour ahead of us to Southern Illinois and drive, you know, yourself just to get used to it’” (Tape 1, page 3). This encouragement continued even as she got older. When she was 19, “I took a bunch of kids and went to Colorado skiing, just took the family van and things . . . he was the opposite of protective, saying, ‘Go out there and do it’” (Tape 1, page 3).

Despite the drinking and the “loose” morals of the household, Karen’s family went to a Presbyterian Church. Karen believes that her parents were raised knowing and believing in the Bible. In her opinion, people in the church sort of assumed that one just needed to be good enough to go to heaven. The church was liberal—”they are liberal in the sense that they wouldn’t really say people are saved. It’s just, you know, being good, it’s good morals, you know, things like that” (Tape 3, page 3). Even though she went to a Christian Church, she heard little of what later became the important message to her.

[7] But I didn’t really hear a message about what it meant to be “saved” or to accept Jesus as my savior or what salvation meant. I don’t think that it was described to me what exactly he died on the cross for, or that Easter—we didn’t emphasize that Easter was the resurrection, and some things like that. And you know, it was just kind of a religion thing. (Tape 3, page 1)

Although Karen was going to church at a young age, she did not feel the need for religion. During ninth grade, Karen realized she did not like wearing dresses and resented having to wear them in church. One day she told her parents, “I’d be glad to go to church with you, but please let me wear pants,” and they said no. And she said, “Then I just really am not going to go” (Tape 3, page 1-2). Her parents did not scold her or lecture her for not going to church. Her parents never corrected her. This may indicate they, themselves, did not care too much about

going to church. After this, her family went to church less often. Ninth grade was also the period of time where she started thinking that, “I don’t think that there is a God, but if there is one, I don’t need him” (Tape 3, page 2). She was becoming a proud person.

Among her peers in school and in life, Karen walked tall. By 15, she was becoming more independent and believing in herself. Many elements gave life to this flowering independence. She felt comfortable not going to church and with how much she was drinking. Her abilities in math and her close relationship to her father also helped mold her independence. She believed in her own abilities.

[8] I was just starting to realize that my mind was something I could do just about anything I wanted with, so I was not humble at all at that point in time. And I was starting to realize, too, that I could make decisions for my own life, so I was feeling pretty in control and on top of things. (Tape 3, page 2)

To summarize Karen’s life up to now, she was a bright child demonstrating her scholastic abilities in the highest track of courses in grade school and high school. Her school achievement was just one part of her life. Even though she was becoming aware of her direction as a teacher, she felt oppressed by her family life. Her parents’ problems, her mother’s drinking, Karen’s own drinking, and her parents’ very liberal orientation contributed to her unstable family life. Despite the family troubles, her dad believed that Karen could “do anything” and let her do whatever she pleased from the age of 15 (including drinking and not going to church). Karen had a very strong independent streak; she cannot remember asking her parents for anything. For the most part, Karen was a very responsible person aside from the drinking.

This all changed in her senior year in high school when she was 17. At the same time that she was assisting in swimming, she went on a skiing retreat. She had Christian friends in softball who prayed before games and talked about Christianity. She referred to them as “holy rollers.” Most of the Christian talk just bounced off of her; she did not even think about what they were

telling her. Her friends invited her to a Christian skiing retreat sponsored by “The Youth for Christ” organization. Speakers at the retreat talked about God and forgiveness. Karen started at a very young age telling people that she did not need God. She continued all throughout her adolescence telling friends the same tale. Aware of these beliefs, her non-Christian friends told her, “You know, you’ll have to hear about God all weekend,” but her attitude was, “I’ll do anything to go skiing” (Tape 1, page 8). Karen enjoyed skiing. She had joined the local ski club when she was 15 and went skiing with a lot of friends. Her dad had taken the family to vacations to Aspen, Colorado from the time she was a young teen.

Although skiing was an important part of her life, this skiing trip would change the direction of her life. We were discussing her experience on the mission trip that she went on during graduate school when suddenly she went back and started talking about her first religious experience in high school. Although the mission trip during graduate school was a major milestone in her life, the first religious experience was the initial step. I continued the interview by asking her about the first religious experience. She responded by saying that it took place in high school and further explained:

[9] It was a need that I felt for forgiveness and so that, you know, there was somebody saying you can have forgiveness, um, it’s, um maybe it was a need to be in communication with a God that I had been denying and then all of a sudden that night . . . after that guy spoke I couldn’t sleep all night and finally at about 3 or 4 in the morning I woke a friend up, and I said, “I’ve got to pray.” I didn’t really feel like I knew how to pray . . . anyway it was the next day when they asked if anybody [had] become a Christian, I did not raise my hand. I didn’t know that’s what happened; I just prayed. (Tape 1, page 8-9)

In a later interview, I asked her about what happened after she went on the skiing retreat. Before she talked about this, she clarified that she continued drinking after her first religious experience.

[10] The message I had heard, I woke my friend up and said, “You’ve got to pray with me, because I want this thing. . . . And alcohol had a hold of me pretty well, so there really wasn’t a huge change. Although I never forgot this message that God forgave me, and that Jesus died to forgive me, so I clung to that when I did things that were a little out of control, but I was still pretty out of control. (Tape 3, page 6)

Up to now, Karen’s life consisted of going to bars in high school, but she was becoming more and more aware that her drinking was getting out-of-control. Something changed during the retreat. As we continued to talk about this experience, I continued to probe her about how it felt during that time, specifically when she was praying.

[11] It felt like I was communicating with someone . . . and, all of a sudden, I believed in an instant that there was a God and that I had communicated with him and that he had heard me and so, um, I can remember feeling, you know, some, some joy at that whole, at that whole thing. It was kind of a heavy weight, you know, to be lifted off, that was lifted off my shoulders. . . . All of the sudden then I thought maybe there was someone bigger than me out there. I certainly knew my parents were too screwed up and into their own thing to care, and now my dad was into this relationship and my mom was drinking all of the time so. . . . It felt like the weight of the world was on my shoulders to take care of myself, I guess. (Tape 1, page 9)

From the ages of 15 to 17, she considered herself an atheist, and then, in an “instant,” she believed there was a God. The story of forgiveness had significance in her heart (especially since there was someone saying that she had forgiveness for her drinking). She realized that someone superior was taking care of her.

After the skiing trip, she was still friendly with the kids from the retreat, and she tried to corrupt those Christians who were at the retreat with her. “You know, we could all go out drinking” (Tape 3, page 6). She also did not go to church or grow in her relationship with the Lord. Despite this,

[12] I knew something was different then, and I knew something that I hadn’t known before, and I knew that there was hope, and I believed God was real, and he was there for me. It was just harder than I thought it was going to be to let go of the crutch that alcohol had become. (Tape 3, page 6)

This resembles a new life or a new consciousness starting to form in her. Going to church on her own accord started roughly a year to a year-and-a-half later when she was 18 or 19. The invitation came from someone who went with her on the skiing retreat, and as soon as she attended she definitely enjoyed going once she started going.

Looking back at this skiing trip now, Karen believes that the ski trip happened for a reason.

[13] But I think part of the reason that—when I went on that ski trip, and I was ready—I felt the need for a savior by then. . . . This is kind of out of control. I don't think I am so good on my own. I think I could use some outside help from God. (Tape 3, page 3)

Afterwards, gradual changes happened in her life.

[14] Um, I think it changed and made me a more stable person all, you know, I definitely wanted to quit drinking at that point in part because I guess I felt like I should. I think I had always felt kind of bad that I knew I was using alcohol. . . . So, I knew that, that was not healthy and that, that was not the way I wanted to live, and I think I got strength from, from God to help me overcome that, and, um, and it was not an overnight thing where I all of the sudden was not drinking at all. It was kind of a slow thing where I was drinking less and less until probably my son was five. (Tape 1, page 10)

College Years (1974–1978): Becoming Her Own Person

Being her own person became one of the foundational bricks that would make a difference in the rest of her life. Up to now, Karen was showing signs of independence such as making decisions about going to church, her drinking, and teaching opportunities at a young age. She was coming into full bloom as her own person in college. This had many aspects. Growing up, she had a very strong, positive relationship with her father. She was not aware of negative facets to this relationship, but she became conscious of them during college. One aspect was that her father was pushing her to be an accounting major. Becoming her own person meant breaking away from her dad's desire for her to become an accountant. All the while, she was also taking a

computer science class. In her freshman year, she started becoming her own person by following an interest in Computer Science. This interest did not go very far. Besides Accounting and Computer Science, she also majored in Mathematics. She followed her passion by majoring in Mathematics Education. Without thinking about it, she was aware that teaching was her direction, and she managed to combine the Mathematics major with teaching. The last aspect of her becoming more independent from her father was when she became disillusioned with him. Karen experienced a lot of growth during this time.

Part of being her own person included having experiences like many other students going to college. Being the typical college student is part of her fond memories.

[15] I could remember the first time I skipped class. I ran into an older friend of mine on campus, and she said, “Let’s go do something,” and I said, “I’ve got class right now,” and she said, “So?” And I remember skipping it, and the world did not come to an end, and I had figured out what I had missed. (Tape 3, page 8)

She also has fond memories of coursework (especially in mathematics). In her freshman year, she was in the honors Calculus class with seven people, and “We all loved being there and having that. I loved being there. I loved taking math classes and learning with other people that were more serious” (Tape 3, page 8). Being in a small class with others who liked mathematics provided an opportunity for her to grow.

While taking Mathematics courses as part of the Mathematics major, Karen also pursued a major in Computer Science in her freshman year. “I just thought it sounded like the thing to do back [then]—it was the new and upcoming thing” (Tape 3, page 8). She “enjoyed” machine problems because it made perfect sense to her, and she “loved” computer programming languages. However, she decided to drop Computer Science in her freshman year after her second course in programming. A sense of being “overwhelmed” troubled her because she felt other students knew so much more than she did (specifically in programming languages). Karen

did not like feeling overwhelmed so “I kind of gave up on that [computer science]” (Tape 3, page 8).

Although Computer Science had been her interest, accounting was a more complex situation. Her father was pushing her to go into accounting. She does not remember very clearly, but she thinks “it may have been that my dad finally talked me into that my second year” (Tape 3, page 9). For her father, she carried on with an accounting major until the end of her sophomore year. As part of the major, she took basic courses in Cost and Financial Accounting. The Intermediate Accounting class cost her; it is her only “C” on her transcript. She had surgery during that semester and then never went back to that class other than to take the final exam. Later, during her Tax Accounting class, she dropped it during the middle of the semester, and doing so was not a “big deal” for her. Her thoughts were: “I have absolutely zero interest in this. I am not going to do this. I never wanted to do it. I did that much just for my father, but all the while taking math classes” (Tape 1, page 3). She came to realize that she was pretending for her father. “I did that when I was younger for my dad, and I don’t want to ever do it again. . . . It was very uncomfortable to pretend around him that I was very excited about being an accountant when I wasn’t” (Tape 1, page 26). In another interview, she made the comment, “Oh, no, this is ridiculous. I’m not going to do this” (Tape 3, page 9). Dropping the accounting major broke a dependence on her dad.

With computer science and accounting out of the way, Karen started to feel like she was in charge of herself and concentrated on the major in which she was interested, namely, mathematics. The university had an arrangement where math majors could also go into secondary education. In the beginning of the junior year, Karen was enrolled in the secondary mathematics major. For her, doing math and teaching math always went together. Several times

throughout our interviews, she commented, “I always knew that I wanted to teach.” She also said she “always intended to teach math” (Tape 3, page 11). Being a mathematics teacher was always her main goal. I wondered when and how she ended up in this education component. To my surprise, she did not remember anything. Apparently, it was so natural for her to do that and go through these motions that she does not recall when she “officially declared.” At one point, her father had told her. “You’re not going to make any money as a teacher” (Tape 3, page 9). This meant nothing to her because she was already walking her own path. She also does not remember if someone introduced her to the College of Education or to the College of Liberal Arts and Sciences program in Mathematics with a minor in Education. She has a few vague memories about how she came to major in Math Education:

[16] I can just barely remember the methods class. I can remember being videotaped and watching ourselves teach and preparing lesson plans and things like that. But nothing prepared me for when I—right after my—well, I felt fine in the classroom—I didn’t feel unprepared, but I just don’t feel like anything prepared me. I felt like I was learning on the spot, which maybe all teachers do. . . . I do remember kind of feeling like they could be doing more valuable things, but I can’t remember what we did that I didn’t think was valuable. I think—you know, back then you didn’t do any observation. I was never in a classroom until the first day of my student teaching. So I guess probably for the reason that they incorporated some of those things, I felt like there were more practical things that I could be learning. It felt like we were going over in a textbook some of the old stuff that I had done with psychology and things like that. And I thought, “I need to see lesson plans. I need to figure out what I’m gonna do next year when I’m in a classroom.” And I just didn’t feel like it was all that practical. (Tape 3, page 11)

Karen’s steps in college were part of a larger process. This process involved coming to understand herself and taking direction of her life. This process had deeper sides that involved personal issues. During college, she discovered that her dad was having an affair with his dental assistant. While in high school, at the age of 15, she worked at her dad’s dental office. She became friends with a couple of different dental assistants, including the woman who had an extramarital affair with her father. When she found out about the affair, it had not become public,

nor did her mother know about it. Although she does not remember the details about when she found out about the affair, she felt “angry” at her father when she did find out because she was disillusioned with his lack of faithfulness and because she was a friend of the woman who was having the affair with him. “So I felt kind of in the middle, kind of like a traitor to my mother [because] I knew what was going on [and her mother didn’t know]” (Tape 1, page 7) and because she was spending time being friends with the woman having the affair with her dad during the summer of 1977. In February 1977, when she was in her junior year, the affair became public, and her father left the house. She continued to feel uneasy even when her mother did know about the affair because “my mom didn’t know I continued doing things with my dad’s lover like going to golf lessons” (Tape 6, page 7). Going out on social events with her dad and his lover continued to bother her. Eventually, later in the summer of 1977, she broke down in tears during an outing and told her, “I can’t do this. I feel so guilty every time I spend time with you” (Tape 1, page 10). In the fall of 1977, her dad married this same woman. She was becoming more aware and sensitive to other people’s (i.e., her mother’s) feelings.

Recall that Karen’s dad was a well-known dentist, and her mom was a housewife who never pursued any career. Karen was the one “getting all of the attention” from her dad instead of it being shared with her mother and her siblings. After the family chaos, Karen came to realize how poorly her dad had treated her mother. She also realized that she took in his attitudes, and this affected her relationship with her mother. After he left the house and remarried, she “just had enough distance from my dad to see things differently” (Tape 4, page 7) and could “reevaluate exactly all the things that had gone on” (Tape 7, page 3). She realized that since she did have a good relationship with her father growing up, she had absorbed his attitudes subtly. As part of this good relationship, her father used positive words and ways to encourage her. This is how he

was; he used “words and actions” all the time. However, she became aware that he used negative words to influence her as well. Negative “words and actions” was his way of conveying an attitude in her that her mother was a “weaker individual.” She became conscious of “how little respect he [her dad] had shown her [mother]” (Tape 7, page 3).

Although this reevaluation started in college, this awareness continued afterwards. Her impressions of her mother changed only gradually.

[17] I really believe God enlightened my mind, or that I just had enough distance from my dad to see things differently. . . . It wasn't something sudden- it was kind of a gradual thing where I can remember thinking she's different than we are—that doesn't mean that she is worth less than we are. (Tape 4, page 7)

She felt that “it was God's work in my life to change me” (Tape 7, page 7). Now, one can see how her heart changed.

[18] Like when we were water-skiing, he would make fun of her because she didn't want to ski on one ski and shamed her into doing it. Who cares? If somebody doesn't wanna do it, don't make them do it. But back then, I went right along with him. I mean that is so wrong, but back then I laughed with him. . . . And I'm ashamed of the fact that I went along and learned this behavior and didn't see what was wrong with it. (Tape 3, page 17)

After 30 years, she can now talk about this in a caring and loving manner. This shows how much she has matured and grown in integrity. She started to feel that going along with her father was wrong. She learned to appreciate her mother on her own terms instead of using her father's influence to judge her mother. According to Karen, these insights came to her through God's help. She became more sensitive to the ways in which people are treated. This turned out to be important in her later teaching of at-risk students.

In December 1983, on Christmas Eve many years later, Karen found resolution in her relationship with her mother. Karen was very ill with strep throat, and her mother wanted to talk. “And so I was really ill and had a fever, and my mom said she wanted to talk to me because she hadn't been feeling well” (Tape 4, page 1). She “let it go over her head” that her mom was not

feeling well and just thought that her mother's drinking was the cause of her illness so her mother's appeal to speak was disregarded. A few months passed, and her mom went to the hospital to get "dried out." During a hospital visit, Karen and her sister realized something else must be wrong because they found her mom slumped over in bed without drinking. They realized that "This can't be right." Medical tests were done and found that her mom was "just full of cancer. It filled her lungs, surrounded her heart, filled her brain—I mean she just had cancer everywhere" (Tape 4, page 2). They knew that her mom wanted to be at home so they found a way to make it work. They made preparations: renting a hospital bed and getting a van for the wheel chair.

As a possible symptom of the brain cancer, her mom's mind was also going. "She was very out of it—she made no sense" (Tape 4, page 3). This was the reason that led Karen to seek power of attorney. She adopted a very "take charge" attitude to make sure she could take care of her mother.

Karen's mother had a time of "being out of it," and this was a time where conversations about forgiveness came out.

Then when one of my pastors from my church came in and said, "Chloe [Karen's mother], do you wanna ask Jesus into your heart?" She [her mother] said, "No, I've done too many bad things." And we tried to explain to her that that was the point, was that we all needed forgiveness, and she [Karen's mother] said, "No." (Tape 4, page 4)

The spirit of God continued to pursue her. A friend of Karen's went to the hospital to visit Chloe and said:

[19] "I am not supposed to leave tonight. God told me that I'm not supposed to leave the hospital room until I pray with your mom." And I said, "Okay, sounds good to me." . . . But when the nurses came in and said everybody had to leave, my sister glared at us when I said, "No, we're staying," meaning me and my friend. And my friend wasn't family, and she had this guitar there. My mom used to love it when she sang. And so I told the nurses we weren't leaving. And later on, after the nurses had left, my friend said, "Charlotte, do you wanna ask Jesus into your heart?" And she said, "Yes, I do." So that

was very important to me—it was a very childlike thing. But then she looked at this friend and I—my sister was there too—there were three of us in the room. And she said, “I’ve seen miracles in you two, and now I have my own miracle.” And she did not make sense like that. (Tape 4, page 4)

This was a spiritual experience for Karen and her mother. This was important to Karen, and it made her happy that her mom, despite everything that had happened in the past, understood and accepted forgiveness. Her mom could see miracles in Karen’s life.

[20] At one point before she went into the hospital, mom looked at me and said, “I’m not afraid of you anymore.” It wasn’t a fear for physical safety—it was a fear for her emotional safety, because I would put her down. And so she had seen the change in me after I became a Christian. I’m convinced it was God enlightening my mind to the fact that I was treating my mom as though she were worth less than I was, and my sister and brother, and enlightening me to the fact that my dad had kind of brainwashed me in that way. (Tape 4, page 4-5)

Karen would put her mother down and think she was worthless. A lot of this would stem from her father’s “brainwashing.” After becoming a Christian and going to church, Karen had a spiritual awakening to the idea that she needed to treat everyone as worthy, just like the at-risk students who lack mathematical knowledge. Her mom noticed that Karen had changed in how she treated her, which made her mom not be afraid of her anymore. Karen began to love and respect her mother as a human and as a mother. Karen believes this is the “miracle” to which her mother refers when she was in the hospital.

Karen continued and finished her Bachelor’s degree. During her senior year, she developed as a mathematics teacher. One of the moments where teaching came together for her was during her student teaching. Belinda M. was her cooperating teacher, and her student teaching took place at a local, small town, junior high school. Belinda M. was unusual as a cooperating teacher because she encouraged Karen in different aspects of mathematics teaching. Another unusual aspect of Belinda M. was that she also worked part-time at local community college. It was the same community college where, one day, Karen would work full-time.

Belinda introduced Karen to teaching in the community college by allowing her to come and observe teaching at the local community college during the same semester that she was student teaching at the local junior high school. The opportunity that Belinda offered helped Karen become a mathematics instructor at the same college later in life.

Belinda M. also gave Karen a lot of freedom in the classroom. She was allowed to carry a lot of the teaching responsibilities for the seventh and eighth grade classes in the fall of 1978.

According to Karen, her fascination with class started on day one.

[21] In the classroom, I remember just taking to the classroom. It just was natural from day one. Um, she [Belinda M.] was having the students get into—and it was the beginning of the school year, it was August, and she was giving them a seating arrangement, and she said, “Now, I could do this [seating arrangement/chart], um, you can do any part of that you want to, you can just stand off [to the side] and watch.” Um, I can't remember exactly how we were doing it but I know students all had to stand up and then we tell them where they were going to sit, and I said, “No, I'd like to do it [seating arrangement/chart].” And, um, just at every stage I remember her saying, giving me options, and I always felt comfortable in front of the class and asking them to, you know, telling them what to do or asking them. I tried some outrageous, oh, uh, projects with them that got the class a little out-of-hand so I learned quickly, you know, having them go measure the circumferences of things or whatever could get out-of-hand. Or I tried creating some puzzles where they had to tape things together. I don't know just different things. (Tape 1, page 4-5)

Student teaching was the beginning of Karen's becoming a mathematics teacher. She was delighted to be in the classroom engaged with students. She felt comfortable being in front of the classroom and telling students what to do. More importantly, she also felt good about what she was doing. She was excited about having students try so many different and “crazy” things (such as measuring the circumference of objects).

Her teaching supervisors from her university during an observation quickly praised her for her teaching materials. This is another way that teaching was affirmed for her.

[22] I knew there were certain concepts that I wanted to get across. So I created a bunch of worksheets and had them write these—I would give a sentence, and then they had to turn it into a percent. And somebody said, “Where did you get these problems?” And I

said, “I wrote them,” and they said, “Really?” And I thought, “Well, yeah, somebody had to?” I needed these examples. (Tape 3, page 13)

Teaching seemed natural to her, as she knew what to do with students without much direction from her coordinating teacher. Instead of being hesitant, apprehensive, or nervous about teaching, she went to the classroom wanting to take full responsibility.

[23] Belinda M. kept giving me the opportunity to do lots, and so I thought I guess some people would want to stand back, and I just wanted to dive in, and I just always knew what I wanted to tell them and what I wanted them to learn, and what I thought that they needed to learn, and it felt natural to, it felt like it was easy. (Tape 1, page 5)

Karen felt natural at teaching because she had the desire to jump in and do the teaching in the classroom without any hesitation or reservations. She knew what she wanted to tell the students and what she wanted them to learn. Teaching felt natural as she developed lesson plans to accomplish her goals, and she felt confident in leading the class.

Growing in Mathematics and God

While in college, Karen started to flourish as a math teacher and gained personal awareness and integrity. As she moved forward after college graduation, she continued to blossom in these areas.

Right after student teaching in the fall of 1978, Karen was offered, and accepted, a teaching position at a local high school starting in December that went through the remainder of the 1978-1979 school year. One of the teachers had left in the middle of the school year to start a computer company. Karen was earning a paycheck, and she enjoyed it. She was also extremely lucky that she could get a full-time teaching job in the middle of the school year at a local high school. However, at the end of the 1978-1979 school year, everything changed. The teaching

position she was in was rumored to be offered to someone else who could also coach. This made her reflect on what to do next in her life.

She could have chosen any of a number of paths, but Karen had been thinking about getting a Master's degree for several reasons. Teaching full-time after graduation was not a top priority for her, and going back to school was something she wanted to do. Getting a Master's degree was important for her because she did not want to lose her "knowledge base" in mathematics. This speaks to how much she valued mathematics as a subject. If she continued teaching for a long time, she was afraid she might forget Calculus. In her mind, "If you don't use it, you lose it" (Tape 1, page 6). She continued, "I, quite frankly, was afraid that if I got into a career and making money that I would decide not to go back, and I just felt like I wanted a little bit more education under my belt" (Tape 1, page 6). Hence, Karen decided to pursue a Master's degree in the Department of Mathematics within the same university where she received her Bachelor's degree. Specifically, her degree was a Master's in the Teaching of Mathematics with an emphasis on Secondary Education. The program gave her the opportunity to take a wide range of courses in different areas in mathematics: "a little bit of everything." She gained a breadth of knowledge in mathematics. Her interest in mathematics shows her relation to and appreciation for the subject of mathematics. When she spoke about graduate school math classes, she had fond memories of history of math, number theory, and the first abstract algebra class, and she took a liking to real analysis. Geometry was "okay," but not her favorite class. Graduate school felt very "normal" for her. "I always loved school and still love school and, I, um, just enjoyed learning and enjoyed, um, the challenge of learning and the learning itself" (Tape 1, page 8). One can hear how learning and learning mathematics is also a part of who she is.

One of the required courses that Karen took addressed issues on racial/ethnic minority students and the difficulties they experience in education. This topic did not come up during informal interactions or our other conversations. Long before the interviews, I had been wondering when and how she started to become aware of the problems that minority students experience in school. We happened to be talking about required courses and coursework, and the topic of at-risk students in her coursework came up. This happened during the first interview, and she mentioned that her “favorite classes were in educational policy studies.” In the third interview, I brought up a related topic that dealt with her experiences in education courses, and she highlighted her coursework in educational policy studies. She pointed out that these courses gave students in the class the opportunity to discuss “who should receive an education, and who should decide who receives an education” (Tape 3, page 10). The enthusiasm seems to be a later development as she discussed in the first interview.

[24] that's probably just looking back now, and thinking of the issues that come up in the Bridge program regarding the Bridge program existing and, you know, the students being at-risk and, you know, still me believing that they—I'm very, very glad that they have the opportunity to come in and things like that. (Tape 1, page 6)

This shows that, despite any difficulties students may have, Karen whole-heartedly accepts all students and feels they belong in her classroom. This is her attitude in front of students, and this is how she is outside the classroom as well.

Once in the Mathematics Department, Karen enjoyed her teaching assignments. She experienced, for the first time, college-level teaching as a teaching assistant to undergraduate students. Calculus was her “favorite,” and she fondly recalled an experience from that class:

[25] I had this one very, very dedicated Chinese student who would sit in the front row and ask me the best questions. He wanted to understand it forwards and backwards and inside and out. And at spring break, he had come up to me and he said, “I have some friends who would like to join [audit] your class after spring break if I [the student] teach them the first half of the class, can they join?” And they did, and he did, and it worked

just great, and they joined my class, and I felt honored that they, you know, that he would think that highly of me to have joined my class. (Tape 1, page 12)

Karen felt honored that this student became so engaged in her class. The student learned calculus from her so well, that he was able to teach his friends, and she was flattered that he wanted to bring his friends to her class.

In addition to taking classes and being a teaching assistant during graduate school, Karen also cultivated another deep-seated aspect in her that is important in understanding her dedication to teaching at-risk students. Recall that she felt that she had her first experience “communicating” with God and with “forgiveness” at a retreat with her athlete friends while in high school. Afterwards, she started going to church in 1975 and “enjoyed” going once she started. Also, at about the same time, she recognized that she should have not followed her father in his actions toward her mother. She said she was “enlightened by God” and learned to look at her mother with appreciation. However, for Karen, life was still hard:

[26] My mother was still was a raging, really bad alcoholic at that point . . . and I felt this terrible guilt at spending time with them [stepmom and her dad] and especially going on vacation with them. So life was just hell you know, what my family had made it was hell and trying to find my way and in this new faith. (Tape 1, page 10)

During graduate school, she attended church with one of her roommates; it was the same church she had attended back in 1975. She felt like she was “kind of depressed,” and this same roommate came to her and told her to get away on a short mission trip. Both knew a number of people from their church who were involved in the organization “Youth with a Mission.” This organization sponsored short and long-term mission trips for going and studying the Bible. In a 2-week time frame, Karen made the decision to leave for England for six months during the spring semester of her second year in graduate school.

[27] I felt like I got my head on straight and just thinking, yeah, this chaos that was my family I can choose whether or not to be in the center of that chaos. I can choose to, um,

you know, it gave me some time to focus on what I believe, and that it was different than what I had believed before, and yeah, I came back still wanting to finish school. There were some people there at the school that came to me and said that “The Lord had told them that I was supposed to stay there in England and be their new accountant.” Of course my accounting schooling that I had and the fact that I was a responsible person and, and everything they thought I would just be perfect, and I'm sure it was just them thinking it because I had no intention of changing the direction of my life. (Tape 1, page 10)

Going on this mission trip was a wonderful break from both school and her chaotic family life. She wanted to separate herself from the upheaval and find harmony and stillness on family matters. Another matter that crept in was people's desire for her to become an accountant. This is the first time where two kernels intersect: Christianity and teaching. There was a seed of an idea that God may want her to do something else besides teaching. Besides her father, hearing from others that she should be an accountant was something new for her. However, she still stood her ground, and the idea of being an accountant did not resonate with her. She wanted to come back and finish her Master's degree and had no plans for “changing the direction of her life.”

Developing as a Teacher of At-Risk Students: 1981-1993

Karen graduated from the Master's program in the summer of 1981 and in the fall, the Mathematics Department offered, and Karen accepted, a part-time teaching associate position. I asked her why she continued with college teaching instead of high school teaching. One reason she took the college position was because, “I knew the discipline problems were out there. I had taught for [a] year, and I had won out over those students to some extent with those discipline problems, but I knew they were there [in the high schools]” (Tape 1, page 11). The second reason was that she felt that it would be a “continuation of doing what I was currently loving” (Tape 1, page 12).

During the first year, Karen taught discussion sections of large lecture courses such as College Algebra. During the following academic school year (fall 1982), she continued as a full-time teaching associate. For her first 13 years as a teaching associate, Karen taught large lectures (with approximately 200 students) and small sections of courses. Her teaching assignments included Business Linear Algebra, Calculus for Business, College Algebra (consisting of an introduction to Algebra and regular Algebra), and Pre-Calculus. Teaching these large classes was an “administrative nightmare” since she had to use large grade books in the era before computers were commonly used. She did not enjoy teaching large lecture courses because it felt more like a job.

[28] I didn’t feel like I got to really teach . . . if I was communicating I didn’t know to whom, um, because I could not get to know the students, and I did the very best I could to present the material, but I didn’t feel like we got the interaction that is really essential, you know, to teaching mathematics. (Tape 1, page 12-13)

As I listened to her during the interview and as I reviewed the tape and interview afterwards, I can hear how incomplete she was. Something was lacking in her teaching life.

In addition to teaching Calculus-level courses, Karen also taught remedial courses in small and large lecture settings. The content focused on algebraic skills and matched much of the content in the courses she teaches now in Pre-Algebra and Algebra. Specifically, these courses covered factoring, rational expressions, equations and inequalities, functions and graphs, exponential and logarithm functions, and polynomials. The population of the students was very similar to the students in the Bridge/Transition Program (see Chapter 3). The courses were diverse “racially” and “ability-wise.” Karen had to learn to teach and interact with students with “very poor math skills” while other students “just needed a brush up on Algebra and take some trig and they’d be ready for Calculus” (Tape 7, page 12). She also realized that there probably was “a disproportionately large number of African-American students in [remedial] math,

compared to the percentage of them in the university” (Tape 7, page 12). When the courses were in a large lecture setting, this teaching assignment was an opportunity for her to reflect on the limits of that setting when teaching basic mathematics:

[29] There were probably many students in there that I could’ve taught algebra to if I had them in a small classroom with a larger amount of time that probably failed at the time. . . . But I can remember, at the time, feeling like I’m losing people, and I have no choice but to do that. I hated it, but I had 50 minutes to present this topic, and just doing it to the best of my ability and knowing I was losing some people. (Tape 7, page 12)

In the summer of 1986, Karen started working in the summer Bridge program. Her involvement helped her become the teacher she is today. She taught every summer until the program ended in 2010, and she does not remember who introduced her to the program and how. Although she had gotten her feet wet earlier teaching small classes with similar students, this was the first time she dealt close up and one-on-one with students. In this experience, she had students for two to three hours 5 days per week, and these students lacked basic mathematical skills. She said that as soon as the first two-week pilot started, she felt connected to at-risk students.

[30] I went in not knowing what it was going to be like. And the thing I remember about that one, and I do think if I remember correctly that this thing first started for athletes. I remember there being some humongous guys in there. I just remember looking up at what they were writing on the board because they wrote really high on the board and thinking these are just little kids that don't know math; it doesn't much matter what size, shape, or color they are, um, they uh, boy, they need some help here, and just having a desire to, you know, look past a lot of things, I guess. Maybe that's one of the things I do, is look past what other people see. Like I don't care if they're an athlete. I don't care—I mean, they think it's such a big deal, what they think is a really big deal is that I would care whether or not they like math. I *know* that they think that's a big deal. I don't care that they don't like math. I wanna help them see that they *can* do it and that maybe it's useful, and that maybe it's kind of neat that they can solve problems. But, you know, it's not a big disappointment to me that they come in not liking math. So, I guess, part of it is that I look past a whole lot of things that don't matter and then just look for the gaps. I mean, like, you know, not just mathematically, but confidence. (Tape 2, page 11-12)

From her first experience with these students, Karen shows an intense desire to be with and teach these students. I believe that her first impressions show her innocence about teaching at-risk students; she did not have any preconceived notions. She also spoke of her experiences after the first 2 weeks and compared that with who is she today. At first, she did not know anything about these students who were athletes. Over time, she saw that at-risk students had all kinds of attitudes and feelings (such as looking down on math or not liking math). In the quote, she comes back to the “big deal that students don’t like math” idea again and again. She brings this up three times. She still does not care that these students do not like math. Despite all of this, she felt that “boy, do they need some help here.” This was a real need that these students had, and this also describes her feelings today. She looks past students’ size, color, race, shape, and any past experiences that students may have had and views at-risk students as valuable while others may not.

The first summer lasted only for 2 weeks because it was a trial run. Karen felt that 2 weeks was too short a time to make a difference in “students’ base knowledge or attitude.” Fortunately, the subsequent summer sessions were 6 weeks long. Another math instructor was responsible for the diagnostic tool that was given to students at the beginning of summer so students could be placed in a math course in the program. Eventually, when Karen was the coordinator for the mathematics component, she was responsible for the diagnostic tool for students in the program.

For the first few summers, Karen was not always completely sure of everything. “I would say that there was a lot of trial and error at the beginning, and a lot of astonishment at the beginning, that people that knew so little math could learn math just fine, you know” (Tape 5, page 1). As she started the program, she kept an open mind and open heart with the students.

Although she felt connected to students right away, she did not bring any strong positive or negative feelings with her. In many ways, she came to the position with a clean slate and heart and with no preconceived notions about this student population. “I don’t remember whether or not I loved it immediately, but I cannot ever remember thinking it was drudgery” (Tape 5, page 1). Having been with at-risk students for so many years now, her feelings for this student population are much more solidified. Now, she really “loves” teaching the at-risk students in this program, and she “loves” the small classes. She “evolved from . . . giving information at the beginning to realizing over time that it was a lot of diagnostics” (Tape 5, page 2).

In the fall of 1987, the Bridge program expanded to include a full-year academic component called Transition. At first, Karen did not have a teaching role. For several years, she was only asked to find teaching assistants to teach the mathematics for the whole year component. “I was the person giving them, um, the names of TA’s, after talking to them, that I thought would be very good instructors for the Transition classes in the fall and spring semesters” (Tape 1, page 14). She still continued teaching large lecture and small sections of courses as an instructor in the Mathematics Department while teaching the summer component. In the fall of 1994, this changed.

Professionally, Karen had acquired two degrees in teaching mathematics. She had started her career as a Teaching Associate in the mathematics department, and she taught small classes over the summer to at-risk students. Apart from getting started in the Bridge program, she also initiated another major development in her personal life in that year. Ever since Karen was young, she can remember wanting to adopt as a single parent, and adopting Nick was another life-changing event. In 1986, she decided not to buy a boat for which she had already arranged financing, and started praying non-stop, asking God to show her whether or not to adopt. “I

believed he, and I still believe that he knows the best for me and the best for all of us, and so I didn't want to go off doing this thing on my own" (Tape 1, page 16). For her, this was a period of searching and guidance. She started reading the Bible from the beginning. In this process, some months later, she found a passage that inspired and enlightened her. "I did not look for this verse. I was in the Psalms which is a pretty, pretty good distance through, so I had probably been reading the Bible straight through for months, 6 or 8 months" (Tape 1, page 16). Psalm 68 says that "God puts the fatherless in families." This made the decision for her, and she started telling people, "I am going to adopt."

Her desire to adopt shows her dedication to those who are not normally served. This is similar to her dedication to students who have limited mathematics backgrounds. Karen's first attempt at adopting was with a service agency in Illinois. At the orientation meeting, she knew right away that being a mother to a disabled child would be difficult for her so this option was out. She said that "I know that I really don't care at all about what race the child is. I just do not want a healthy white infant child" (Tape 1, page 17). Adopting a child of a different race was strongly discouraged by this agency. Passion and compassion filled her heart for those who are not always wanted.

Another attempt was to adopt overseas. Once again, Karen came before God and prayed. "Well, Lord, I just, I mean I had a slight preference towards going to the country and not just having the child, um, flown over on a plane. . . . I know Guatemala was a possibility, Brazil was a possibility, and India was a possibility for single parents" (Tape 1, page 17). Karen decided on Brazil because she could pick up the child.

[31] I know these things might have happened anyway, because I know that you, you're wondering how I know, but I moved into my office. Um, we were changing offices. . . . Um, I got to choose what desk I wanted, and seriously, in retrospect, this wasn't even the best desk, but I believe God led me to it, and behind that desk was a huge poster of a

butterfly that said, “Fly to Brazil,” and I chuckled, and I prayed, and I said, “Well, God, aside from anything else, then unless you stop me, I am going to go to Brazil, because this poster is, you know, some sort of an answer maybe,” and I knew it might not be, but I figured that with nothing else to go on, Brazil was one of the countries I had to choose from and this poster said, “Fly to Brazil,” and so, I told the Lord I said, you know, “Just stop me, if it’s wrong but with nothing else.” (Tape 1, page 17-18)

In the early part of 1987, a setback occurred with the decision to adopt from Brazil. When she checked on the status of her request for adoption, she was told that the Brazil program had closed down without any notification. Suddenly, the agency called her and told her about a little boy in Peru. Her response was “That’s great!” and she made preparations right away. These included trips to the Peruvian Consulate in Chicago and getting official documents and plane tickets. Despite this, she did not have complete peace with it.

[32] I went to church—it just happened to be Wednesday night or Sunday night services, I don’t know—the day before I was supposed to leave and, and so I went and asked my pastor to pray for me. He was kind of a new pastor. He didn’t know me real well. . . . He knew me well enough, and so he prayed that if, you know, that God would give me peace about it or that he would call it off, you know, that something would happen if this is not the right child for me, and I went home and there was a message on my answering machine from the agency that the, um, adoption was called off, because the judge there would not work with that lawyer. I assume it was [a] crooked lawyer, maybe, who knows. That’s all I know. I just believe that God took care of it. That it was not the right child for me. (Tape 1, page 18)

Even at the last minute before Karen went on the trip, she wanted to be convinced that this adoption plan was from God. Going to church, asking for prayer, and getting a response on the answering machine continue to show her amazing faith and trust in God. This experience also shows how much God has a role in her life. The Peruvian child was not “right” for her, but she still had hopes that another child would be hers.

Another opportunity came along in November of 1988 when she received a phone call saying, “We have a little boy in Brazil.” Once again, she never received a phone call telling her that the adoption program was started up again in Brazil. The adoption agency just called and

said, “We have a little boy in Brazil. He is not very healthy so we would like you to get there as fast as you can” (Tape 1, page 18). That little boy is now Karen’s son.

Karen’s persistence and determination for adopting and helping those who are underserved are part of her essence. She went to Brazil with much difficulty. First, she had to borrow a lot of money to pay lawyer fees in cash. Second, she had to meet with social workers, lawyers, and other people in Brazil before she was finally able to get to her son. However, she felt a deep connection when she was holding him in her arms for the first time, when he was only five months old. “[When] they handed him to me and it was like I had known him all of his life” (Tape 1, page 20). An observer said to her, “It just looks, you know, he is very different with you than what he is with us or whatever. It’s just like he has known you forever. I said, ‘Yeah, I feel very comfortable with him’” (Tape 1, page 20). “Comfortable” is also one of the words students in her classes used to describe how they feel talking to her and approaching her.

After the cliffhanger adoption, Karen settled back at home with her son. With the expenses of adopting and being a single mom, income was going to be important. She also wanted to provide opportunities for her son: “I always wanted Nick to be able to have a reasonable number of opportunities for swimming lessons when he was young” (Tape 4, page 9). Other expenses included diapers, childcare, and later gymnastics and other sports. The other concern was that the starting salary for a teaching associate was \$14,000 in 1981, and by 1989, the salary had increased to \$19,000. For Karen and Nick, “it just wasn’t enough—things were very tight” (Tape 4, page 9).

Fortunately, part-time employment at the local community college was available for Karen. Recall that Belinda M. let her observe college instruction at this same community college while she was student teaching. Karen had also taught one course at community college some

time before she adopted Nick. Karen remembers walking in and asking for an application at the community college and getting the job right away. This happened in 1991 when her son was 2 years old. She taught a variety of courses similar to the ones she taught at the university including Algebra I and Linear Algebra. After the first 2 or 3 years, she also supplemented her income with working in the learning lab at the community college. In this role, Karen worked one-on-one or in small groups of up to three with students, teaching modules from Pre-Algebra, Algebra I, Intermediate Algebra, and Geometry. Students struggling in these classes could come in and take lessons in the areas in which they were having difficulty. She had a wide range of students, occasionally including students who were autistic or mentally challenged. Working with these students who had difficulties gave her the experience to work with a wide variety of students. Working in the learning lab also gave her “flexibility” because it allowed her to work during the day there and be home at night. Eventually, she asked for as many hours as possible in the learning lab so that she could quit teaching regular courses at the local community college. “Working one [teacher] on three [students], which I love doing, unless I have an autistic student—you get to look the students in the eye and figure out exactly what they need, meet their needs, get them ready for a class” (Tape 4, page 9). Karen continues to work with autistic students at the community college, but her preference would be working with the autistic student one-on-one.

All the while, Karen was still working as a full-time instructor teaching regular courses in the mathematics department at the university and working with at-risk students during the summer. I wondered how teaching at the community college would have helped her work with at-risk students since the students at the community college and Transition program were similar

in that they lacked basic mathematical knowledge. Teaching at community college would prepare her for the future.

[33] Working one on three, you really find out what people are thinking and what is hanging them up, and what works and what doesn't, and explaining things to students, that then you can use as an explanation in front of an entire class. And so I know that it has helped me to improve as a teacher, to work one-on-one and one-on-two. . . . I can remember times when there would be just one spot out of three would be filled, and I would work one-on-one or one-on-two. . . . And working on the one-on-one, one-on-two, one-on-three setting, I so much more about what they are thinking, and where their thinking is going wrong, and how to fix that. So yes, it is—I mean that's just where I learned what they're thinking. Office hours at the university is the same thing. And every once in a while, in a classroom setting, the kinds of questions that they ask, allow me a little insight into where they're going wrong. (Tape 4, page 10-11)

Teaching one-on-one with students in the learning lab provided a wealth of knowledge for Karen. She learned that students do think about mathematics, and she also learned what they were thinking mathematically. She determined what students knew and how to guide their thinking. She also figured out ideas that “hang up” students. She learned techniques from these one-on-one interactions that could possibly be used in a lecture as a way to introduce or teach a lesson. Those one-on-one interactions helped her become a better teacher for at-risk students because she learned about common difficulties that students were having. Based on my observations, Karen uses her knowledge from her one-on-one interactions with students in the large-group setting.

Becoming the Bridge Program Leader

The amazing force Karen presents now in teaching at-risk students was mostly developed in the period from 1994 up to retirement in 2011. This is when she was recognized as a seasoned mathematics teacher as demonstrated by her three teaching awards. From the interviews, one can distinguish several different types of growth in her, which will be discussed in this and the next

few sections. Her major development started when she went to the administration and asked to be the sole instructor for the students in the whole-year program. She summoned the courage to start working full-time with these students. After this, in the subsequent years, one can see her growth as a classroom teacher in several areas, including diagnosing students' needs, promoting little successes for students, connecting interpersonally to students, learning about the student population, affirming students, and coaching them. By constantly teaching these courses over a period of time, she became a seasoned and more effective classroom teacher. She started to deal with students at a personal level to help promote their mathematical learning.

Until 1994, Karen had taught mathematics courses to at-risk students at the university, had gained experience with at-risk students one-on-one at the local community college in a learning lab, and had worked with at-risk students over the summers. In 1994, on her own initiative, she went to the administration to propose that she become the sole instructor for the mathematics courses offered by the Transition program during the academic year. This was the beginning of her tremendous unfolding from 1994-2011. Certain seeds had been planted that made her into a great teacher. She experienced a lot of growth and became the center of the mathematics teaching in the program.

In Karen's full-time position in the preceding years (1982-1994), teaching large classes for the university was "difficult" for her. The administration of teaching large classes was part of the challenge, but teaching 200 plus students was also tough. One problem was that Karen had to work with other TAs in managing the course, and she had difficulty working with students taking the course. In the classroom, "I tried to get interactions, and I'd try to leave time when I would say, 'Work with your neighbor on this problem' and try to keep the students involved in active learning. It was very difficult in large lectures" (Tape 4, page 12). She wanted the opportunity to

do something “different,” and teaching small classes would fulfill her desire for small group activities and more one-on-one work with students.

In 1994 she realized that one of the primary instructors of the Transition program would be leaving the position. Karen became concerned about who was going to teach these courses in the future since TA’s taught most of the courses. “I was feeling responsible at that point. I had been part of the Bridge Program for enough years that I was feeling responsible for these students after the summer” (Tape 4, page 12). This triggered Karen’s approaching the administration.

She went to the Bridge/Transition director and said, “What I think, you might save money, honestly, hiring me full-time, and I would love to teach the Transition classes, and I have enough time, you know, that I can teach all of them . . . rather than looking for different instructors” (Tape 1, page 14). The administration accepted, and in 1994, she became the full-time instructor teaching mathematics to at-risk students in the program while continuing to teach in the summer component.

As we were discussing Karen’s courage to go to the administration during our interviews, her dedication to the students was clear.

[34] From the very beginning, I just believed these students can learn every bit as much as everybody else can. . . . But other people would not see it that way. But from the beginning, I thought it was very interesting to work with students that had such a void, you know, in their math education. (Tape 4, page 11)

Karen’s role as an instructor in the mathematics department changed for the better. “The Bridge/Transition very, very, very much matches my personality. It’s been a good match” (Tape 1, page 26). Teaching large classes did not fit her because it felt like a “job.” She went from teaching large classes one semester (and looking for good TAs) to teaching small classes that had

10 to 30 students. “Wonderful” is the word she used to describe the change. She could see the smiles on the students’ faces, and she could hear them say, “Oh, now I get it!”

Despite Karen’s lack of academic knowledge and experience teaching at-risk college students, she seemed to have a natural talent for understanding the needs of at-risk students. As part of our interviews, I asked how she was able to address their needs.

[35] Now, this is going to be a surprising answer, but if it pops into my mind, I mean I'm surprised by this answer, so it pops into my mind so I'll say it because, um, I think I'm just built this way to see it. (Tape 2, page 10)

Karen clarifies that helping and understanding students’ needs comes instinctually for her. Ideas and thoughts come to her naturally. As soon as she took over the full-time teaching responsibilities in this program, on her own accord, she determined the needs of the students and changed the teaching schedule because she felt doing so would help students. During our first interview, we talked about this.

[36] I get to know the students and who is struggling with what they are struggling, and, um, then get to design the next day’s lecture based on what I know that they need, you know, work on, rather than just so we go on, we go on, you know, here’s the next lesson. (Tape 1, page 15)

This paved the way for her proposed teaching schedule:

[37] When I took over the Transition classes, I asked permission. I said, “Can I offer these at different times and that sort of thing?” and I remember them saying, “You can do anything you want with them,” and that's when I decided that I wanted them to meet, um, more hours per week if that's, if I could do that, and so I have the luxury of having the time. And that happened when I took those classes over, that I said, “Well, I would like to have them, you know an hour and a half a day, four days a week, and it's really an hour and 20 minutes a day, four days a week.” . . . Yeah, so everything about the amount of time and the size of the class, it lends itself toward greater education if, you know, I look back into, oh, I think back into when Socrates or somebody like that could mentor somebody one-on-one, and I think that's probably the ideal learning situation is just doing something, you know, 15 hours a day, and, uh, I feel like that I come as close as we can get to have them four out of seven days a week there with me, so if they're stuck on, you know, the weekend only is the time they would have to wait three days to ask me a question, and they could come to office hours or something. (Tape 1, page 15)

Teaching Transition students enabled Karen to blossom as a teacher. Her mind and her passion were focused on the students and how to help them. She was able to get to know the students one-on-one in her courses just like the students in the learning lab at the local community college. These interactions made her aware of their struggles in learning mathematics. This is what she is like in the classroom: she eagerly wants to know how to help students. The experience has been very “rewarding” for her. Since the beginning of taking over these courses, Karen wanted the best for students and thought about the best ways to serve them. While the other university math courses met for 150 minutes (50 minutes per day for 3 days week), she was thinking about how to meet their needs and tried to meet those needs by having classes for 320 minutes (80 minutes per day for 4 days) a week. A strong desire to be with students one-on-one runs deep within her. Her desire to teach at-risk students one-on-one at the local community college also shows this. She had the initiative and the understanding to help these at-risk students with little experience and formal training on how to teach them. Also, she “loves meeting with them almost every day of the week” (Tape 2, page 12).

During our interviews, as Karen reflects now about going to the administration, she was very “excited that when it occurred to me” (Tape 5, page 8). Our conversations showed her passion and enthusiasm:

[38] I thought, “Oh, my gosh, I wonder if I could do this?” So it wasn’t just would I rather do that—it was I knew I would rather do that. . . . Just thinking about the possibility and how wonderful it was gonna be. . . . I was so excited that that actually came to pass that I got to teach small classes. (Tape 5, page 8)

Karen clearly had a strong desire to work with these students. This was the last step that drove her to become the coordinator of the math component for the entire program.

Developing into an Effective Classroom Teacher

One can see Karen's teaching development in different aspects of her growth. In the last section, she started with going to the administration and working full-time with at-risk students in the whole year program. After she took this position, this propelled her into developing as an effective classroom teacher. Judging by student evaluations and Karen's teaching awards, she became a highly effective teacher of at-risk students starting in 1994 until she retired in 2011. Her evolution as an effective classroom teacher was a major part of our fifth interview. All of the following sub-headings come from our discussions in interview five and involve her growth in diagnosing students' challenges, promoting little successes, learning about students' backgrounds, and interacting personally with students.

Diagnostician

One major aspect of being an effective classroom teacher for Karen is diagnosing. In her terms, "diagnosing" means that she constantly tries to identify where students are in their knowledge prior to starting a lesson.

[39] At the very beginning, I was probably just giving information and trying to give it at the right level . . . I think one of the things that has—that I probably learned to do better and better, is diagnose what the students need. And there [are] some things now that I realize are errors that a lot of students make, that I just didn't have enough experiences along the way. . . . And so I learned to diagnose better so that was a definite evolution that goes on to this day. . . . I just had to listen so carefully to each question they ask, and think why are they asking it because there are so many different ways to answer every question. And now I just have evolved because I have so much experience, I can tell from the wording that they use, what they need to hear, why they didn't understand a problem, and that kind of thing. And so I've evolved as a diagnostician. (Tape 5, page 2)

As Karen describes, with experience, she became aware of common errors that "a lot of students make" and what is difficult for them to learn. For her, an important part of diagnosing involves learning to "listen carefully." Today, she can tell what students are asking from "the wording" that they use. She is aware that listening was a tool that promoted her growth as an

effective classroom teacher because it led her to understand students' difficulties. As will be discussed more fully in Chapter 6, from classroom observations, one can see that she does, indeed listen to students and diagnose students' knowledge at different levels.

"Little Successes"

Many, if not all, of the at-risk students Karen works with experience some kind of failure in mathematics during their education. She wanted to change this by wanting and giving them "little successes" during their learning.

[40] One thing that has definitely evolved is my realization that they need to experience little successes—not just me giving false pats on the back, but little successes. Probably in tapes of classes, I'm heard saying "That's good." Sometimes when it seems like something isn't even good. But if somebody is adding negative six and negative nine, and they get negative 14, there is so much good about that, because they realized that what they combined was going to be negative, and that it was going to be the sum of two numbers, and not the difference—they're realizing the direction. And so, just realizing how important it is for them to have successes, because these students have had such bad—well, some of them have had bad experiences with math, some of them just haven't had enough experience with math, but now they're old enough to feel like they are behind anyway. And they just need to know that they can do it—they need to have some success along the way. (Tape 5, page 3)

Many teachers say "good job" or give "false pats on the back," but, for Karen, seeing the "good" is genuine. She could articulate the good that she sees, and it really means something. Students know that her compliments are real. Actually, becoming aware that students need "little successes" was an important realization for her. She remains positive and recognizes so much "good" in students' work and their efforts. She wants students to know that they "can do it." She realizes that these students are "old enough to know that they are behind in school" so advocating little successes in the lives of these students becomes even more important. They may have felt a sense of hopelessness, so pointing out the good in their work is crucial. After being in various courses with her and after many hours of observation, in one-on-one interactions, large-

group settings, and in working at the board, one can see that Karen is constantly making sure that students experience “little successes” on their own from their efforts.

Students' Backgrounds

Another aspect of Karen's becoming an effective classroom teacher was learning more about students' backgrounds. Today, she looks like she knows the kinds of students she will be having in her classes. In the beginning, she had no idea about almost all of these things. She did not know about the kind of students with whom she was dealing. Smaller classes, longer class periods, and personal interactions gave her more opportunities to get to know her students. Karen's knowledge started to grow.

[41] I did also learn more and more about where the students were coming from that were in our particular program. I started realizing more and more that they had varying exposures to math, realizing that some of them had whole years where there was a substitute that didn't teach math. And that's not all of them, by any means, but I realized that they were just coming from such a wide variety of places, that I couldn't assume anything. So that was just something different that I learned, was that they were coming from a far different place than I was—they were coming from some violent situations . . . I started realizing, I guess, more, how does it affect a student to be a first-generation college student, because they weren't thinking about going to school all of their lives. So I started learning more and more about where this particular—but like I said, not all of them—I mean some of them were from the local high school, and they just screwed around, and they didn't have the grades to get in, but they really wanted to go to the university. So part of it was realizing that you can't stereotype people—that they come from very different places. (Tape 5, page 11)

Karen had many realizations in this area. One general conclusion she made was that she could not make any conclusions about the students' backgrounds. She also realized that students had varied exposure to math. She started realizing students were coming from a “variety of places” or “very different places.” Some students had substitute teachers all year long for their mathematics instruction. She also realized that many of these students are affected by the fact that they are the first generation to enter college. Innumerable realizations came with this. Students needed to get acquainted with office hours, studying habits, syllabi, etc. She also

became aware that some students were not thinking about going to school while other students were just messing around in high school. These realizations influenced her teaching and her interactions with students in different ways. Throughout my classroom observations, I noticed how she accepts students regardless of their backgrounds, but she also paid attention to how students' backgrounds affected their needs as college students.

Personal Interactions

Another important part of Karen's becoming an effective classroom teacher was her personal interactions with students. As she worked with students in small classes, she had many opportunities for one-on-one personal interaction.

[42] I have evolved, definitely, in knowing the level of connection I need with the students. At the beginning, I was young. I don't know how to describe it. Maybe just because I've aged, that the connection I have has evolved. I am really comfortable with the mother/grandmother connection that I have now, because, more quickly, they're able to believe what I think is the truth, that I care and really want them to learn mathematics. And now that I'm significantly older than they are, they're able to accept the kind of—I think there's more of a trust there. So the level of trust I have with them has evolved, maybe just based on my age. (Tape 5, page 3)

Karen is there for students emotionally and mathematically. The “level of connection” with students has changed over time. She started teaching with a “young person” connection. Over time, she has gotten comfortable with feeling the “mother/grandmother” connection to her students. This helps students really believe what she is saying is the truth. Specifically, students trust her in her honesty: she really cares about them and “wants them to learn mathematics.” The level of trust she had with students grew over time.

Working With the Whole Student at All His or Her Levels

The above sections describe specific teaching practices that Karen developed as she took on full-time teaching of students in the Bridge program, but there are also more general aspects

of Karen's role as a teacher and her orientation to students that are worth noting. These center around Karen's work with students as "whole students"—i.e., she related to students as people and not simply as mathematics students. This and the subsequent section explore these aspects and provides a more holistic view of Karen and her teaching. For example, she became a "coach" to students. As she worked with students, her role as a mother or grandmother helped them believe in themselves. Also, working with the whole student involved her supporting students with verbal affirmation. She believed and showed confidence in them. Karen's working with the entire student shows her genuine care and her dedication to them.

Coaching

In our society, "coaching" often refers to the activities of an athletic instructor or trainer. The term, "coaching," is also used for other areas such as business, life, career, etc. These are all generally similar in meaning. Karen serves students by being like a "coach," especially in regards to teaching mathematics. She helps students succeed at mathematics, and in college in general. This includes modeling different mathematical techniques and study habits. She gives specific instruction on work with mathematics and how to act in college.

[43] To listen to the teacher or, you know, they just um, you know, for some of them, because not all of them have been coached well by them and not all of them come from inner-city Chicago schools, but the ones that do, literally, all they had to do was show up to class to be thought of as a great student, and they weren't expected to listen and be respectful and um, you know, learn, for instance, and that kind of thing, so yeah. That—it comes out of the, what I think of as the scholastic immaturity. They just aren't quite ready to be, um, fully present in the classroom to learn, and you just kind of have to coach them on that a little bit, you know. Well, sometimes I have to give them the homework talk, like "Do you guys know"—and maybe this would be true for any student, too—"Do you know why I assign homework? It isn't to get a homework grade in the gradebook but because you need practice, if you wanna"—you know, so sometimes, I just have to come right down to explaining to them, um, what is expected of them in the classroom, or that it is expected that they'll listen to me or whoever is up at the board, you know, and that being present isn't good enough and it is expected that they won't be texting, because why would they be in the class—you know. (Tape 2, page 8)

Karen accepts and works with students from wherever they are (just like the young wealthy man she taught when she was 17). She has developed her own way of “coaching” students. She spells out the rules of the game, including how to participate in class, how to get good grades and why homework is important. She believes that students come to her courses wanting someone to say, “Do this and get the answer.” She is trying to change the way students think of mathematics and of education in general. This involves changing the ways students do mathematics and their conceptions of what it means to be a learner of mathematics.

Servant Attitude Towards Nick and Her Students

Karen’s parenting of Nick has proven to be helpful in relating to students in the program. Parenting Nick helps connect her with students individually because of some of their learning difficulties. She finds similarities between Nick and the students in the program.

[44] I feel like they, um, need some mothering, I guess, and they need somebody to believe in them, and that's one of the things, you know, that all of Nick's life he struggled with ADHD . . . but I do tell these students that they can do it, that they can learn math, and it's very much the same as parenting, I guess. I want them to, to know that I do care whether or not they learn the math, and that I like them regardless—one of the things that has nothing to do with my son’s race, but it means so much to students I think when they find out that he isn’t good at math, and that I still like him, and I like them whether—you know, I think that most of them don't have a chance to learn this, that I can, can like them regardless of whether or not they're good at math. That doesn’t matter to me. (Tape 1, page 24-25)

Karen understands that some of these students may not feel like they belong in college or at this university. In order to help these students get through college, she has a desire to be there for them in a “mothering” or “parenting” manner. She wants her students to know that she believes in them just like she believes in her son, despite their struggles. Her care and treatment for both her son and her students is genuine and independent of their liking math; she cares for them as human beings. Students can feel a great sense of respect that she has for them.

[45] Yeah, just that I respect them—they can sense the respect that I have for them as people. And I respect anyone who’s trying hard to learn, especially when I know they do not like mathematics. And they’re really pouring their heart and soul into trying to learn it, and often successfully, but not always. I think they can sense that I respect them. (Tape 7, page 3)

Karen clearly holds no judgment nor does she condemn students for where they are in their learning.

Adopting a bi-racial child (Nick) was an unexpected choice that helped Karen connect with African-American students. After she spoke about the timing of the adoption and the beginning of teaching at-risk students full-time, I wondered if she realized these two events happened at about the same time.

[46] Well, I mean it occurred to me shortly into the Bridge program that if they knew I had, um, a black child that maybe they would not think that I was a racist, but maybe—because I think that—I noticed right away that, um, the defenses of some . . . black people just became much more friendly when they realized Nick was my son . . . I did just notice, um, that my students seemed to just have a different rapport with me, um, when they did, but I wasn't teaching the Bridge program before that either. . . . It's not like my opinion of black people changed after I had a black son. I just really never cared about race so I might have had a fine rapport with all of my, um, students that are, you know, of a different race than me even without my son. . . . So I think it's worked, just has been a wonderful side advantage, little bonus that when my students know I have a multiracial child that they know that I really don't care, and that I am not judging, and that I am not a racist. So that's been a wonderful side effect of that, that we can just break down that barrier right away and say, "Okay, I just like you for people and students. It's not that I, you know, wish you were a different color or I am scared of you or leery of you or anything, you know." (Tape 1, page 21-22)

Karen feels that students who see or who know her son, may be more comfortable with her. This was an unexpected benefit from adopting Nick. Karen is always trying to make students feel comfortable around her and trying to connect with them. She did not care that those first summer students were “humongous guys.” She has been able to see these students beyond their skin color. Students who stop by her office can see a picture of her son on her desk. They make the comment “Oh, is that your son?” (Tape 1, page 23). Seeing Nick’s picture is a way for

students to get to know her, and the picture can be a way to draw them to her. She does not point out the picture on her desk to students. Out of the students' own curiosity, they ask her about her son. She believes the picture of her son encourages positive interactions (i.e., attitude) between her and her underrepresented students.

Selflessness as a Mother or Grandmother

One of the first impressions that one may have of Karen after talking to her for the first time is that she is like a grandma. During the interviews, students articulated that Karen is like a mother or grandmother. I believe this stems from both how she treats them interpersonally and hearing about her son. She is also selfless towards her students and wants to be there for them. From the second interview, we discussed her “role” as a mother or grandmother.

[47] I've had at least one student every semester that I can remember recently say, “I wish you were my mom.” And the reason it comes up, well not—yeah, the reason that it comes up is because I probably talk about my son, you know, at different times, and, um, that's not the reason that they wish that I was their mom, but it's the way that I talk about him. I think they can tell, you know, how much I love him and care for him, but you know, I do think that nurturing students is kind of part of my job, and nurturing their self-esteem, especially in regard to doing mathematics, because most of the students that I get do not like math and have not had success with math. But what I see in them is smart, intelligent individuals that have not had the opportunity to fully realize, you know, their potential to learn math or anything, um, you know, to, you know I don't think that they've been raised—and not that they've had bad families or anything but most of them weren't raised thinking that, you know, their goal is to go on to college and most of them I don't think were necessarily raised to be told to be anything that they wanted to be. All these things I had, you know, I had somebody telling me that, and um, so just in case, I just don't think it hurts to have one more person telling them that in any way that I can, you know, and so I do—I look at them as people with great potential, and um, that they're just at the beginning of a journey. I, you know, wanna just encourage them as much as I can to believe that they can do it, and just, to just—so that's how I see them. I see them as a great big bundle of potential. (Tape 2, page 1)

Karen's devotion and the way she talks about her son has made students realize how much she cares and loves him and makes them wish that she was their mother. Although she feels “mothering” is a part of her job, her desire to cultivate their self-esteem (especially in

regards to doing mathematics) is part of her genuine caring nature. This is evident from her beliefs: that she sees them as “smart, intelligent individuals that have not had the opportunity to fully realize . . . their potential to learn math or anything.” This is visible in how she treats students interpersonally as well. She asks them how they are doing (among other things) and continues asking students how she can help them and be there for them.

Verbal Affirmation, Believing and Confidence

At the beginning, Karen realized that students needed to experience little successes in mathematics. She has also felt that she needed to be a source of encouragement to at-risk students. She acknowledges and tries to address their lack of confidence.

[48] I think maybe it is that they *do* lack confidence a little bit, over some of the students that, you know, have had success after success, you know, and come in to the university knowing, “Oh, yeah, I’m just going to do this, too, you know.” So there’s probably that difference. Um, it is that they require a little more encouragement. (Tape 2, page 6)

Despite the students’ background, she wants to promote their self-efficacy. As an instructor and as someone who cares, she wants to communicate to students that she believes that “they can be anything they want to be.” This hits this group of students more and differently than other students. Of course, she also wants them to believe it for themselves. She sees them with great potential, and she wants to continue to encourage them—just like her father did for her.

Supporting and believing in students is important to Karen, and this was discussed in great length throughout the second interview. During this interview, we continued our discussion on verbal affirmation and affirming students.

[49] Well, it makes me, um, glad, and feel like I have been encouraging to them, you know, so I think, well, I’ve hopefully done as much as I can, then, to let them know I believe in them. I mean, I think that they can tell, you know, that I believe in them. So I’m very, very glad when they say something like that, I’m thinking “Yes!” you know, I at least got through to them, you know, that they know that *I*, um, *am for them*. You know, I just wanna make sure that they know that *I am for them*. . . . The ones that I feel like I make the biggest difference, um, are the ones that really respond to—you know, they

must have a desire to learn, um, and then they respond to the fact that they're being told that they *can*, you know, and the positive reinforcement goes a long way. (Tape 2, page 1-2)

Being there for students is at the center of who she is. Encouraging students is one way that she is there for them. She wants to make sure that students know that she is there for them. Not only does she want to be their mathematics teacher, but she also wants to be someone who is with them as a supporter, cheerleader, advocate, and mentor. Her greatest impact is on those students who respond to her encouragement. Her encouragement “clicks” with those students who want to learn and respond to verbal affirmation. It can go a long way because it builds the self-esteem and confidence of students. Verbal affirmation is one major way in which she encourages them.

[50] Any response that a student gives to me, any question that they give to me, I think that um, I try to say something positive about it, like, “That’s a good question,” or, you know, if they give me any answer, I will, you know—in fact they pick up on it every now and then. There’ll be an answer that I’ll say “that’s close” or something, and then I realize it’s really not and all of a sudden, they realize it really isn’t, and I think okay, I’ve been found out. Um, but if they’re giving me any answer at all, then they’re thinking, and they’re willing to put what they’re thinking out on the line, and that is good, you know, and so I wanna encourage that, so I really, um, I try to make positive comments about, you know, any question that they’ve asked or any comment, especially any answer that they have made, try to work with their answer to, you know, lead them toward the right answer . . . I try to encourage them to come in and ask questions if they have them, let them know that *I*, you know, *am there for them*, and I don’t just see it as a job where okay, I’ve gotta be here tomorrow, but I really want them to find an avenue, you know, for getting help if they need it, so I hope that I let them—When I was younger I did it even more. I gave them my home phone, and I would spend *hours* at night on the phone—doing math on the phone—and I’ve had to cut that out just because I’ve literally worn out, you know, I’ve gotten worn out. And I don’t think it was necessary. I think it was way over the top, um, to be willing to be on the phone doing math with them. But, you know, I like to make appointments at coffee shops or whatever in between office hours if they need to get together, so just knowing, you know, letting them know I am available to them. (Tape 2, page 2)

Karen praises students for their willingness to do mathematics. Encouraging students to put themselves at risk in front of peers is one way that she supports their mathematical thinking.

Many teachers mechanically express their verbal affirmation (e.g. “good question,” “that’s close,” etc.) to students. However, for Karen, verbal affirmation is not mechanical. Instead, this is directly connected to being with the students and her encouraging and caring nature. This is the way she is. Equally important is having students know that she is “there for them.” She understands that they might need help and wants to be there to encourage them and their learning. She has come to realize that students put themselves on the line with an answer, and this shows that students are willing to try to learn. Karen believes in her students and is, therefore, willing to spend extensive time with them to help them learn.

Enjoyment of Mathematics and Teaching

Karen wants students to be aware that she is comfortable with her students and that she enjoys being their teacher.

[51] I think it is important to let them know that I enjoy being with them, to let them know that I enjoy teaching. That is what I enjoy more than—I mean, I enjoy the math just fine, I like, you know, I like that math is very logical, but I really like them to *know* that it excites me to see them learn, because then maybe they’ll want to learn more, you know. So I try to let them know—I may be overly positive, get a little crazy, and a little silly. (Tape 2, page 2)

One can hear all of the passion and enthusiasm in “I enjoy being with them” and in “I enjoy teaching.” Karen finds teaching and seeing students learn enjoyable. She uses the word, “exciting” to describe this desire to see students learn, and she enjoys living the “aha” moments, and the students’ smiles. Her craziness, passion, enthusiasm, and positive energy are demonstrations that she wants to be in the classroom teaching these at-risk college students.

[52] I get a little crazy and silly. I am normally kind of a reserved person, you know, in some settings I’m a really reserved person, but get me in the classroom and I will say silly things and do—like today, I picked up three pieces of colored chalk and started writing on the board with them all at once, or I’ll—this is not even a really good example, um, you know, just do silly things with them to let them know, hey I enjoy being here with you. And—but specifically I get a little excited about—well, you know how you feel about the babble that comes out of me once in a while. I let my feelings about “isn’t this

cool,” you know, come out, and then I’ll say something to them that lets them know, this is—that’s awesome, you know, or um and so yeah, I guess I try to be really positive . . . I wanted to be there and present and a hundred percent uh, for my students. And, most of the time, it just comes naturally, and I feel like doing that, but when I don’t, I make sure that I do it anyway, put on the energy. Takes a lot of energy, [a] lot of mental energy, emotional energy. (Tape 2, page 3)

Karen gave several examples of how comfortable she is with students. Being silly in the classroom is part of who she is and how Karen understands herself as a teacher. Her silliness communicates to students that she enjoys “being here.” She has no hesitation or reservations about appearing silly and displaying her feelings of “isn’t this cool!” in mathematics. She feels that it is important to be really positive in the classroom so students can see someone who is concerned about their learning and about them. Another silly thing she has done and continues to do is put thought bubbles on the board and tells students, “You’ve gotta think about this.” “I do the thought bubbles to be silly, to remind them to think about it. I think if I just say it they won’t, but when I draw the thought bubbles, sometimes on the board, they laugh, and maybe it makes them pay more attention” (Tape 2, page 4). Most of the time, her energy, her enjoyment, and her silliness come naturally for her; she does it because she feels like doing it. This is not a show; being herself is something that is in her and also gives her a sense of fulfillment.

Caring for Students Mathematically

Despite the limited mathematical knowledge that the at-risk students might bring with them to college, Karen makes sure that she holds them to high standards.

[53] I’ve always made sure—this is just a total aside, because I like to make sure I throw those in—that Transition classes do cover the whole syllabus. There is a myth, and not everybody believes it, but in the Math Department, I have had people say, “Oh well, isn’t that a watered-down version in the Transition program.” And it is not. I teach the same material as everybody else teaches. (Tape 1, page 15)

Her desire to make sure that her at-risk students receive the same mathematical material as other students at the university is important to her. And it is important to let others know of

her expectations she has for students. This is one way that she cares about students' mathematical learning.

One of these important high standards that Karen tries to address in her teaching is thinking and problem solving.

[54] Think *and* problem-solve. Think slash problem-solve. They need to learn how to learn, and that is maybe a little bit different than problem-solving in general, but yeah, what I think—you know, I don't think that most of them need a lot of mathematics in what they're going to do in life. I think that while it's going to be a wonderful thing for them to get a degree at this university, I don't think that they need a degree from this university. I'm hoping that they get it, if that's what they want, and it'll certainly help them go places, but what I really believe that they need is to learn how to problem-solve, and so, um, that is what I teach *through* the mathematics that happens to be in whatever particular course they're signed up for. (Tape 2, page 4)

According to Karen, teaching mathematics is just a means to teach problem solving. She has a larger vision for her students because problem solving can help their endeavors in education and in whatever plans they may have in the future. This shows that she cares about her students beyond the program. Although the mathematics curriculum is set by the department, she is determined to teach them critical thinking.

[55] I do just stick to the curriculum I'm given, and, uh, I mean, I do stick to it, not *just* stick to it, but like today in class, um, we were talking about solving quadratic equations—solving, um, rational equations. It turned out to be some quadratic and some linear and so, you know, I kept going over how do you know what method to use, because I think in math, and in life, I mean, that's one of the toughest things, is you get a problem, and nobody is there to say 'use this method,' and so, you know, I wanted to make sure that they were thinking ahead, that they will have to figure out what method, you know, to use, so I was trying to walk them through that today, and then ask them some questions, you know, what is it about this problem that would tell you, you know, that it's even a quadratic equation, or what is it about this that would tell you that, um, you, you know, do you wanna complete the square, why or why not, just, you know, helping them to think through some things like that, rather than just saying, "Okay, it's a quadratic equation; let's use the quadratic formula." (Tape 2, page 2-3)

Karen has a strong desire to push students to think and problem solve, and mathematics is a means to do this. Instead of telling them which method to use, she wants them to figure that

out. The question to students is “How do you know what method to use?” She wants to challenge them to think about what they know about a problem, to think ahead, and to determine which method to use to solve a problem.

Although she wants her students to solve problems on their own, she also believes that students need help to get there. Hence, Karen teaches her students incrementally. This means ensuring that she teaches the most basic skill first, teaching slowly, and showing one small new concept at a time. As will be discussed in subsequent chapters, Karen’s incremental approach is evident during lecturing, answering questions, asking questions, and reviewing homework problems. Students in her classes have a wide range of exposure to mathematics. Some have taken 4 years of math while others have only taken 2 years. Some remember past lessons, and others do not. With any particular mathematical topic or concept, she teaches from the “most ground level” and “makes sure that they’re having successes along the way.”

[56] Even not-at-risk students that haven’t seen the material before, there’s too much risk, so to speak in teaching larger increments and leaving anything to their imagination or leaving anything for them to fill in—I make sure I fill in the blanks for them, or make sure that they have filled in the blanks correctly. (Tape 5, page 6)

Karen feels responsible to make sure students know every little step and know it accurately. She does not want to leave anything to chance. After 30 years of teaching students, she knows that students can make up their own mathematics. She has come to realize over time that there are

[57] Little skills that a person needs in order to really understand. And if they don’t understand, then you’ve lost them. And so that [realizing that she needs to teach] just helped me in the evolution of my understanding all the skills. But at some point along the way, I made a decision to try to figure out, you know, that I wanted to think about every little step that could hang someone up. I wanted to figure out what’s causing them to not understand. And then along the way, you start realizing that people learn in different ways. (Tape 7, page 14)

This is just another way that Karen strives to promote students' self-confidence in mathematics. She realized that students who did not have all of these little skills became frustrated and lost. She realized that she needed to teach using incremental steps.

The Essence of Karen

For me, the essence of Karen is found in the following quote. For a few Transition courses, she had exams at night, and she was in need of a substitute teacher for one of those evening exams. She asked a few teaching associates in the Mathematics Department to proctor the exam. She remembered the class very fondly, "several of them [students] being very good students and very serious students, and just being one of those classes that was just 100% a joy to teach" (Tape 7, page 1). After the test, the substitute instructor handed the exams back to Karen and said,

[58] "Well, that was kind of a rough crowd or a rough class." And I was really taken back because I would have said the opposite about them. And so I had to stop and think. And it didn't take me very long—I mean probably less than 30 seconds, I thought, "Why in the world would this person say that?" And then I thought, "Well, it just has to be because of their race; it just has to be a stereotype situation." And what's really interesting, is that this person is one of the last people on the face of the earth that I would have thought would stereotype anyone. . . . And I can tell you that I definitely felt sad that these great students would be stereotyped as rough. And I just happen to remember that there were a couple of them—I don't know if it was the time period—that wore a lot of necklaces, chains, like gold chains or something—and I thought, "Well, bummer, that, you know, this person would look at them, and because they're black and have chains on, would think this is a rough class. (Tape 7, page 1-2)

The following captures Karen's feelings, attitudes, and behaviors about teaching and about teaching at-risk students, "It doesn't matter to me if somebody has tattoos and three chains around their neck. If they tell me they wanna learn math, I'm just thrilled" (Tape 5, page 11). This is true today and was true the day she was 15 and started teaching Algebra to the young wealthy man. As will be described in more detail in Chapters 5 and 6, Karen's students and my

own observations indicate that Karen understands her students' needs and helps them without condemnation or judgment.

CHAPTER 5

STUDENTS RESULTS

In the previous chapter, the teacher interview data were analyzed. The current chapter examines the students' interviews. Students who participated in this study reported positive ways in which the instructor affected their learning of mathematics. Students also discussed the instructor's effect on them as people. The participants identified several factors that can be examined in the context of two themes: the teacher's caring about students' mathematics learning and the teacher's caring about students as people. The current chapter examines these two themes and provides exemplars of data from the student interviews to illustrate both the instructional practices that were helpful and the instructor's interpersonal communication with students that demonstrated her care for students as people. The chapter closes with an additional cross-cutting theme, which is the benefits that students felt they gained from Karen as both a caring person and teacher.

As explained in Chapter 3, 36 students participated in interviews; half of these students interviewed once, and half of these students participated in two rounds of interviews⁶. For the purposes of analyzing the data, all student interviews were combined together as one group. The interviews were the unit of analysis for the entire dissertation. In order to distinguish content from the first round and follow-up round of interviews, the letter "A" is used to designate content from the first interview. The letter "B" designates content from a follow-up interview. A number before the letter is used to designate a specific student.⁷ A single coding system was used for

⁶ There was one student who participated in a third interview and fourth interview. It was included as part of the second round of interviews.

⁷ The same number before the letters (A and B) indicates the same specific student. For example, content from an interview might be noted as 11A, and then, a few lines later, content from another interview might be noted as 11B. In this case, this is information from the same student taken from the first and second interviews, respectively.

both interview sets. There was no need to develop a new coding scheme since the comments were similar in nature across the two rounds of interviews.

Figure 2 shows the total number of 54 interviews for all major findings. Figure 3 shows the number of responses that are only in the second round of interviews. Figure 3 also shows consistency in the categories among students' responses in the major findings. In many of the categories, there is a large portion of responses found in both sets of interviews. Figure 3 shows the number of student responses stated in both interviews and the number of responses stated only in a follow-up interview.

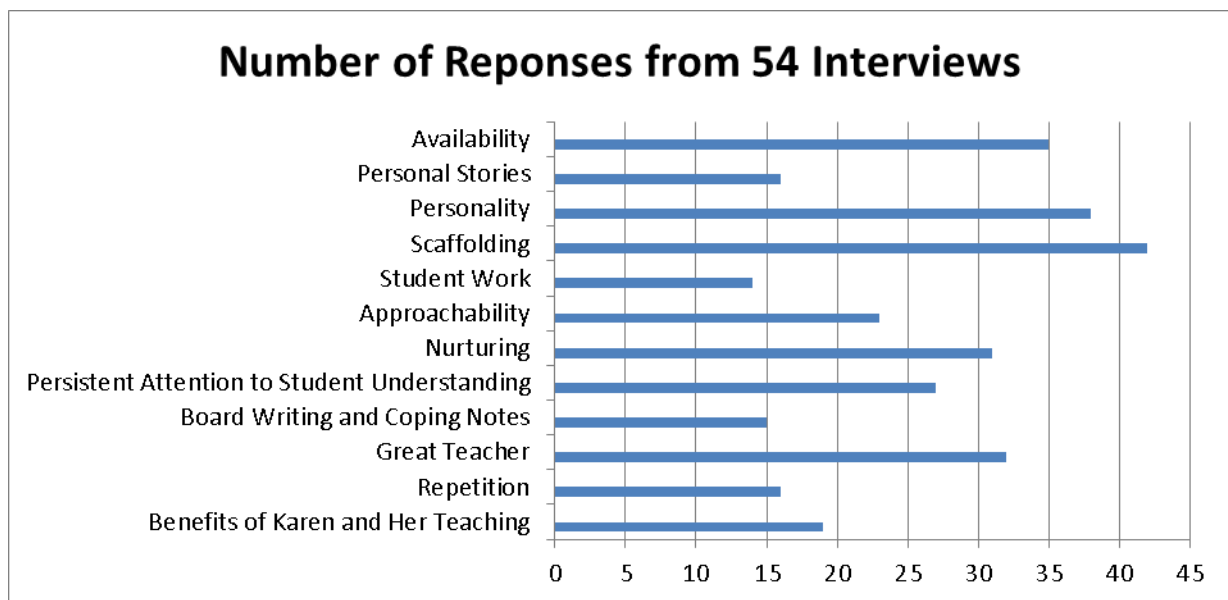


Figure 2. Results of student interviews.

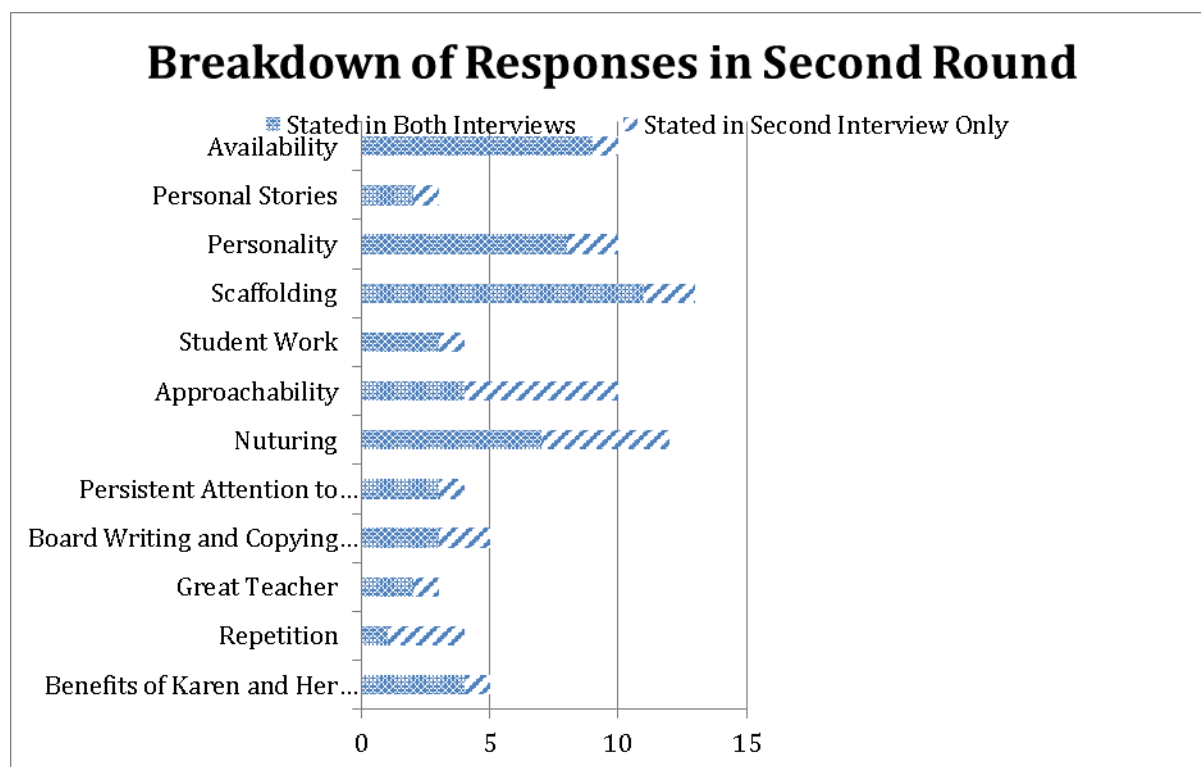


Figure 3. Breakdown of student responses for second round of interviews.

The total number of responses (out of 54 interviews) is provided for each major finding. The number of students who gave the responses in each major finding is also provided. Some major findings or categories (within this chapter) are comprised of sub-categories. The same counts are provided for the sub-categories. Note that an interview may be associated with several sub-categories, and a single statement expressed may contain several themes and fall into multiple sub-categories. As a result, the sum of the number of interviews classified in sub-categories may not equal the count of the interviews in a major category.

The student codes used for the analysis of the classroom data helped ground the analysis for the remaining student interview data. For this first round of coding, I only coded specific, direct comments that students had on the instructor and her teaching. While coding the entire student interview data, I kept and used the student codes (e.g., Approachability, Scaffolding) from the classroom data analysis. These codes were used as an anchoring tool for continuing the

analysis for the subsequent rounds of coding. During this second round of coding, I tried as much as possible to code every comment a student made in which they mentioned the teacher, her teaching, teacher comparisons, and other comments that weren't directly observable in the classroom. In general, the second round of coding was much more inclusive. In addition, both sets of interviews focused on the positive aspects of Karen and her teaching. Students rarely articulated negative comments about Karen and her teaching, and the comments were minor. The following are questions from the student protocol:

1. What do you think about Karen?
2. How does Karen make you comfortable?
3. How is it going for you this semester in your math class?
4. How is Karen being helpful?
5. (Probe Question) How do people like Karen help you get over those hurdles?
6. (Probe Question) What does Karen do in the class that helps? Anything specific?
7. (Probe Question) Do you think that your views on mathematics have changed because of Karen?
8. (Probe Question) When you came to Karen's class last summer, how was it like? I mean, what did you think of the math back then?
9. (Probe Question) Do you think Karen is caring?

General Comments – “A Good Teacher”

Overall, many students characterized the instructor as a great teacher. There were 32 responses (out of 54 interviews) that, in some way, characterized Karen as a good teacher. There were 30 students that gave these 32 responses. There were 12 responses that used the phrase “good teacher” to describe her and 8 responses that used the term “great teacher.” There was a wide spectrum of synonyms used to describe Karen as a good teacher. These included “like her

better than my other teachers,” “teaches well,” “enjoyed her teaching,” “really good,” “good math teacher,” “really nice teacher,” “love Karen’s teaching,” “like the way and how she teaches,” “radiant teacher,” “excellent teacher,” and “favorite teacher.” This count does not include the times in which students made a comment on the more specific qualities that Karen exhibited (such as when students stated that she is great at explanations). There was one response that described how great the instructor was with these at-risk students. 27A articulated a viewpoint fairly typical of most interviewees: “Karen is the best teacher in this profession, like, for high school kids into transition into college math.”

Theme I: Caring About Students’ Mathematical Learning (Teaching Practices)

To move beyond general positive statements about Karen as a teacher, one can look more specifically at the recurring themes in students’ interviews regarding the specific qualities that made Karen effective. Six overall categories of factors emerged: *(a) scaffolding (including administration and organization), (b) board writing and copying notes, (c) student work, (d) office hours, (e) repetition as an aid to understanding, and (f) persistent attention to student understanding.* Each category is explored using exemplars from the student responses. Each of the following sections states the total number of student interviews that exemplified each major category. There are a total of 54 student interviews from 36 different students.

Scaffolding

According to student interviews, the category of scaffolding is the most prevalent theme articulated in the area of teaching practices and in the entire study. In general, scaffolding can be defined as the techniques to help students learn new material. Generally speaking, teachers structure lessons to build from what students already know and then move to what students did

not know. Teachers give different forms of assistance (e.g., hints) to help students reach a higher level of thinking. This can include displaying graphics, activating prior knowledge, or modeling an activity beforehand. Although students didn't necessarily say these exact words, the student responses reflect similar ideas that are in the spirit of scaffolding. In addition, classroom observations revealed that the instructor asked students for what they knew about the day's topic. The instructor helped students take little steps so they could get from what they already knew to what they needed to learn. The goal was to have students learn new material without taking any big jumps in mathematical concepts. Student participants mentioned *step-by-step* instruction and the breaking down of mathematical concepts into little pieces during the interviews. Students also described Karen as *pacing* the lesson correctly, including being organized and patient when explaining mathematics to students. As one student explained:

She [Karen] takes it from small to big, from the easiest to the hardest so every student can understand how she got to that point. And it makes it easier for them to know how to get to that point, too. (4A)

There were 42 responses (out of 54 total interviews) that referred to aspects of scaffolding. There were 30 students that gave these 42 responses. Two specific aspects related to scaffolding emerged from the student interviews. These two sub-categories are: (a) step-by-step/breaks it down, and (b) pace and explanation. Each sub-category is described next.

“Step-by-step” and “Breaks it down”

The most prevalent sub-category of “Scaffolding” (in terms of the number of responses from students) was “step-by-step/breaks it down.” There were 27 responses (out of 42 interviews that mentioned scaffolding) that included either of these precise phrases, and some participants used both phrases. There were 24 students that gave these 27 responses. Many students in this sub-category also referred to the other subcategory of “pace and explanation” in addition to using

the terms “step-by-step” or “breaks it down.” For example, 3A reported that “She takes it a step at a time. She says it so you can understand it. She takes each section and breaks it down. Karen actually explains it to us.” The following passage by 5A summarizes what students meant by step-by-step.

She actually slowed down things a little bit, and she actually did more than just three problems on the board. And she took it step-by-step. I mean plus, minus, negative, then you get this answer, and then find out how we get this answer. She takes it step-by-step, and she just made sure you got it, like every step right, and that you understood.

This is another passage (by 7A) that concretely describes more of what happened during the instruction.

[She] breaks it down a lot. [She] breaks down more. My high school teachers were not as slow as she does. She puts one step on the board and asks, “Are there any questions?” [My other teachers] didn’t go as slow as her. They would put it on board like her, but she would put a step on board and ask if there are any questions and make sure you understand it. They would put the whole problem, and they would ask us to do it. They call someone to the board and make them to do it. She does more of the work. In high school, we did more of the work.

Similarly, student 15A expressed,

She walked through it with you. She explains it and breaks it down all the way. She just explains it to the point where there’s no more explaining to do. She breaks it down all the way until there’s nothing left to break down.

Student 22A concurred, stating that,

Karen takes her time. She explains everything. Breaks it down to the last piece of the puzzle, but she would take her time with it. Karen will break it down and down. She stretches the information to a point that you wouldn’t even think a teacher would, like, so you would know. She goes over everything, and she breaks it down too, so that you remember the material.

The following statements incorporate all of these ideas (“breaking it down,” “explaining,” “step-by-step”) and were said succinctly. 24A conveyed that “[She] slowed it down, walk through everything, breaks it down, the way she explains.” In a later part of the same interview, the student (24A) gave a concrete example of this that took place during the semester:

Because the way she said it, she was like . . . the way she had it set up. I was like, okay well, with my brothers and sisters that's not going to be a function; I've got two, and I am only supposed to have one like on the alphabet. But then she broke it down, and I'm like, oh, okay, I get it now, learned how she broke it out because she said she had five and then somebody else had one.

27A indicated that, "She knew how to break it down and took her time. She didn't speed through it. She explains very easy." 33A concisely said, "Breaks it down to the basic form. [She] teaches slowly." 18A noted that, "Karen would break it down. She would talk slowly and take it step-by-step, explanation and that really helps me a lot, too." Another student described Karen's teaching as follows:

She would take her time and explain the whole process step-by-step even though it was long. But, she still would, like, take her time. . . . Karen doesn't move in a fast pace, like she takes her time, for everybody to understand the concept. She showed us the basic steps, and instead of taking the short way, she doesn't, takes the long way to try to help you because, you know, how some people, like, they don't know the short way, but they can do it. (21A)

The following is a greater description and provides a larger perspective on teaching step-by-step and breaking it down. 36A reported that:

She starts off with small problems so you can figure out in a cinch. And she likes tricking us with these hard problems. There's nothing wrong with Karen's teaching because she breaks it down step-by-step. She starts with simple examples and works her way up. She breaks it down even, if the book don't [sic] have enough examples, she makes up one off the top of her head.

Some interviewees used the precise phrases "break it down" and/or "step-by-step" with few other comments. For example, 8A expressed that, "I like how she breaks it down. She also breaks every step." Another student (25A) noted that, "She taught step-by-step. She gave you the steps. She wrote out the steps for you." 2B acknowledged that, "She walks step-by-step. She doesn't take short cuts. She can't assume we'll know the next step." 22A articulated that "She teaches everything to the 'T.' She takes her time. She explains everything."

There are still more supporting passages that were not used in this subcategory. With the large number of responses in this area, students thought that the practice of breaking the mathematical material down, the step-by-step instruction, the pace, and the explanations altogether were helpful.

Pace and Explanation

Although the ideas of pace and explanation were previously mentioned as part of the subcategory “step-by-step, breaks it down,” some interviews included pace and explanation as stand-alone comments. There were 12 responses (out of 42 of the “Scaffolding” category) in this subcategory. There were 10 students that gave these 12 responses. Students said either pace or explanation or a combination of these terms without mentioning “step-by-step” and “breaking it down.” For example, 9A reported that, “She explained very well, like, everything to me.” Another student (10A) recognized that, “She really goes over all the different concepts that we need to know.” 34A expressed that, “She actually explains why.” In these comments, explaining was important. Others only mentioned pace. For example, 11B acknowledged that, “She moves at a steady pace, slow pace to understand.” 15B recognized that “She doesn’t move too fast.” 12A concurred, stating that “[She] slows down to help students.” The following response contains both explaining and pace. 23B reported that “I like [the] pace she goes [and] how she explains things.” 11A conveyed, “I like how she explains. She makes it easier for me. She doesn’t move really fast, and she moves slow and steady so we can all understand if we have questions and stuff.” 23A agreed that “[She] explains it to me in a way that I would never thought of it, very slow, slower pace.” 36B articulated both pace and explanation.

In several of these quotes in this category, students also mentioned the exact words “so you can understand it” or simply the word “understand.” This is connected and related to

explanation and pace because students felt that the teacher's explanation and pace helped students understand the material. For example, 3A stated that "She takes it a step at a time. She says it so you can understand it." Students claimed that this teaching method was used to help them understand mathematics. Karen taught slowly and intentionally explained material thoroughly. In addition, the way students' responses suggest that they were aware that this was a form of Karen's care. Persistent attention to student understanding is another major category that emerged from the data and is discussed later.

Although not exclusively related to scaffolding, there were several notable student responses pertaining to broader issues of general course administration and organization and the ways in which these helped promote their success. 7A summarized the general viewpoint: "Very structured and laid out. Keeps the class organized and everything connects together in math; everything is in order and really organized." The following student passages further illuminate this perspective:

3A: She tells us what the lesson is going to be about.

15A: I like the grading system and homework. I like that she drops the lowest homework grade. Her set-up is really nice. She gives a way for students to pass. There is no excuse for you not to pass the class.

Although relatively few students directly spoke on administration, these comments are worth noting for two reasons. First, effective course administration was apparent in the classroom to the researcher as well as to students. Second, these remarks agree with comments assigned to other categories, including scaffolding and board writing/copying notes.

Board Writing and Copying Notes

Related to students' comments about Karen working through problems "step-by-step," the students also talked about the clear notes they could take due to Karen's systematic writing of

the steps on the board. Based on the observations, the structure of class centered on students sitting at desks while copying notes from the board. While Karen communicated her thought processes, she wrote out every little step for each problem on the board, and the students copied these “notes” as their own notes. Karen would solicit student responses as she went through explanations, writing the material step-by-step on the board.

As 7A commented, “I think she does more of the writing. I think it makes it easier on me.” According to the students, copying board notes as their own notes was a factor that influenced their ability to learn mathematics. There were 15 responses (out of 54 interviews) that referred to board writing and copying notes. There were 12 students that gave these 15 responses. Those students indicated that copying the notes from the board was helpful for learning mathematics. Although the way in which they found note taking helpful varied, the overall practice of note taking was an integral part of their learning and studying. For example, 2A reported:

I'm a note-taker. I like notes 'cause I like to refer to things, so when it's convenient to go back and just look at them. Like I can go back tonight and review for the quiz 'cause I need to pass this quiz.

Students felt that copying the notes from the board was an activity to which they could connect and that tied directly to how they learned. For example, 36A expressed that using “colored chalk” helped “spice up the graph.” This quote exemplifies that this student felt that board work tied into her learning. Another student (15B) expressed that, “She writes out everything she says on the board.” This can be helpful because it connects the teacher’s voice to written mathematical text. Taking notes can, perhaps, fit several learning styles of students because the instructor verbally tells students the mathematical concepts (auditory) and then writes what she says on the board (text fits visual learners). 8A concurred, explaining, “I’m

usually a visual learner, so when she actually writes on the board, and she also breaks every step, I see it, and then I'm, like, okay, this is how she did it." One of the most explicit comments about the benefits of Karen's board writing came from 22B who described the utility of note taking in the following manner:

She writes every note on the board. It [note taking] makes it easier on the student. . . . It makes me feel more determined and more confident in myself because knowing that I will be able to get these notes. I will be able to study. My study habits will be more comfortable.

This comment shows the potential impact that note taking may have on students. Notes can be a confidence-building tool that students can take home to guide their mathematics learning.

Student Work

Although the instruction mostly employed teacher-centered practices, there were still activities that involved student participation that were helpful for students. As described by 28A, "She keeps you going. She will keep you active in class." There were 14 responses (out of 54 interviews) that mentioned the importance of classroom activities involving students. There were 13 students that gave these 14 responses. The activities included group work, working out problems individually in class, and going to the board and working out problems. In their responses, students expressed what they found helpful with the activities. For example, 28A noted that,

Every time she will tell me to do a problem on the board, I will try to do it because whatever you put in the class, you will get out. If you put nothing, you will get nothing out of it. . . . If you try your best and go to the board, and doing your homework, and she will make sure you pass.

3A also gave a concrete example that she had in the summer program.

I'll use Bridge as an example. It was a final, and we all had to play Jeopardy, and so that was like Jeopardy in math? Who could pull that off? She actually pulled it off. And like I

really understood it, even though we had, like, our tutors and stuff, like, helping us with it, she made sure that we understood it in our own language and not in a different type of language. Like we understood it as if we all were teenagers doing some type of work, like she put it in our language, so that's how she made it fun.

There were students who felt they knew the intent from these activities, but there was no overall consensus on the intent. This seems to suggest that students understood Karen's intent with the activity. 4A expressed that:

Because, if you notice, a lot of times she has the students participate. And I like that because I think that would get more students involved. And then the more students that are involved, the more students will know the material.

Another student (36A) explained that:

She likes it when we work in groups. On homework, she doesn't like giving the answer. She likes us [to] get into groups and try to figure it out. Basically, she wants us to depend on one another. Basically, she is teaching us teamwork.

For these students, having different types of activities helped them in other ways beyond learning mathematics. There were also students that benefited in other ways. 35A conveyed,

When we had that group project that we worked on the board in a group. It was good because I had to talk to her, and I had to help the other group. That was good for me. It opened me up a little bit, more outspoken.

5B reported that coming to the board served as "a little bit of motivation." Another student (10B) concurred, "When she tells us to work in groups, it motivates us to know people. Going to the board is encouraging because it shows her what we know."

In general, students appreciated the activities for different reasons. One liked the activities because of the teamwork. There was a shy student (35A) who needed to practice her English so she liked the activities because it helped her talk more to the instructor and the other students. This ties into 36A's comment that the intent was to improve teamwork. Another student realized she would learn more if she participated and went to the board. Based on the wide range

of student responses, Karen had the potential to reach many students because students liked the activities for different reasons.

In addition, as an extension of this category, a student (16A) said, “She [Karen] was very fond of checking our work.” This student made this comment because, after every individual or group problem, Karen made sure to check students’ work during class time. Based on observations, most check-ins occurred verbally with the instructor circulating around the classroom and asking students if they got the right answer. This also included going over the problem on the board. Other times, the instructor visited students at their desks.

Office Hours

Another salient factor that students reported as important for helping their learning was the teacher’s office hours. There were 35 responses (out of 54 interviews) that discussed the teacher’s great accessibility. There were 26 students that gave 35 responses. In general, students and the instructor had many purposes for office hours (e.g., study hall, preparation for exams, answering homework questions, etc.).

With the exception of one response, all responses used the words “office hours” as the way to characterize the instructor’s accessibility. Six responses that involved six students (out of 35 in the “Office Hours” category) also used “one-on-one” as a method of describing her availability in addition to saying “office hours.” Many students also recognized that the instructor was willing to meet outside of her scheduled office hours. For example, 27A made the following statement:

The math tutor wasn’t showing up at our sessions. So, Karen would be just constantly. . . . She said to me constantly, come to her to help me. And she’d be outside the classroom where I kind of stand sometimes, and I’d ask her about some math homework. She was always out there to help me. She would, like, set her appointments for like 8 o’clock in the morning on days she don’t have office hours to help you out when you need it. I think she’s awesome.

3A articulated that the instructor said, “My office hours are these times, but I’m gonna make [it] fit your schedule, too. So, if you can’t make it at these times, then just come to me when you’re available.” Another student (36A) concurred, stating that, “She reminds us of her office hours. She makes herself available as much as she can with her schedule.”

In addition to students saying they used office hours, there were six responses (out of 35 out of the “Office Hours” category) that specifically talked about getting their questions answered at office hours. There were six students that gave these 6 responses. 11A acknowledged that “If I have any questions, I can go to office hours or something like that. She is always there to see if you need help for something.” 16A concurred, claiming that “I’ll go to office hours and ask her to explain a problem that I don’t get.” 18A summarized the general approach that Karen took during office hours:

She’ll sit down and [explain] everything, and she erases the problem and starts going back and where we got lost. . . . And when you go to her office hours, it’s like she’ll sit down with you. She erases the problem and starts going back trying to, “Where did you get lost?”

There were seven responses (out of 35 of the “Office Hours” category) that expressed some kind of benefit from going to office hours. There were 7 students that gave these seven responses. Students communicated specific benefits from the instructor’s availability. For example, 9A articulated that, “It was good for me because I was able to understand more from being outside of the class setting.” 35B reported that “Office hours helped my grades and my scores on my homework.” 15A agreed, stating that “Ever since I’ve been going to office hours, I’ve been getting 10s [a perfect score] on my homework and 20s [a perfect score] on my quizzes.”

Repetition as an Aid to Understanding

Based on observations and the student interviews, there was a lot of repetition of all kinds (e.g., reviews before and after exams and quizzes, repeating answers and formulas, going through many examples) occurring during class time. This was exclusively done to help students learn the intended content and skills. In the student interviews, repetition emerged as a theme. There were 16 responses (out of 54 interviews) involving 15 students that described some form of repetition. Students noted many examples including going over problems again and again. Students also realized that the instructor used multiple examples during the instruction. Another form of repetition that students observed was that Karen kept explaining mathematical content again and again in different ways. Although maybe uncommon, students also considered going over homework as a form of repetition. The main reason is because the homework review reinforced earlier mathematical content and because Karen recapped the steps on how to solve mathematical problems. Another observation that students made was that the teacher repeated herself using the same precise words. For example, 5A explained:

She will go over and over it again until you get it right. She makes sure you got every step right and that you understand. She does more than three examples. Giving a lot of examples. Going over the homework problems. Mostly when she does the homework problems; that helps the most.

A key observation in the above passage is that the student recognized the various forms of repetition and felt that the teacher used repetition to ensure that students understood the material. 28A agreed:

If you are having a problem with the homework, she will go over it and help you understand why is it this way or why is it that way. Or, like, if you got something wrong on a test, she won't only tell you got it wrong, she will go back and help you understand why it was wrong.

One form of repetition involved going over the homework and reviewing material after exams so students knew why they got the wrong answers. Based on observations and students' responses, going over homework falls in the repetition category because Karen retaught the material again while she went over the homework. For example, if Karen was going over a homework problem that relied on completing the square, she would recap the steps for finishing the problem. After completing the problem with the students, she would remind students of the entire process of completing the square as she did the day before when she first taught the lesson. There was also a similar process for reviewing material after exams.

Persistent Attention to Student Understanding

Students viewed Karen as persistent in ensuring their mathematical understanding of the content. Karen demonstrated perseverance in many ways. Although not always concretely observable or recognizable, students could feel that the teacher was tenacious about ensuring that they understood. This may be considered unusual in a college setting. Some of these students previously never had a teacher who strived to ensure mathematical understanding. Students were able to pick up on this quality based on how she interacted or reacted to their questions, remarks, and behaviors during class. This is a different theme from scaffolding for which students made direct comments about a teaching practice that stressed content understanding. This category is mostly comprised of stand-alone comments that included the term "understanding."

There were 27 responses (out of 54 total interviews) that emerged from the interview data that related to Karen's persistent attention to student understanding. There were 26 students that gave these 27 responses. Some comments were general. For example, 29A expressed that "She'll be more understandable now, but she's the type of teacher that she cares about helping you make sure you understand." Another student (31A) recognized that "And she didn't care if she had to

come in 45 minutes early—she would be there, and she would help me.” 20A noted that “When people don’t understand, she does more. If someone doesn’t understand it, she will try to get to the bottom of it. She cares; she really wants to help you.”

There were some students who made specific remarks on what the instructor did that showed she wanted to ensure understanding. 13A made the comment “I mean, whenever you ask her to work out a problem, she will continue to explain it until you understand it.” 13A (along with other students who made claims about scaffolding) viewed the explanation of the material as important for ensuring understanding. 12A indicated that Karen’s teaching methods were a way to ensure understanding:

She cares about all of us. If we struggle, she slows down a bit, and she’s like, “Okay, let’s go back. If we do this, go back to what we learned and put it into this. It’s the same thing—it’s just with different numbers.” She just always reminds us, like, “Don’t forget, go back and remember, you know how to do this.” And then it’s, like, “oh, okay, I get it.”

2A depicted another way that the instructor ensured understanding:

Like, half the time, everyone doesn’t need the example that she puts on the board, and she’ll do it just for that person just to make sure that it’ll get through to them, which is fine. And it just makes me double-check my work.

This statement links to the concept of repetition because the instructor is going over and over content material. 10A suggested that “She cares that we learn what we are doing, and she makes sure that we try to get as much information as possible in the time that we have.” This shows how Karen was tenacious about making sure that students had a lot of information, which can be another form of ensuring student understanding of the material.

Another student, 7B, illuminated how Karen’s personality helped explain content material to students who had difficulty understanding.

She makes sure you understand that part before she goes on to the next part or you’ll not get it. . . . She is really patient; even when she is teaching, she is really patient. When people don’t get it more than once, she doesn’t get frustrated. She is not like, “Why don’t

you understand this?” She is really calm about everything. She never raises her voice. She is really patient.

According to the students, being patient was an important teacher quality to have to ensure understanding. The issue of patience permeated comments made in many categories (including “pacing” and “repetition”) discussed earlier in this chapter, as well as the category of the teacher’s personality mentioned in a later section.

Everyone Understanding

There was one minor grouping of similar responses that emerged from the data on “persistent attention to student understanding”: students acknowledged that the instructor aimed for everyone to understand. There were nine responses (out of 27 of the “Persistent Attention” category) that recognized that the teacher wanted everyone to understand the material. There were nine students that gave these nine responses. For example, 4A acknowledged that “Every student can understand how she got to that point.” 3A expressed that:

She will stop anything she’s doing just to help you understand things—that’s what I like. . . . And she is, like, if one person doesn’t understand it, then we slow it down so that everybody can be on the same page and not everybody being scattered all over the place. Like, she keeps us all together—I like that about her. . . . She will stop anything she’s doing just to help you understand things- that’s what I like.

21A explained that “Karen doesn’t move in a fast pace, like, she [takes] her time for everybody to understand the concept.” 22A noted that:

She would take her time with it, like she would not let nobody else go home, like even if it meant [not audible]. She would be like, “No, I’ve got to make sure everybody else knows this, too.” So, it was like, Karen kept it like that.

27A agreed, “When she is teaching, she don’t care about what she’s teaching because she’s going to make sure that everybody in the class understands what’s going on.” 15A noted that “She goes slow so everybody can be on the same page before she moves on.” According to this

student, one reason the instructor teaches slowly is to have every student in the class understand the content.

The following statement describes both persistence to ensure understanding and previous experiences students had with teachers. 25A reported that:

Like she cares that we are trying, and she cares that we're not understanding. Some teachers would just keep going and leave us behind. If one student has a question, Karen is to stop the whole problem and she's going to erase what she already has and go back to the step that you knew not even thinking about the rest of the class. Even if the rest of the class gets it, she's still going to go back, and I like that.

This statement illustrates several points on instruction. 25A is aware that there were students who were really trying in the class and who were not understanding content. The student also acknowledged that Karen went to great efforts to help students understand the material; she erased the board and went back to earlier steps, even if the rest of the class claimed to understand the problem.

The following statement generally describes Karen's attitude and behavior toward student understanding. 1A indicated that,

She makes sure they get the gist of things. She makes sure you understand her. She makes sure you understand her because there are some teachers that don't care if you understand them or not. They just lay it out there, and you either get it or you don't.

Theme II: Caring for Students as People

One persistent aspect of the interview data is that students reported interpersonal communication factors employed by the instructor that affected their learning experiences. Four overall categories emerged from students' responses: (a) *personal story*, (b) *personality*, (c) *teacher approachability*, and (d) *nurturing*. There is some overlap across the categories in this chapter. However, the categories in Theme I all pertained to the teacher in relation to aspects of

students' mathematics learning. The following categories are about the teacher caring about and relating to students as people that occasionally relate to Karen's teaching.

Personality

Several aspects of the instructor's personality persistently emerged in the students' interviews. Due to the large number of descriptors used and the common meanings with the descriptors, one can say that her positive personality made an impression on students. Many character attributes were included in the responses, including "nice," "genuine," "sweet person," "kindhearted," "resourceful," "patient," "very helpful," "loyal," "honest," "open," "caring," "jokes," "very positive," "very calm," "relaxing," "always happy," "smiling," "very kind," "joyful," "bubbly," "good woman," "great person," "wonderful person," "very smart," "doesn't get upset," and "funny." A key observation about these responses is that they are all positive comments regarding Karen's general character.

There were 38 responses (out of 54 interviews) that described aspects of Karen's personality, and 29 students gave these 38 responses. This is the second most prevalent category that emerged from the student interviews. Students would use several of these simple descriptors in one passage. Such passages also expressed appreciation of her personality. Many positive aspects of Karen's general character help one get a feel for the type of teachers that work well with this student population. The following passages also validate how the instructor saw herself in Chapter 4. For example, 22A claimed that:

Karen was a sweetheart. Everybody thinks of Karen as a sweetheart. I never heard a bad thing about Karen to be honest. Karen is just so nice. . . . You always see Karen smiling. Even if you think she's mad, she's always smiling. I like that. Karen is always in a good mood.

5B expressed that "I think she is a wonderful person. She is so kind. She doesn't get frustrated. I like those types of people because she is like an angel." 10B voiced that "She sets

the mood for how the day is going to go. She is always happy. I never see her with a frown on her face.” 32A acknowledged that “I don’t think she makes the joke on purpose, but she, like, gets you, and you’re like, ‘She’s funny.’ I think she’s sweet and caring.” 30A summarized the general viewpoint expressed by interviewees in describing Karen’s personality:

She’s sweet: She’s like the lady next door who’s, like, always cooking and baking, and you know you can go ask her, and she won’t say anything. Like, “Karen, can I have some cookie?”(sic) Or, “Can you make me a cake for my birthday?” She’s the lady who always has decorations for the holidays. She’s just very warm. Warm like welcoming.

A few participants articulated a connection between her personality and her teaching. For example, 3A acknowledged that “She’s the type of person who, like, makes learning fun.” 13A admitted that “I’ve never met a teacher who doesn’t raise their voice, and it’s like she has the same—not flat tone, but the same bubbly tone, whether she’s happy or getting a little irritated.” 2B also said that “She tries to make us laugh and keeps us attentive. . . . She is always excited at 8:30 in the morning.” These last three students verbalized that her personality had an influence on their learning environment. Based on observations and her interviews, Karen was enthusiastic during her teaching. She showed this to students, and it influenced the learning environment for students.

Teacher Approachability

Although the instructor’s approachability can be viewed as a teaching practice, this attribute (along with her personality and other attributes) shows how Karen treated the students as people instead of just as students. Unlike the other attributes (e.g., personality) that *enhance* the instructor’s approachability, this category centers on students explicitly stating that they felt able to approach the instructor. Based on observations, Karen treated students in a positive manner and demonstrated approachability in how she spoke to students, the way she answered simple questions, and her ability to connect with students’ lives or experiences (e.g., sports).

Students watched how she interacted with other students one-on-one. This is relevant because students were able to observe how well Karen treated others and then felt encouraged to approach her. Based on students' responses, she demonstrated approachability because she had a calm, relaxing, patient voice. Her approachability went beyond overt ways of being friendly. There were 23 responses (out of 54 interviews) that discussed the instructor's approachability. There were 19 students that gave these 23 responses.

There was a wide spectrum of responses under this category. The main idea that emerged was how comfortable students felt around the instructor and in approaching her. This level of comfort and approachability was illuminated in many ways. One way was that students felt comfortable going to Karen with any sort of problem. For example, 3A recognized that, "If I had any type of problem, I could go to Karen. Of the teachers at Bridge, Karen would be the first person that I go to." 26A agreed, stating that "It seems like I could go to her if I need any advice about anything." 15A also expressed that "She's someone you can talk to whether it's about math or not. She welcomes her students to help them out." 22A acknowledged that:

So, that's kind of cool, too. You can tell Karen anything, like, "Karen, I'm having a problem." Karen has a big heart, like, okay, I'll take my time with this, like, one-on-one time with that person or will recommend him for it. She would help you more than anything by helping first.

Another student (29A) noted that "I'm sure she would be open, like, if we had something that we needed to get off our chest. She'll probably talk to you about it." Since Karen talked about her family and joked around, 11A articulated that "talking about other stuff makes me think, like, we can talk about—[anything] it's not strictly math. We can talk about other issues or whatever." 21A stated that:

It seems like, you can tell her if, like, you're having, like, a stressful time; you can talk to Karen about that. I feel like she is a teacher/counselor.

32A recognized that Karen could give good advice:

She'll help you, give you advice because I know she has a lot of experience as far as being on the campus and knowing what it can do for you. Yeah, I think people can talk to Karen. She's not going to tell you "Go on. I don't want to talk to you." She'll listen. Because I can tell, like, she did it in Bridge. She was nice in Bridge even though she wasn't my teacher. I just knew her so it was like, I think it makes me feel happy because if I have a problem I want to know I can talk to someone. I don't want to just be moping around like "Oooh" or whatever. I could just talk to someone.

Others simply felt comfortable being around her and communicated these emotions with few words. For example, 22B acknowledged, "She is very open and straightforward." 11A reported that "For the most part, she's easy to work with . . . I got along with her really well. [She is] fun to work with."

A smaller group of responses in this area focused on students feeling comfortable going to the instructor to ask mathematical questions. There were 15 responses (out of 23 of the "Teacher Approachability" category) that focused on some variation of "answering questions." There were 13 students that gave these 15 responses. For example, 23B went to Karen for every question he had because he got this "comfortable feeling. [She] doesn't belittle you for not knowing something. [She] makes you feel comfortable to ask questions." 7A concurred, explaining that "[With Karen], if you got it wrong, she would go over it. You wouldn't feel dumb or anything because other people in the class wouldn't get it, either. Some people will get it, and others will not." 29A spoke about Karen's availability and approachability when she said "because you can go to her with any questions, you know, like 'I don't really understand this, and I might need help,' and she's like, 'Okay, well when do you wanna meet?'" Another student (22A) recognized that "Karen answers every question. Like two people might have a question about the same problem. She will answer everybody's question." In general, answering questions shows the willingness to help students, and this makes a teacher approachable. 7B summarized

the general perception and viewpoint expressed by interviewees about how approachable the instructor was:

If you ask Karen, she will help you. I like that it's a smaller class [MA xxy] because she can go around, and more people can ask questions. She is not mean about it. She doesn't laugh at you for a dumb question. She makes it a really comfortable environment to be open and talk. If you don't understand something, if it was a big lecture, she didn't care.

Personal Story

One recognizable characteristic of the instructor was her gift at telling personal stories. I observed the instructor tell personal stories starting in fall 2008 and ongoing until the end of this dissertation project. There are countless examples of stories that the instructor told students. The majority of these stories had nothing to do with mathematics. Some of these stories are documented in the Results Chapter on the Classroom Data. One episode that nicely illustrates Karen's story telling with students occurred in a semester I observed previously. This example involves an April Fool's joke involving Karen and her son. One semester, in between classes, the instructor received a phone call from her son telling her that he was calling from prison. She was highly distraught. A few minutes later, she received another phone call from him telling her it was just an April Fool's joke. She "replayed" this joke with the class that she was beginning to teach: she told students that her son was in prison and then, a few minutes later, admitted to the students that it was a joke. This example was chosen because it depicts many of her attributes: Karen's funny character, her informal interactions with students, her telling of personal stories, and her free spirit.

Karen shared personal facets of her life with students, and this seemed to make students comfortable with her. There were 16 responses (out of 54 interviews) that mentioned Karen's family: grandkids, son, etc. There were 14 students that gave these 16 responses. All respondents

in this category were female. Additionally, Karen taught many of these female students during the summer. These students had fond memories of meeting her grandchildren for the first time because she brought them to her classes over the summer.

There were a few students who could relate to Karen because their families had also adopted children just like Karen had done. 5A (who was part of an adopted family) claimed, “She talks about her grandchildren and adopting Nick. It was just so sweet because usually the same people adopt the same kind of children. She seemed like she wanted a child that needed help.” Generally speaking, students seemed to appreciate that she spoke about herself and her family. Her personal stories helped make students feel comfortable as depicted by 15B:

Because she allows us into her personal life; most teachers wouldn’t do that. She gives her cell phone number and talks about her son and her grandson, her daughter-in-law or her son’s girlfriend. She is comfortable with us to the point where I can be comfortable with her.

This student recognized how personal Karen was with her students. Giving away her cell phone number, talking about her personal life, and being comfortable with students was important for this student. An important remark is that Karen being comfortable with students enabled students to be comfortable with her. Students felt that they could approach her. Karen also had other qualities that demonstrated her approachability. These qualities are presented throughout this chapter.

Nurturing

So far, Karen has shown students in multiple ways (availability, approachability, etc.) that she cares for students and their learning. In the category of “nurturing,” she showed students that she was willing to go beyond the instructional responsibilities to show them that she cared for them as people. “Persistent attention to student understanding” is specific to mathematical learning whereas nurturing encompasses a broader perspective on her caring nature. In general,

nurturing was towards students as individuals with Karen displaying concern for students holistically, independent of learning.

In this category, there were 31 responses (out of 54 interviews) that articulated some form of nurturing from Karen. There were 24 students that gave these 31 responses. Students pointed to specific nurturing aspects in Karen, and they felt those aspects helped them to learn. There was a wide range of comments that students articulated during the interviews.

One way that students felt nurtured is when Karen took a personal interest in their lives. For example, 6A acknowledged that:

She [Karen] shows concern about people. She would ask me about pregnancy and how I'm doing outside of math. It makes me feel like they are about me and not just me but also my work. She is asking about my baby instead of, you know, math. She asks about that. I think she would be able to give me, you know, advice.

Another student (13B) said, "I feel like she wants to make sure everybody succeeds." For this student, "it [this caring] is easier to see this one-on-one instead of being in the classroom." Some students discussed general feelings but gave no concrete examples of Karen's caring. 29A recognized that "It makes me feel good that we have a teacher that cares." 36B stated, "It feels like she cares. You can tell the teacher cares about you." 31A indicated that:

You could tell that's what she wanted—she just wanted me to be comfortable with the material. . . . She's just so calm, like, if you don't get it, it's okay. There's no rush—I think that's what it was—there was, like, no rush, like you have to get this right now because you have a test coming up. It's ok.

In a longer passage, another student (22A) recognized:

Karen is a, like a really caring teacher, like, she is just a really caring teacher, like, she would be one of your best teachers. . . . I think she cares for me. I think she cares for her students as a whole. Karen can laugh and care for me as a friend and then still be serious about your work at the same time. Karen can be a friend. She can be a great teacher. She cares for you. [She] makes sure you learn the material.

A few students talked about how Karen reminded them of their grandmother or mother. For example, 23B expressed that Karen reminded him of his “grandma” and followed-up with “She carries herself in a very respectful manner. She is always being caring. You just get a very loving and comfortable feeling around her. [This is] her essence, and it shows through her teaching.” 5B echoed similar feelings: “She reminds me so much of my mom. She [my mom] smiles and laughs about everything. She reminds me more of my mom when she adopted Nick.” Another student (16A) stated that

She is, in a way, I view her as a mother. I mean she is very heartwarming, like, you know, like most teachers, if you don’t get it, “Oh well, I’m moving on anyway.” Karen makes you feel better. She doesn’t put you down. “Why are you in this remedial class?” Karen would say, “You are not remedial. It’s just a beginning class, basically.” So, I think Karen makes us feel better about the situation that we’re in.

21A identified with Karen as a grandmother and mother. In the following, 21A recognized that:

It’s like she treats us like her kids. That’s how I feel. She used to bring us treats every Friday [during the summer]. Like, if you can ask for advice, she’ll give, like, candy. It felt like she was taking care of us. It makes me feel like she’s my second mom. I think that she cares. Like, I don’t know, in my view, I think she would probably do her job if it wasn’t a paying job; I think she would do it for free. That’s what I think.

Later on during the same interview:

To me, she was like a mother. I’ve never seen her angry. Like if we were talking, she would smile and just say, “Please be quiet.” She is very calm, but that’s what I like.

Again, later on during the same interview:

She reminds me of my grandma. On my dad’s side grandma because my grandma she was a very generous person. She was always there for me if I needed help.

Verbal affirmation, encouragement, and building confidence were specialties of the instructor. A30 recognized that the instructor was very affirming to students:

She’s always smiling. “Everything is OK.” Like, “Oh, you’re fine. Good job.” The “good jobs” go a long way. Like, there aren’t enough “good jobs” given out there today. There’s

not enough, like, “Congratulations!” Like, “I was very impressed with your test scores.” Or, like, “Congratulations, I know you’ll do fine,” you know. Like, when people ask questions, when we do reviews, she’s like, there’s never like, oh, “this is too easy, you guys shouldn’t have a problem with this question right here.” It was like, “Oh, that’s a good one. We can go over that.” And you need that. Sometimes it’s hard ‘cause you feel like you have a dumb question. You feel like everybody else is getting it but you, kind of thing. And Karen doesn’t make you feel like that. She makes you feel like everybody might be struggling a little bit so I’ll go over it anyway.

2B stated, “She gives reassurance to students. She always wanting to give and help.” 35B

echoed the sentiment:

She keeps believing in me and tells to keep believing in myself. I almost gave up on her class. . . . The joy in her eyes that she loves teaching people. She likes pushing people to keep moving forward and not give up on themselves. She is a great teacher. Karen’s eyes say that you guys, all of you, have potential. You just need to find it. She believes in all of us, each one of her students, in every one of her classes. . . . She is doing whatever she can to help us. She’s doing her best. I really appreciate that.

Many of these passages show how Karen’s personality was intertwined with caring for students’ mathematics learning. In an earlier interview, the same student (35A) reported that Karen was “very caring” and that:

Karen helps in my confidence. Karen helps me get there. Karen will always tell me, “You are just one step away.” I do raise my hand so Karen can check my answer. She will say, “That’s very close,” and that makes me feel really good about that.

5B also felt encouraged and expressed that “She cheers us on. Sometimes she will say, ‘You guys can do it. You guys can do it. You can do this problem.’” 4B concurred, stating that “[She] encourages me to ‘Try even harder. Don’t give up.’ She wants you to do better.” 16A recognized that “She makes you feel, like, when you get something, she encourages you. When she smiles, it makes me feel better, you know, the way she teaches everything. It helped me a lot.”

The following student (23A) had many difficulties in math during a 3-year time span at the university. 23A summarized the general viewpoint expressed by interviewees on the issues of

self-confidence and the difficulties that most students have in mathematics. This was a common perspective among students in the teacher's courses.

Karen would tell me, "Oh, no, that's right. You are going the right way. Trust yourself." I also have a lot of self-esteem issues in math because I know I am bad at math. It hinders me from doing thing[s] I know may be right because I second guess myself, and so, actually, lately, I haven't been second guessing myself if I know the process and the technique. I do it; I do it to the best of my ability. And I go for it.

"Be confident with your answer, with your first answer." And Ms. K really pointed it out to me. "[23A], just be confident. I see that you . . . You are not stupid. You can do this." She made me feel like math was not so much like kryptonite."

Besides verbal affirmation, Karen also showed warmth by showing concern when students were absent from class. 18B recognized that "She gets upset when people are not there on time, when people don't show up, weren't there to take the quiz." Karen also went beyond the traditional teacher responsibilities. Although these students had individual advisors for guidance on coursework, many still went to Karen for advice on math classes. For example, 10B reported that Karen gave advice on what other math classes to take. Another student echoed similar help from Karen. 14B noted that she would get counsel from Karen. "It depends on what Karen believes I should take after that [in terms of coursework]." In the first interview, while discussing future coursework in mathematics, this same student (14A) noted that, "Whichever one Karen feels that I'm ready for, but I'm thinking Algebra probably."

As 24A was reflecting on coursework, she claimed that "Karen said, 'I could do stats,' then I'm like, okay, I can do stats and get a gen. ed. out of the way and then go to pre-calculus and calculus." 16A also asserted, "Actually, I wanna talk to Karen—maybe she can refer me to Stat 100. If not, then I will be in Algebra for the spring semester."

Students also talked about the effect that caring had on them. 12A stated,

She motivates me to learn. I wanna learn. If I don't get it right, I'll be like if I do this, can I do that? And she's like, "No, just stick with this." I don't know—she just always helps me a lot, and I really appreciate that.

Another student (11A) claimed that,

It makes me think she really cares about our grades. Most teachers, like, don't say they care if you fail or not. Teachers don't say two words to you; they'll give the lecture, and then that's it. If you don't understand it, they are not going to say, "you can come get help." She's different in that way—she's caring—she's always there.

In a subsequent interview, 11B expressed that "[It] makes me happy that she is willing to do whatever she can to help us." Later on in the same interview, in comparison to other teachers, 11B said, "She cares about us by being there every single day." Another student (22B) also compared Karen to another teacher:

Karen has in her heart like, "I want these students to learn. I want these students to learn as much as possible. All of it, as much as they can." When she goes home and makes a lesson plan, she thinks about us when she does. I like Karen a lot. I think they're [other professors] are good. They don't have the care as much as Karen does for the students Karen cares about every one of her students, all of her students.

24A expressed that "She makes you want to come to class, and you're, like, okay, I'm ready to learn even though I don't want to be here." Karen helped motivate and encourage students in their learning. For many, coming to class was an important first step.

Benefits of Karen and Her Teaching

During the interviews, students verbalized the benefits of having Karen as an instructor of mathematics. This was unexpected because there were not any questions directly asking for benefits. Students talked about this on their own accord. This was an important theme that emerged from the student data. There was a wide spectrum of responses. There were 19 responses (out of 54 interviews) that conveyed benefits of having Karen as an instructor. There were 15 students that gave these 19 responses. The remarks in this category do not include all the benefits that were described earlier in the chapter. For example, there were students who said that they benefited from going to office hours. Benefits mentioned earlier in this chapter relate to

a specific attribute of Karen and her teaching whereas the following discussion focuses on cross-cutting themes that arose from students' experiences with Karen as both a person and mathematics teacher. There were three sub-categories: (a) learning environment, (b) grade improvement and confidence, and (c) student attitudes. Each is discussed in the subsections below.

Learning Environment

A welcoming and meaningful learning environment emerged as another sub-category from the interviews. This helped motivate students to learn. 21A conveyed that "She makes mathematics fun. She makes me want to learn." 15B said that "She makes [us] feel comfortable with learning the material [that she] is providing for us. It makes me want to be there and care about what I am doing." The following has the overarching theme of the learning environment, but it also describes how this student felt about the course. 22A said that:

It makes me feel more secure, and I like it. I have a teacher that I can go to class and I can actually learn information and I can [be] perfect so that makes me feel secure and better when it comes to test time so, you know. It makes you want to come to class more. Like you will skip a class in a class where the teacher is boring, or a teacher lies to you, or something like that. Karen makes you want to come to class. I just like to learn, it's always something that you want to learn, like she thinks that you really want to learn. . . . It makes you want to take mathematics. If you want to keep going, like, if this class is like this, I wonder how my next class could be. See what I'm saying? So, it's like that. It is just like you notice things. You notice that class is always full just because everyone wants to come to class. Karen is always in a good mood, so it's like you never do not want to come to class or nothing like that. It would never make me want to stop taking math, just because of Karen. If anything, it would make me want to keep taking math.

A student (5A) who had trouble over the summer also saw an improvement in her grade during the summer and academic year. She also had positive feelings about doing mathematics and also spoke about the learning environment:

I just really enjoy the class. I'm getting a lot out of it, learning even though I'm learning the same things about it, I'm learning new things every day that I probably forgot or got lost along the way. But, it's a really great class.

There are other benefits beyond learning mathematics that students mentioned during their interviews. For example, 27A expressed that:

Like when Karen taught us to ask questions now and, in some of my classes, I ask questions a lot. I just wait until the end of class, and then, I'll talk to the teacher one-on-one most of the time because I hate being the center of attention.

This student was learning appropriate behavior due to the learning environment in Karen's class. Specifically, she had to learn that asking questions was an expected part of learning in a college setting.

Grade Improvement and Confidence

There were students who reported that their grade improved throughout the semester. This, in turn, helped them feel confident. For example, 35A conveyed that "My scores are bad. Now, I am good at it. My second exam was really good. I am really proud of myself." In a subsequent interview, this same student noted that "I see the grades go up a little bit. I feel a little bit of accomplishment in myself." Another student (6A) noted that:

My tests had been coming up. And the lowest I've gotten was 12 [out of 20 possible points], and, at first, and that was in the beginning—that was low. But after that, I've gotten an increase, and the recent one I just received I got 20 [out of 20 possible points]. That's perfect.

Another student (34A) who came to college with very low mathematical skills described his experience with improving his grades:

At first, the class was beating me up, and then it was making me mad. And one day, I was, like, I could see the math, and I was understanding it, and it was really weird because I'm, like, I can understand and see it now. And then one thing led to another, and yeah. I got 19 out of 19 on my last quiz and homework. And on my first exam, I got a 47.5 [out of 100 points], and then on my second one I got 86.5 [out of 100 points], which I think is a good improvement.

There was a correlation between the student's (34A's) grades in the course and time spent in the course. As he spent more time in the course being taught and getting extra help with the

instructor, his grade in the course increased. This same student (34A) also expressed his attitude changing towards mathematics:

My views have changed because now I know I can do math. Like, before, I used to be, like, I hated math, and now I'm, like, it's just a matter of time before I get it. Whereas opposed to how I used to be like "I'll never get math." Like, even in class, if I don't understand something, I'm, like, it'll take me, like, maybe two hours of practice, and I'll understand the concept and how to work it . . . [I like math] a lot more actually. I actually discovered I had a passion for it, which is weird.

31A, who has a learning disability, recognized joy in learning and working with Karen during the summer and the academic year:

And to get a B over the summer, I cried. I was so happy just because, like, she just let me do whatever I need to do to understand it. . . . I guess I wanted to show her how I could improve just because she had so much dedication to helping us. . . . It was such a good feeling—it's a feeling of satisfaction. Like, I've struggled in math for so long, and it was just always so hard for me. And I literally would just be, like, well, I know I'm not gonna get this, so what's the point of me trying? And she totally just, like, changed that around for me, and she really, just, like made me feel so much more confident in math.

Another student (5A), who had had another teacher during the summer and moved to having Karen as an instructor over the summer, thought that having a different teacher made a difference in learning mathematics:

She worked miracles on me because in Bridge [the summer portion of the program], at first, like, the first couple weeks of Bridge, I had a different math teacher. And I was failing her class—I mean I had an F-minus, if it was even possible to have an F-minus. And then they decided to switch me and a few other students that were failing in her class. And I ended Karen's class with, like, a B+. Because it was strange to move from one teacher. . . . it's pretty much, it was actually the same type of math that was taught in each class, but different teachers. And I just thought that it was a miracle because I was, like, wow, you two are teaching the same type of math, but with this teacher I am failing, but with her—I'm passing.

In a later part of the interview, this same student talked about how good it felt to do mathematics because she felt like she understood the material:

I feel like, that, instead of just solving a problem, I actually accomplish something. Because in Bridge, at first, like I said, I was having a tough time with the math problem[s] with the other teacher. But now, I'm just starting to get problem after problem, and I feel like I'm accomplishing something, a goal. Like, when she goes over

things that we went over the summer, like the radicals, like when I get excited, it feels like rainbows and sunshine. I'm like yes, something I know, I know how to do this, I'm gonna get this done, and it's gonna be so easy.

A student (23A) who had struggled in mathematics since elementary school and continued to struggle in mathematics in college had a grade improvement in the course. In the first interview, 23A stated that:

At first, I thought, I was like, "Not this again." I mean, clearly it's a C. I knew I could do better. So, I look at the paper, I said, "Oh." I went over it with Ms. Karen. She said, "See, like here you forgot your sign." It was, like, little things. "See, I am not really worried about you like people who completely went to left field. This can be fixed really easily." She gave me some little tips that keep, when she saw that in my mind that sometimes I like to solve things in my head I skip a step and that is probably where I make my mistakes. She said, "No. Even if you don't want to, even if you don't like to, write it all out, just write it all out because sometimes I have to do it because it keeps you on track." And, I said, "Ok." I did it, and I got my second test back, and I, like, got 19 [out of 20 possible points]. I'm like, "Oh, my God. This is great." I did my homework, and I got great homework scores, too, so, it, it shows that I'm really trying this time. I'm really practicing; I'm putting forth the effort. I have a great teacher. So everything is, like, fitting in this big puzzle called math.

In a different part of the first interview, the student (23A) also talked about his grades.

My last homework I got a perfect 10. My last quiz I got a 19 out of 20. I see, at first I would have thought, "I really couldn't do math." Even when I get my homework, it's not that I can't do math, it's that, you know, I make small mistakes, like I drop my signs. I am proud of myself. I, actually, smiling inside because, you know, last year because I did so bad I was like, I self-pitied myself. And I took a lot of time. The worst thing is because you know yourself more than anyone and you can beat yourself up worse than anyone else can.

This same student (23B), in the subsequent interview, stated that "I feel really confident when doing math when I was around Karen or when I am doing any type of math now." This student also articulated that he became the go-to person for other students who needed help in the class. He organized and ran a study group twice a week outside of class. Finally, in summary, student 9A summarized what other students had been saying: "And I really was doing really good [sic], and I was confident in myself in math."

Student Attitudes

Related to the issue of mathematical confidence, another sub-category in this theme is student attitudes towards mathematics. 25A acknowledged that, “I don’t like math, but the way Karen teaches makes me like math.” The following quotes reveal the ways in which students’ mathematical confidence was intertwined with their attitude toward the subject:

My views have changed because now I know I can do math. Like, before, I used to be, like, I hated math, and now, I’m, like, it’s just a matter of time before I get it. Whereas opposed to how I used to be like “I’ll never get math.” Like even in class, if I don’t understand something, I’m, like, it’ll take me, like, maybe two hours of practice, and I’ll understand the concept and how to work it. Yes, [I like it] a lot more actually. I actually discovered I had a passion for it, which is weird. (34A)

I’m just, I’m looking at math in a new light maybe in a, in a weird way. I can learn to harness it [math], you know, like the force, like a Padawan, putting it in Jedi terms, like learning to become a master. You can use it; it just takes practice. (23A)

The following semester this same student (23B) talked more about the ways in which Karen influenced his attitudes toward mathematics:

She is very passionate about math. She makes even the person like me who really don’t care about math or, err, don’t like math have a basic respect for math. I really didn’t respect math until I took one of Karen’s classes. Seeing it from her point of view, and the way she taught it, and the way she explains it, and me going through with it, has changed my view. I don’t like it, but I respect it. Respect the importance of it.

Conclusion

In this chapter, the results of the analysis of student interviews were presented. The two major themes that emerged were Karen’s caring about students’ mathematics learning and the teacher’s caring about students as people. Within the theme of caring for students mathematically, we saw that students emphasized the importance of scaffolding (including administration and organization of the course), board writing and copying notes, student work,

office hours (availability), repetition as an aid to understanding, and persistent attention to student understanding.

Within the theme of caring for students as individuals, students emphasized several components: Karen's sharing of personal stories, her personality, her approachability, and her nurturing of students as people (as opposed to simply math learners). The chapter concluded with a cross-cutting discussion of some of the benefits students articulated about Karen and her teaching. In that final section, we saw a glimpse of how intertwined these various themes were for students. Students spoke about the ways in which Karen's positive and caring nature as a teacher and as a person ultimately enhanced their mathematical confidence, attitudes, knowledge, and skills.

Overall, this chapter lays out a way of categorizing the student interviews to identify important and helpful aspects for student learning. However, students may have found these major categories somewhat artificial given the ways in which these aspects were intertwined. For example, there were student responses showing how intertwined the personality and caring of the teacher was with their mathematics learning. The next chapter presents the results of the classroom data.

CHAPTER 6

CLASSROOM DATA RESULTS

I do think that nurturing students is kind of part of my job, and nurturing their self-esteem, especially in regard to doing mathematics, because most of the students that I get do not like math, and have not had success with math. . . . I see them as smart, intelligent individuals that have not had the opportunity to fully realize, you know, their potential to learn math or anything. (Instructor interview, tape 2, page 1)

The above excerpt gives a general idea of Karen's demeanor and expectations in the classroom. The goal of this chapter is to give an overall view of what Karen does in the classroom and how it coincides with her self-characterization above as someone seeking to nurture her students. The key themes or dimensions that I focus on are:

- Teaching Mathematics (Mathematics Communication: caring about students' mathematics learning)
- Relating to students (Personal Communication: caring about students as people)

These two general headings are broken down into several sub-headings (see Table 11). Each sub-heading is illustrated with classroom episodes and observations. Classroom episodes with common characteristics are grouped together. Episodes can be assigned multiple codes as mentioned in Chapter 3. More information on the explanation of what is considered an episode and how coding was conducted is found in Chapter 3. There were a total of 168 episodes.

Table 11

Interview and Observation Codes

Final codes	Teacher codes	Observer codes	Student codes
Theme 1: Caring about students' mathematical learning			
Final code	Diagnosing	Assessing prior knowledge	
Final code	Teaching incrementally	Scaffolding	Scaffolding

(continued)

Table 11 (continued)

Final codes	Teacher codes	Observer codes	Student codes
Final code	Checking for understanding	Checking for understanding	Student work
Final code	Coaching	Coaching	<i>Nurturing</i>
Final code	Scholastic immaturity	Discipline	
Final code	One-on-one interaction	<i>Mathematical</i> availability and approachability	<i>Mathematical</i> availability and approachability
Final code		Administration	Administration
	Mathematical immaturity		
			Repetition to aid understanding
			Persistent to student learning
			Board writing/note copying
		Real-life context	
		Student involvement	
		Clear directions Direct instruction	
		Clarifying learning objectives	

(continued)

Table 11 (continued)

Final codes	Teacher codes	Observer codes	Student codes
Theme II: Caring for Students as People			
Final code	Nurturing	Building rapport, approachability	<i>Nurturing</i>
Final code	Humor/silly	Building rapport, approachability	Personal story, personality
Final code	Verbal affirmation, believing and confidence, little successes	Verbal affirmation, <i>interpersonal</i> availability and approachability	<i>Nurturing, interpersonal availability and approachability</i>

In this chapter, the results are centered on the researcher codes, which were formed based on my own observations in the classroom. Figures 4 and 5 show the number of occurrences for all the “Final Codes” presented in this chapter which were deemed “Final” because they consistently appeared in the data (in contrast to “initial codes” that were less consistent and deemed less important in the final analysis). As part of the analysis offered in this chapter, teacher and student perspectives are included to show the general consensus on the results as seen in the Final Codes in Table 11. A greater discussion of teacher and student perspectives with reference to research is deferred to the Discussion Chapter 7. For example, I will discuss how student involvement and direct instruction can co-exist within the same lesson. In addition, there were some minor findings (or initial codes from the teacher or student data sources) that did not stand out to me and so are not a part of my main researcher codes. However, after reviewing both minor and major codes, I tried to connect minor codes (e.g., *Repetition to Aid Understanding, Persistent to Student Learning, Board Writing/Note Copying*) to major researcher codes (such as *Assessing Prior Knowledge* and *Scaffolding*).

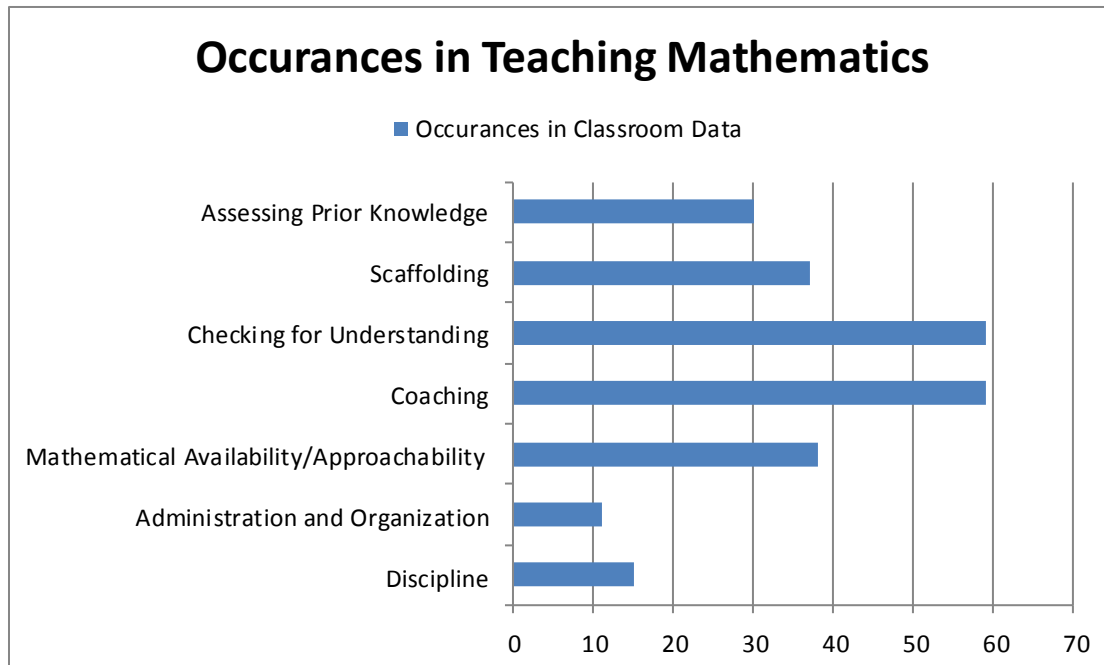


Figure 4. Occurrences in Theme 1: Caring about students' mathematics learning.

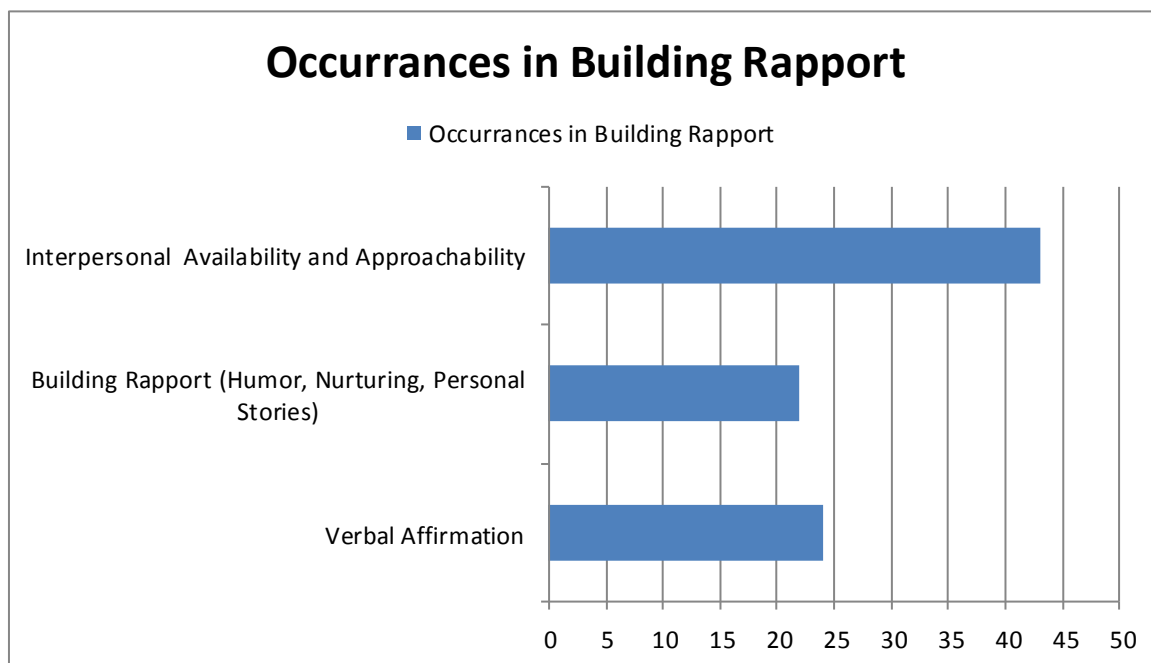


Figure 5. Occurrences in classroom data Theme 2: Caring about students as people.

The structure of this chapter is as follows: I begin with the transcript of how Karen, the instructor, oriented students to the class on the first day. A brief description of a typical day of

instruction follows. The rest of the chapter discusses the two overarching themes that guide the analysis of the classroom data. The first theme is the instructor's "caring about students' mathematics learning," and the second theme is the instructor's "caring about students as people." The instructor used both forms of caring to make mathematics more accessible to students. The analysis draws out the teacher's caring nature.

Description of The First Day of Class

Karen arrived in the classroom a few minutes before the class started at 9 am. There were 8 students already in the classroom. Two girls were talking and asking each other about Karen. "Who did you have as an instructor over the summer?" one girl asked the other. Once all 30 students arrived, we would be very cramped for space since the classroom was small and the seats were crammed next to each other. Karen walked in and quickly said, "Hi" to several students individually as she got ready. One male and two females said "Hi" to her. "I know less than half of you," Karen said out loud. "Did you have a good day yesterday?" she continued, though it was not clear if she was speaking to the class in general or to a specific student.

Karen counted the students that were present, and the majority of the students were in class. Many students already knew each other well enough to carry on conversations. Karen then introduced herself and asked the students to introduce themselves as well. She smiled and spoke to the students casually.

Class officially started when Karen addressed the class by saying, "Let me give you some reading material. Welcome to Pre-Algebra. We have lots to go over today, but we are going to do math. I am sorry." She introduced herself for a second time and let students call her Karen or Ms. Karen. Her initial interest in the students' lives was made evident by having students introduce themselves. Students were asked to state their name and their major. Karen began the activity by

telling the students more about herself, including that her major is her grandchildren. She said, “I love teaching. I like math. I love teaching math.” She also let them know that “You’ll hear me talking about them [grandchildren], here and there.”

She continued by explaining the expectations for students.

In this class, I will want you to come up to the board and show us things, ask questions—don’t worry. Maybe 15 out of 30 people have the same question. Feel free to talk, respect each other just like when I am up here.

After this, Karen let the students in the back of the room start with the introductions. The amount of noise and talking reinforced my belief that the students knew each other. Students were also laughing at each others’ introductions.

Karen also took this opportunity to let some students know that she remembered them from a year ago during the Bridge Summer program. She asked, “How many are freshman? How many are sophomores?” She told students that she was also asking these questions for the purposes of my study. Karen started using verbal affirmation on the first day of school. “You have chosen a good school. You have chosen a tough school. You are doing the right thing with taking Pre-Algebra before you go on with any other math . . . because Algebra moves very quickly.” After this, some students walked in late, and she welcomed them with a smile and had them introduce themselves.

As she started going over the syllabus, she told students, “Feel free to interrupt me if you have any questions. I will also leave time at the end for questions.” Karen told students that she was really bad with email; however, she told them the best way to contact her was before or after class. Karen stated, “If my office hours aren’t working for you, then I can set up an appointment with you. I have a lot of free hours that I didn’t end up offering them as office hours.” She mentioned her office phone number to the class, and she also told students that she is only at her

phone on Mondays and Wednesdays during her office hours. Students were encouraged to call her at her office, and she continued by telling students where her office was located. She explained that she had tried to arrange the schedule for office hours to accommodate the greatest number of students.

Karen continued,

What I was trying to do was try to catch people who had 1:00 p.m. and 2:00 p.m. classes so if you have 1 o'clock, so don't rule out the 12:30 p.m. office hour . . . because you would be surprised how much math we could do in those 20 minutes from 12:30-12:50, especially if you are the only person there. We can probably do 10-15 problems and definitely get you unstuck. Don't rule out that little half hour. If you have a class until 1:50, don't rule out coming at that point because it says 2:30. I don't necessarily leave at 2:30; if none of you are there, then I will leave at 2:30, but if somebody is there working, I can stay past 2:30 . . . Take the "or by appointment" seriously.

There were students in the back texting so Karen stopped lecture to address this. Her silent break from lecture caused students to pay attention to her. She stopped a second time because there were students in the back talking. An important guideline that she explained to the students was that there would be no calculator use until after the first exam. She made it clear to students that there was mathematical material that she wanted to ensure they knew. Karen asked a student to read the section in the syllabus on homework. A student stood up and read it out loud. Students were surprised by the "no late" homework policy. Students groaned when the policy was announced. There were also many specific guidelines announced. Homework needed to be done in pencil and was due on Thursdays. Karen repeated the "no late homework" policy. Karen wanted students to have other students drop off homework when they were absent from class. She also announced that the lowest homework grade would be dropped.

Karen announced an important guideline. There would be no make-up homework or quizzes. Karen explained, "This is the reason. I don't want my office hours to be this big make-up quiz/testing center. I want it to be a time [where] we just work on math the whole time. We

want to work on math.” Quizzes and exams were announced. Karen passed out other handouts that informed students about the number of homework assignments, due dates, exam days, etc. She told students to put all of the dates into their calendars. Karen went over another handout that discussed the grading system. She used a point system for grades, so she told students that they could figure out their grade at any point. An explanation of the point scale followed.

At 9:34, Karen started the math lesson by giving students the first assigned homework for section R.1. Students realized that the homework was not due for another week. Karen responded with, “Don’t put it off until next Wednesday.” The course started with a lecture on the real number system and included material on natural numbers, whole numbers, integers, rational numbers, and irrationals. Like most of her lessons, Karen started with the most basic concept or an easy example, and, in this case, it was natural numbers. Karen said, “You have the natural numbers that you started with when you were 1 or 2 years old. When you were counting numbers or blocks, there are little babies [that] count 1, 2, 3, and that’s why they are called the natural numbers. It’s natural to count that way.” She followed with a lot of examples of whole numbers, real numbers, rational numbers, etc. Karen explained, “Rational numbers can be written as a terminal or repeating decimal. [They] can be written as a ratio/fraction of 2 integers.” She also wrote the following numbers on the board as examples. She went over them with students out loud.

Board Text

$$3 = 3.0 = \frac{3}{1} \qquad 0 = \frac{0}{1}$$

Irrational Numbers- real numbers that are not rational.

$$-\sqrt{7} \quad \sqrt[3]{5} \quad \pi \quad e$$

Karen asked the students, “Can you give me [an example of] an irrational number?” A student said to use a fraction with a zero at the bottom.

Karen then wrote on the board:

$$\frac{?}{0}$$

Karen right away said, “It wouldn’t be a number at all. I’m glad that you brought that up,” and she went on to say, “That’s undefined and doesn’t count as a number.” As part of the lesson, she let students know that she was drawing a graphic organizer to illustrate the concept of the real number system for visual learners. The lesson continued with Karen asking students to get into groups so they could work together, and she also asked them to move their desks so they could talk to other students. The assignment for the group was to label numbers as natural, whole, real, etc. Karen wrote the following numbers on the board for students to classify.

Board Text

$$0, -10, \frac{22}{7}, 1.23333, 0.01001001 \dots, 2\pi, -\frac{1}{3}, \sqrt[3]{-2}, \sqrt{-2}, 0.538, \frac{-15}{3}$$

a) Which are natural numbers?

Answer: None [Students originally thought -5 belonged on this list.]

b) Which are integers?

$$\text{Answer: } -10, \frac{-15}{3}, 0$$

c) Which are rational?

$$\text{Answer: } -10, \frac{22}{7}, 0, 1.23333, 0.538, \frac{-15}{3}$$

d) Which are irrational?

$$\text{Answer: } 2\pi, \sqrt[3]{-2}, 0.01001001 \dots$$

Without Karen calling on specific students, they spontaneously came and wrote answers on the board.

Many students engaged with the lesson. Specifically, they were talking to each other about these mathematics problems. Students were also looking at their notes. Karen walked around the classroom helping students, and she announced to the whole class that numbers can go in more than one list: “Every real number can either be rational or irrational.” After students were done working, she asked them to come up to the board to put their answers up. Karen regrouped the entire class and reviewed the answers on the board. Karen went over each number explaining why each number belonged in each list. After this activity, the class took a 5-minute break. During the break, students asked Karen about her grandchildren.

The class resumed with Karen passing out a sign-in sheet that asked students for their names, year in college (e.g., freshman, sophomore), and the years of math taken in high school. She also gave me the opportunity to introduce myself and the study. I spoke briefly about myself (i.e., I am a Ph.D. student in the College of Education) and spoke more on the study and the consent form. As part of my study, I let students know I would be taking notes, talking to them informally, and conducting interviews about what Karen was doing to help them learn math.

Karen continued the math lesson by teaching mathematical properties, specifically the Commutative, Associative, Distributive, Identity, and Inverse Properties. The lesson also included a review of fractions. During the lecture, Karen wanted students to get in the habit of working together so she asked them to check with a neighbor on their answers. This would continue to be a common characteristic of her teaching.

The last mathematical topic covered on the first day of class was the order of operations. She told students and wrote on the board “Order of Operations: Parentheses, Exponents,

Multiplication and Division, Addition and Subtraction.” As part of the discussion on the order of operations, she tapped into their previous knowledge on this topic by using the common acronym PEMDAS (Please Excuse My Dear Aunt Sally). She ended the class by giving students a preview of topics that would be covered in the next class session. Karen said, “We will pick up on R.1. Before you leave, we are going to do one order of operations problem.”

General Characteristics of Class Structure

Before analyzing the specific and unique characteristics of the classroom data, a brief overview of the class structure is presented. Although this explanation is for the two sections of Pre-Algebra I observed, this description is also typical of the other semesters and other courses I observed Karen teach.

The morning class section was scheduled for a two hour block from 9-11 a.m. With the exception of quiz and exam days, the following structure was in place for her classes. She greets students as she walked in even if there was only one student present in the classroom. At about the same time, she takes materials out of her schoolbag. After a general greeting to the students, she gives a short overview of the schedule for that day e.g., “Today, we will go over homework from the previous section; we will also start a new section.” The announcements for and administration of the course are reviewed along with the class schedule. Once all this administrative information is provided to students, she takes homework questions or requests from students.

This homework review takes no longer than one hour. During this time, students can ask any questions they have about the homework. For the most part, she does the problems on the board with students watching her and copying the problem down on their papers. For the most

part, Karen tries to do all the problems requested on the board. However, there are times when students may work in groups or work on the board.

There are two possible options for what happens after the homework review is complete. If the homework review is too long (closer to an hour), then the class will go on break. During break, Karen still engages with students. Students go to her for help on homework, course advising, and/or to schedule appointments with her for extra help. She seldom takes bathroom breaks. The other option occurs if the homework review is short. Karen will launch into the lecture component and will lecture for a short while before the class takes a break. During the lecture component, she starts by trying to connect the new lesson to the previous lesson, which may include a review. After this short introduction, she moves into the lesson. The lecture component usually lasts more than one hour independent of break time. Although Karen does a lot of the teaching during the lecture component, there are opportunities for students to try problems on their own. Towards the end of lecture time, Karen may end with a preview of the next lesson.

There are three exams during the 16-week semester. On exam days, no new material is covered. At the beginning of class, there is a review of content. This review consists of going over questions on the homework at students' request. Depending on time constraints, she may also create problems on the board, but this is rare. The review lasts no more than half an hour. After the review, students take a small break and hand in homework. This transition is quick because the students start the exam soon after. The time allotted for exams is an hour and a half. Students can leave once they are done with the exam.

Theme 1: Caring About Students' Mathematics Learning

Assessing Prior Knowledge

A clear and observable feature of Karen's teaching was assessment of students' prior knowledge. Assessing prior knowledge was her technique for attempting to retrieve knowledge and understanding that students may have been taught before this course. There were 30 such episodes out of 186 total coded episodes. The category of assessing prior knowledge appeared during the instruction in two primary ways: *Starting New Lessons* and *Reviewing Previous Content*.

Assessing Prior Knowledge: Starting New Lessons

Karen assessed prior knowledge at the beginning of the lesson in the following example.

- (Episode #25) Karen started the lesson on factoring. She asked students, "What is factoring?" Only one student said the "inverse"; this is after she said, "I already said it today." A few seconds of silence went by. Karen: "It's un-multiplying. So, you end up with a product. If you write 4 times 5, that's called a product, 2 or more things multiplied together. The first thing we learn is factoring out the greatest common factor (GCF)." She starts with a simple example [$3x(2x-9)$].

Most lectures in all of Karen's courses that I observed began in a similar way: she asked what students knew about the current topic. She wanted to use their already present knowledge as a way to connect them to the new lesson. This example illustrates one way of caring in that she wanted to know about the knowledge that students brought to class. She also wanted students to be conscious that they, too, have mathematical knowledge that can be used to push them forward in their learning of new mathematics. In addition, this method encouraged student involvement and affirmed their knowledge in mathematics.

The following episode shows Karen directly asking students if they have encountered specific content knowledge previously.

- (Episode #138) When Karen starts the unit on graphing, she says that graphing is something they had done before. After selecting points, she asks students to graph the points by hand on their paper. “Some of you may know a lot; some of you would know that this is a line that the slope is whatever.” After doing a few more examples, Karen asks students, “Have you done this stuff before?”

The questioning in Episode #138 was centered on asking students what they knew about a specific topic as a way to introduce a lesson. Karen also tried to figure out if students had seen this content before. However, she did not necessarily use their answers to advance their knowledge in this situation.

Reviewing Previous Content

Besides assessing prior knowledge at the beginning of lessons, Karen used it throughout her teaching.

- (Episode #64): While doing a problem on the board, Karen asks, “What do you think needs to be in the LCD?” Students’ response: “an m .” Karen responds: “How many of them? . . . “Two. Do I hear three?” Students’ responses is not audible. Karen: “It is two because of the m^2 . This one has one. This one has two. Why don’t we use three? What we are trying to do is get them all of the same. So, we only need to go as high as we see in one of the denominators. . . . We don’t need more than what we see in a denominator. One m would not be enough because what would we do with m^2 ?”

Karen is discussing old skills that students learned in the past to help promote new learning. This example is at the core of assessing and diagnosing prior knowledge. On the basis of assessing prior knowledge and other techniques is this chapter, the instructor consistently tried to connect to students (including to their previous mathematical knowledge).

Karen did not blame the students for lacking prior knowledge but instead warmly filled the gaps in students’ mathematical knowledge. As discussed earlier, the students in these courses were missing content that they should have learned either in elementary or secondary school. This lack of knowledge caused her to teach prerequisite skills throughout the semester in all of her courses. Throughout the years that I observed her teach, I cannot recall a situation during

which she criticized students for their lack of mathematical knowledge. In over 200 hours of observation, I saw her respond only with respect, kindness, and compassion when asked questions about prerequisite mathematical material. Student interviews also support this claim.

Teacher and Student Perspectives

In her interviews, Karen used the term “diagnosing” to describe assessing previous knowledge. Diagnosing is a form of caring because it reveals Karen’s concern for students’ thinking and learning.

During the student interviews, there were no responses indicating that students were aware of Karen assessing prior knowledge. Therefore, there are no student codes that correspond to diagnosing/assessing prior knowledge. However, assessing prior knowledge is essential because it is a stepping stone for another teaching technique—scaffolding—which is very important to students.

Scaffolding (Building on Prior Knowledge to Promote Learning New Material)

Assessing prior knowledge can evolve into another method that can help students learn mathematics. The term *scaffolding* is used to describe this technique, and it goes beyond assessing students’ prior knowledge. According to Vygotsky (1978), scaffolding is when the “learner gets assistance or support to perform a task beyond his or her own reach if pursued independently” (Wood et al., 1976, p. 90). Karen started with a basic skill needed to teach a concept, teaching it slowly, step-by-step, providing support for students to solve problems that they initially did not know how to solve. She allowed students the opportunity to ask questions as the problem progressed. There were 37 episodes coded as “scaffolding” of the 186 total coded episodes. This method was an evident and recognizable feature of Karen’s teaching; it was

commonly used for starting new lessons and progressing through a lesson. The following episode illustrates this technique.

- (Episode #105): Karen tries to connect the concept of word problems to the world. “Adding prices at a grocery store is a word problem. It’s really a word problem.” She explains how buying Ramen Noodles and bananas is a word problem. “It is a simple word problem, but keep it in mind it is a simple one. You are just adding numbers. Without word problems, there is no point of having math.” Karen starts basic on the worksheet. The following three statements appear at the top of the worksheet. The underlined parts are what students need to figure out. After a few minutes, she goes over it.

“The perimeter of a figure is the sum of the lengths of sides.”

In other words, the perimeter of a figure is the distance around the figure.

The perimeter of a rectangle is given by $P = 2L + 2W$.

After this brief introduction, Karen launches into basic perimeter problems. She asked students to figure out the perimeter of a triangle and rectangle. After a few minutes, she goes over the problem on the board. She asks students, “Do you feel you know what a perimeter is before we tackle any of the word problems?” She moves on after this with problems that are basic equations that use these formulas so students can get used to solving equations. The following are the examples.

2. Find the width of a rectangle whose length is 9cm and whose perimeter is 25cm.

3. Find the length of a rectangle whose length 4ft. more than its width. Find both dimensions if the perimeter of the rectangle is 76ft.

As part of the general routine, after Karen asked students what they knew about the topic of a new lesson, she described the new concept and instructed students on the needed skills multiple times. She taught new skills by going over many examples at the board out loud with students. As she went over these examples, she solicited student responses, and students took notes during this time. While using this technique, she gave clear, verbal, step-by-step instructions to help students understand new material. She communicated, out loud, her thought processes so that students had a model of how to think mathematically. She also wrote the steps on the board. When she solicited students’ responses, she stopped writing and faced them.

As noted by the teacher in her interviews, students had not experienced a lot of success in mathematics. This experience allowed students to experience “little successes” as they did basic problems successfully out loud with the teacher at the board. The instructor wanted to reduce student confusion, frustration, math anxiety, and the risk of failure. This is how she made mathematics much more personal and comfortable for them.

Teaching incrementally was such a prevailing feature in her everyday teaching that, when it did not happen, students fell apart. The following is an example in which the teacher started with a complex problem at the beginning of a lecture.

- (Episode #118): Continuing from the previous lesson, Karen continues doing more complicated examples of completing the square. The first example has fractions ($3x^2 - 21x + 4 = 0$). (The solution is below.) While doing a second “messy” completing the square problem [listed below] on the board, I notice that, up to this point, there are a lot of questions from students. After Karen answers several student questions, she makes the following comment: “This is how college algebra differs from what you did in high school. You did all of the easy ones in high school.” She gives an easy problem for students to work together. Unlike other days, Karen started the lesson with hard examples. Karen: “I think you guys need to do an easier one on your own with a neighbor. Seriously, work together on this. Solve by completing the square.” I hear students’ mathematical conversations. She walks around and helps students. After walking around, she goes up to the board to solve the equation. Karen: “Let’s do this together. I know if I went around individually it would take too long.”

$$\sqrt{\left(x - \frac{7}{2}\right)^2} = \pm \sqrt{\frac{131}{12}}$$

$$x - \frac{7}{2} = \pm \sqrt{\frac{131}{12}}$$

$$x = -\frac{7}{2} = \pm \sqrt{\frac{131}{12}}$$

$$x = \sqrt{\frac{131}{12}} = \frac{\sqrt{131}}{\sqrt{12}} = \frac{\sqrt{131}}{2\sqrt{3}} =$$

$$\frac{\sqrt{131}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{393}}{2 \cdot 3} = \frac{\sqrt{393}}{6}$$

Starting with complex problems was atypical, and I do not remember observing this except on this one occasion. As previously mentioned, the instructor generally used prior knowledge as a springboard to teach new concepts. This approach was also used in going over homework and reviewing for upcoming tests and quizzes. Her general approach for doing any mathematics problem with students was to start with the most basic step, building from what students knew. The instructor commonly asked, “What’s the first step?” or a variation of this question.

Karen’s approach of using scaffolding within an interactive lecture was present in her everyday teaching with few exceptions. In the many years of observing her, I do not remember her doing a “discovery” or a “project-based” type lesson besides teaching word problems. Even during the lesson on word problems, Karen tried to give students a small recipe or a script for solving word problems. In her teaching, scaffolding was not used for discovering processes or patterns in mathematics or for project-based teaching as proposed by NCTM (1991; 2000). For example, she showed students on the board how to derive the quadratic formula through a set of algebraic manipulations of symbols (Observation #16, episode #120) instead of discovering the formula on their own.

Another important feature in this method is that Karen got a sense of what and how students were learning. She used this information to give more or fewer examples, monitored the difficulty of the problems, and modified the lesson if necessary. As the instructor completed examples on the board, she solicited student responses and tried to move students to develop mastery. It is evident in multiple ways and is illustrated in the next major code, “Checking for Understanding.”

Teacher and Student Perspectives

Both the teacher and the students concurred that scaffolding was a noticeable aspect of Karen's teaching. Karen used the terms "teaching incrementally" and "little successes" to describe scaffolding. She meant that students need to see that they have done even a little part of a problem correctly so they will not give up (Teacher Interview 5, page 3).

As mentioned in Chapter 5, students described scaffolding as "baby steps." Their views also included the pace of the lesson and the teacher's explanation as attributes of scaffolding that make learning helpful. The episodes of scaffolding also reveal how the instructor made students comfortable learning mathematics.

Connecting to Other Findings

A related idea that emerged during the teacher interviews was the concept of *mathematical immaturity*, or *students lacking the mathematical knowledge and skills that would typically be expected of college students*. Karen acknowledged that her students lacked mathematical maturity as they had limited knowledge of some basic topics, had difficulty solving multi-step problems, and struggled in using different approaches than what the teacher demonstrated. For example, students struggled with basic mixed-number concepts that are typically taught in middle school:

- (Episode #78): Karen does this example on the board. Karen asks students to put $15\frac{1}{2}$ in a mixed number. She asks students, "Think about this carefully. Is it 7 times $\frac{1}{2}$ or is it 7 plus $\frac{1}{2}$?" Only 2 students respond, and she says, "I hear one of each. I hear 2 people answering." She repeats the question. More students say times, and others say it is addition. "It is a good question. In algebra, when we write things next to each other, it means times, but when we write mixed numbers, it actually does mean plus. It means the whole 7 and in addition that $\frac{1}{2}$; that's why in algebra we don't use a lot of mixed numbers because two things next to each other usually means we multiply . . ." Karen uses a pizza as an example to explain that it is 7 pizzas plus a half.

One key note is that mathematical immaturity was something with which the teacher had to contend while working with at-risk college students. Mathematical immaturity revealed more about what Karen faced in her experiences teaching remedial mathematics and not about her characteristics as a teacher.

Checking for Understanding

Checking the students' understanding of mathematical concepts was another key instructional method. It took on various forms (e.g., asking students for answers, group work, board work, individual seat work). Regardless of whether the work was group or individual work, Karen walked around the classroom checking to see if students had completed the problem. Karen usually waited until she had seen students' work and knew that students had worked out part of the problem *before* Karen or a student presented the whole, complete problem on the board. There were 59 episodes coded as "Checking for Understanding" out of the 186 total coded episodes. The following episodes depict this technique:

- (Episode #4): Karen asks students to do this problem with classmates: [- 21 -14 (-4) - (10)]. Karen says, "Try this with a neighbor. It's too quiet. When you are working on math, it can be a very noisy thing." It gets louder; Karen starts working with students individually at their desks. (f⁸: I see one student showing another student how to do this problem.) After a few minutes, Karen goes over the problem on the board.
- (Episode #65): Students have the opportunity to work on a problem on their own or with other students in the class. Students are working together. Karen walks around checking answers and helping individual students. After a few minutes, she goes over the problem on the board.

There were many different ways in which Karen checked for understanding. This included, but was not limited to, asking questions during lecture, homework review, board work, group work, and quizzes. A common phrase she used to initiate these activities was "Try this with a neighbor," which provided her an opportunity to observe students work and provide help

⁸ f indicates that this piece of information came from a field note record.

as needed. Karen checked every few seconds for understanding because she constantly asked students what they knew during lecture. In her courses, she spent the first half of class time going over homework, which is a form of checking for understanding. After half of the class was spent on checking the students' understanding on the homework, she also provided group work, independent practice, and board work as a way to check the students' understanding on the new topic that was taught. This shows caring because she stopped and made time to check students' work. She was also concerned about whether or not students had learned the material. Checking for understanding was a priority for Karen as seen through her concentrated efforts and the time spent on this.

The most compelling episode of "checking for understanding" is episode #42 for several reasons. First, the teacher directly and specifically told students that she was interested in knowing if they could factor. She communicated her expectations because she was aware that students were not doing any of the mathematics. The solution was to get students to the board. Second, besides checking for understanding, this episode highlights other aspects of Karen's teaching such as one-on-one interactions, coaching, teacher availability, and working with students who display scholastic immaturity (or discipline).

- (Episode #42): Students are in groups of four. Karen: "I want you to come up to the board in groups of four. Those sitting in back should work at the back board." The set-up of the activity took a long time. . . . After four minutes, I heard Karen say, "This is now the third time I have asked you to quiet down." Unlike the other group activities, the students are up at the board doing math. Instructor: "I hope it is a lot more fun because I did get you up. The idea is that now I can see how you guys are doing at factoring, and if I only ask questions I only hear a few students answering the questions. I don't know if people are stuck. In your group, take turns being the one who writes on the board, and everyone else helps him out. One person should be writing, and everyone else should be coaching." She tells students the problem out loud so that students can write it on the board. From the recording, I continue hearing a lot of talking and movement from the students. She walks around and helps groups. Karen: "Erase your work quickly." She asks them to quiet down and gives them another factoring problem. Once again, students start working on the other problem, and she still walks around and helps the groups. Karen: "It's not

just about you standing up in a 2-hour class. I can see how you are solving the problem.” (f: Karen turns off the lights to get students’ attention, and she looks around at all the boards to make sure the student work is correct.) There is a lot of participation from students, which included the students’ writing on the board, talking to each other, and calling the instructor for help. At some point, the instructor closed the door. After students attempted to solve the last problem, there was a lot of noise. Karen said, “Try to act like you are in college.” She does not go over the two problems right away and gives them a third problem. She still walks around and helps students. I hear a lot of talking that includes math. Students get stuck, and she said, “I will get you unstuck.” She asked students to sit down. She now addresses the entire class on how to do this problem. She starts with pointing out what they did right. “You have the correct number.” She goes back to the board as the entire class regroups and starts going over the third problem $2x^4 - 3x^2 - 5$. (f: I asked Karen why she decided to do this activity this way. She said, “There were too many students not taking notes or not doing the math problems I assigned in class.”)

Teacher and Student Perspectives

Both teacher and students agreed that checking for understanding was a component of daily instruction. For Karen, the key distinction between checking for understanding and diagnosing was that diagnosing refers to checking previous knowledge and checking for understanding refers to ensuring comprehension of the more current, up-to-date content. Based on student interview data, students had a larger view of checking understanding that also included individual seat work, practice, and board work.

Connecting to Other Findings: Persistence in Ensuring Student Learning

There are additional findings that relate to checking for understanding. One related finding is students’ awareness that Karen was persistent in ensuring their learning. This persistence went beyond just checking students’ work. The following episode illustrates this.

- (Episode#18): As students request problems out loud, Karen writes the number of the problem on the board. I hear students requesting a lot of homework problems. Karen: “I don’t guarantee that I will do all of them. You may do some of them. These are too many for me to do for you, guys.” Karen asks students, “Are you guys all comfortable with 56? It is even. What’s the answer to 56? I am hearing a couple of answers. Maybe we should look at 56?” Karen writes the problem on the board. “Talk it over with at least one person that is close by you.” As students are working, she hears three different answers from students. She goes over the problem with the entire class on the board.

Even after exams, Karen continued to go over material that students did not know on the exam. She also went over homework after the problem had been completed on the board or after homework had been handed in for grading. Asking students constantly about the steps, methods, procedures when doing mathematics and using multiple examples and multiple ways to teach a concept were also forms of persistence. Checking for understanding was a demonstration of Karen's persistence to ensure that students learned the material.

Coaching

In her teaching, Karen went beyond the typical role of a teacher. She also played the role of "coach" as she encouraged students to develop productive mathematics learning behaviors. Karen used a wide variety of methods such as modeling certain ways of doing mathematics or techniques (e.g., trial-and-error). She advised students on how to learn mathematics, advised students on how to obtain specific learning skills, and explained good study habits (e.g., how to write math notes). Similar to an athletic coach or trainer, Karen gave hints and tips as a way to guide student learning. There were 59 episodes of this code out of the 186 total coded episodes. The following episodes demonstrate her coaching nature:

- (Episode #13): Karen begins to talk about the amount of homework she assigns when she relates the amount of homework to sports. There are a lot of athletes in this section. Karen tells students her sports speech. "Homework is like a sport. You get to practice it for when game time comes. [Game time] is the exam, and if you haven't practiced it on the homework, you can't expect that when game time comes, you'll be able to do it well. I wouldn't want to deprive you from enough practice. . . . I do it for your own good. I assigned what I really think you need to do to be ready."
- (Episode #3): Talking about negative numbers, specifically -10, Karen says, "When you are thinking about negative numbers, two negative numbers, take negative numbers -6 and -4, if you lose 6 dollars and lost another 4 dollars, you have lost -10. I encourage you to recopy everything else; don't just copy -10." She used the concept of money and the number line to explain -10.

One of the traits of her mathematical coaching was that Karen explained her thought processes to students. She completed problems on the board with student responses, and she showed that these mathematical techniques do not work with this problem. She abandoned a possible mathematical idea. She tried to model “how to do” mathematics including trial-and-error. Modeling different mathematical techniques that might be unfamiliar to students were a common part of every class session. Demonstrating the instructor’s thought processes were also a common part of every class session. This was a form of caring because the instructor wanted students to take ownership of their learning of mathematics. She tried to expand students’ views of how to learn and study mathematics. This was challenging to do since these students tended to have a poor attitude towards mathematics. The following episode shows Karen mentoring students in other ways.

- (Episode #50): This happens at the beginning of class before Karen introduces the schedule. A student did the wrong set of homework problems. Karen states, “Extra practice is always a good thing.” A few seconds later, the instructor said, “I am concerned with what I see on the quiz. Some of you need to be doing more practice. Do you know what I mean? If the quiz is the game, then you have to be ready for it by practicing. Practicing it enough that it is second nature by the time you get there. All the quiz questions were just like the homework questions. . . . I am afraid we are doing too many problems up on the board, and you guys are thinking ‘It’s just a matter of getting the homework done.’ It’s not. Practice only counts if you are doing it. It doesn’t count if I am doing it. The goal isn’t just to get it done on your homework paper. It’s college. You guys are paying for it. Here’s the deal. If I put it on the board, but you just copy it down, in your mind, you should’ve not considered that homework done. You should be going back to it later. Just be glad that you have the answer there so you know how to check it when you do it or figure out where you are stuck, but you guys know whether or not you are doing it yourself. Unless you have done every single homework problem yourself, you are not ready for the quiz. So, it is up to you. It’s about how much you want to get out of college education.

Besides mathematical coaching, Karen mentored students in practices that are conducive to learning. There is a wide range of ways that this mentoring happens: advising in coursework, advising students to take notes during lectures, showing them how to study for math exams, etc.

Note taking was an observable feature of mentoring as recorded in my journal. Common phrases that I heard were “Put this in your notes,” “For your notes,” and “Write it this way” (Journal, July 26, 2010). Based on my observations, this happened at least once per class and usually more often. This showed caring because she went beyond her “mathematics teaching responsibilities” and mentored students so they could be successful in college. In addition, this attribute suggests caring because she wanted to be allies in the students’ goal of finishing their college education.

Teacher and Student Perspectives

Both teacher and students agreed that coaching was a teaching technique apparent in the instruction. Karen’s coaching analogy was fitting with the morning section because this class had many students who were on athletic teams.

During the interviews, students articulated that Karen had gone beyond “teacher-like” qualities but did not reference the term coach. Rather, students were aware that Karen had gone the extra mile to take care of them in their learning of mathematics. For example, students were aware of the “tips” that Karen sometimes gave individual students to help them or hints to the entire class. This is apparent in many ways throughout the major findings in this chapter and previous result chapters.

Discipline

Karen reprimanded students for the purpose of regulating behaviors that were disruptive to learning. She maintained classroom management for learning and classroom activities. For example, she instructed students on appropriate test taking behaviors. At the beginning of the semester, most reprimands were for being too noisy. Karen handled excessive noise by telling students to be quiet. After mid-semester, the reprimands were focused on students not trying hard enough on their own. As a response, Karen continuously tried to encourage them. There were 15

episodes coded as *Discipline* out of the 186 total coded episodes. The following episodes demonstrate discipline concerns:

- (Episode #31): Karen writes on the board. . . . The class gets loud again so she said, “Do you think you are in high school or something? Every time I write something or whatever, you break into conversation. This is not high school. . . . Try [long pause], try not to be talking every time I write something on the board because we’ll waste a lot of time and negative energy with me saying to you guys, ‘Be quiet.’”
- (Episode #39): While going over a math example, Karen reprimands students in the back of the room. She does this by asking them a math question. The instructor says, “I am going to ask these guys because they are in their own world back there.”

These students were with other students from the same program, and this was one reason for the noise level. Karen had found that they “got along” very quickly at the beginning of the semester. These types of disruptions were very common at the beginning of the semester and less so when the semester continued and when some students had dropped. I noted in my journal that the morning class was very loud, and Karen had to repeatedly tell students to be quiet (Journal, September 3, 2009). My journal frequently had entries that mentioned the loudness in the class. Later during the semester, I noted a change in the AM class. Many students were absent, and this made the climate very different. “I could tell that Karen was enjoying her teaching a lot more. She was laughing and interacting with the class a lot more She was more like herself: funny, easy spirited” (Journal, October 13, 2009). Reprimanding students was a form of caring because Karen tried to instill appropriate behaviors for an educational setting and also cared for students who were negatively affected by the behavior.

Teacher and Student Perspectives

During our interviews, Karen readily stated that students lacked scholastic maturity. Based on observations and her comments, students did not know when to be quiet and listen. Especially in the fall semester (as opposed to the spring semester), Karen had to remind students

that they were no longer in high school. During student interviews, students did mention disciplinary issues. However, there were only a few who were aware of it. Those few who recognized that Karen was doing something about the problem said that this made them feel cared for. They also acknowledged that these disciplinary problems were minor in comparison to those in their high school.

Mathematical Availability/Approachability

A major aspect of Karen's teaching was her friendly frequent interactions with students. Mathematical availability and approachability is defined as a teacher exhibiting easiness in her accessibility to students and easiness in allowing students to approach her during whole-group and one-on-one interactions. My view on availability and approachability was much larger than just office hours. It included whether the teacher addressed and helped students during lecture and class time and also included having one-on-one interactions with students. In many situations, the teacher and students had direct contact and worked together on mathematics during class time, breaks, and office hours. There were 28 episodes coded as Mathematical Availability/Approachability out of the 186 total coded episodes.

- (Episode #17): At the beginning of class, Karen reminds students about the quiz and gives a suggestion. "Look ahead in your [school calendar] so you know when the quizzes are." While addressing the entire class, Karen offers students office hours. She has the syllabus in her hands and is referring to it. "To make sure you guys knew, those half periods are still good times to come in. . . . I am looking at office hours. I have not had a lot of people come in and maybe you were not very stuck this week. If you are, the 12:30-1 p.m. time, even if you are free then. I had somebody come in yesterday. The student came in and got a number of things asked. And at 2:30, I don't have to leave." She continues with stating that she can stay pass 2:30 p.m. "I have had people make appointments already. Monday at 9 a.m., Monday at 10 a.m. Just make sure to get help if you need it. And, of course, there are office hours tomorrow before the quiz."

One-on-one interactions took several forms. For example, Karen was constantly offering office hours and also maintained office hours. As noted in my journal, I was impressed and

happy that Karen took the initiative to talk to students individually about coming to her office hours. I was impressed because “she was going the extra step” and because she was trying to salvage the grades early on (Journal, September 9, 2009). This showed students that she cared about ensuring that they received extra help.

Karen was consistently enthusiastic in her interactions with students and her presentation of the lesson. She faced students, had strong, attentive facial expressions (e.g., leaning forward slightly towards the students, smiling, and fixing her eyes on students), and exhibited strong vocalization. This promoted more opportunities for students to work with her because they may have felt that she was attending to them. When she needed to stop during lecture to help students, she walked over to students and provided them with one-on-one instruction. By providing opportunities to ensure student understanding, Karen demonstrated caring for the students. These were also indications that her full concentration was on students and indications of good listening skills.

Teacher and Student Perspectives

Karen saw her availability and approachability as central to her teaching. In her interviews, she said the best teaching was through one-on-one interactions with students. As she worked more and more with students one-on-one at the local community college, she learned a lot about students’ mathematical thinking. These one-on-one interactions also served to make Karen more approachable to students.

As stated in the previous chapter, students cited benefits in getting help during office hours and being able to ask questions during class. Students asked questions about class activities, homework, and even about basic or skills such as reducing fractions. Students did not

appear reluctant or embarrassed to ask any question. There were, however, some students who were able to take more advantage than others.

Administration and Organization

The administration and organization of a course are an important element that was apparent in the observed classes. These elements went beyond lesson planning and are defined as the teacher managing the procedures and guidelines of the entire course. There were 11 episodes of this code out of the 186 total coded episodes. The following classroom examples illustrate administration and organization of the course.

- (Episode #2): Karen starts where she left off from the previous day. She gives the students directions about where to start with their notes. She states that this is R.1 Conclusion and is also written on the board. She gives them directions on where they are at in the section—about how far along they are at finishing the section.
- (Episode #70): The first homework is returned to students. She tells students which math problems she graded on this assignment. Karen: “I usually don’t give an answer key for the homework, but I will today so you can get an idea of how I grade homework.” She explains the point system, and she requests a student to read the homework section on the syllabus. Specifically, the part states, “above all you must show all work. This gives you an idea what is all work. . . . Homework is worth 10 points.” After papers are passed out, she provides an example of a fictitious student and calculated his grade.

The management and administration of the course were an essential element in Karen’s teaching. Management and administration encompassed the structure of the entire course (e.g., guidelines and procedures for the homework) and the structure or routine for the day-to-day activities (e.g., preview of the lesson, the organization of the lecture and notes, time for breaks, etc.). Karen kept all the details regarding the course straight. She was careful, thoughtful, and attentive to the details of administration and organization.

Many students lacked structure in high school, and many were freshman who were being introduced to the lack of structure in college life. Karen showed concern for students by modeling structured behavior and instilling structure into the course and everyday activities. This

structure gave students a feeling of what to expect when they came to class. Providing structure let students know that learning and accountability for their learning would take place every time they came to class. Instilling structure showed caring for the students' mathematical learning and learning in general.

Teacher and Student Perspectives

Although administration and organization of the course were apparent in the class, this was an element that Karen did not talk about during her interviews. Perhaps managing the various details had become second nature to her and therefore not noteworthy. Although there were not a large number of student responses for this finding, students were aware of the entire administration and organization of the course. Many times students would either respond in the negative or affirmative to the structure of the course, which indicates that, at some level, they were aware of it. For example, on quiz day, instead of going over the homework, Karen would teach new material and return to the homework before the quiz. Students would respond poorly to having the class structure changed because they preferred to go over the homework. This was evident with whining and complaining from students. However, students did not explicitly talk about the ways in which Karen kept the class organized and running smoothly.

Real-Life Context

Another feature of Karen's teaching was her use of real-life contexts to teach mathematics. For the purposes of coding classroom episodes, I defined real-life context as Karen using the real world or the life experiences of students as a way to teach mathematical concepts. Real-life contexts allowed students to see the application of mathematical concepts. There were 11 episodes of this code out of the 186 total coded episodes. The following are episodes that illustrate Karen's use of real-life context.

- (Episode #8): During the lecture on absolute value, Karen asks students, “How far are you from your dorm?” This is in reference to the concept of distance (on the number line). She says, “You might say about $\frac{1}{2}$ a mile, you are not going to say $-\frac{1}{2}$ a mile from my dorm because of direction. When we talk about distance, and we talk about positive numbers that’s why absolute value ends up being a positive number.”
- (Episode #44): Karen said, “We need to do substitution in factoring. The idea is that it can help. You will use substitution in any higher mathematics you are in and in a lot of different settings. . . .” A student says, “Z.” She said, “Z will work. $Z = x - 3y$ every time I write it. As long as we write it down, we are fine. People do that all the time. When you are texting, if you write UR that means ‘your.’ You say it does. . . . You can’t leave the Z permanently. Unlike texting, you have got to go back and put the real thing in. Every place you see a Z, you put $x - 3y$.”

Real-life context went beyond concrete day-to-day representations. It involved contexts that were specifically familiar to these students. Karen’s use of the dorm was specific to this group of students because they were freshmen and lived in dorms. The same was true for the use of texting and substitution. Neither of these examples would be applicable to very young children. In general, I believe that Karen’s use of real-life context showed that she was connecting to her students or relating to their lives.

Teacher and Student Perspectives

During their interviews, the teacher and the students did not mention anything about real-life contexts being used during instruction.

Student Involvement

Despite the fact that Karen’s instruction was teacher-centered, one key characteristic of Karen’s teaching was the high degree of student involvement. For the purposes of coding classroom episodes, “student involvement” includes student participation, engagement, or idea sharing in classroom activities that facilitate mathematical learning. This can take on many forms: students working with each other, the teacher asking students questions, and students asking the teacher questions. Student engagement promotes other students’ involvement and learning. This is not

limited to mathematical discussions. Student involvement should embody a broader perspective. The teacher asking students to introduce themselves was also a way of getting students involved. There were 62 episodes of this code out of the 186 total coded episodes.

As seen in the classroom episodes already presented, Karen engaged students in a myriad of ways. She was constantly asking students questions, including asking them if they were comfortable with what they were learning. She employed real-life contexts in mathematical applications and students' experiences (e.g., dorm life, phone texting, sport analogies). She tried to promote mathematical discussions (i.e., the difficulty of word problems). In a previous episode (#18), students were working on math and giving their answers. In episode #64, when discussing LCD, Karen asked, "Why don't we use three? What we are trying to do is get them all of the same. So, we only need to go as high as we see in one of the denominators. . . . We don't need more than what we see in a denominator." She wanted students to think about how to determine the LCD. She was waiting to determine what students were thinking. The following episode is another example in which Karen tried to have students discuss their answers.

- (Episode# 84)

$$\frac{m^2 - m - 6}{m^2 - 6m + 9} \cdot \frac{m^2 - 2m - 3}{m^2 - 3m - 10}$$

Karen asked the class, "I would like at least two different volunteers to come [to the board], you see if different people do this, you might get a different thought process that might help you know how to factor these. I will factor two of these polynomials. Can I get a volunteer to come up and factor this one and show us what you think about this one?" A student comes to the board. She explains her work. During the explanation, Karen asked the class, "Do you agree with these numbers? How do we know we are right? I want to make sure all of you guys believe the student who came to the board is correct." After Karen does a few examples on the board, group work continues. I hear Karen helping different students. The class continues going over the quiz for approximately an hour.

After this problem, Karen does one problem on the board. When she is done, the review continues with students redoing problems on the quiz in groups. Karen said out loud to

everyone, “A lot of students had trouble with this.” (f: Karen does the problem on the board. Karen uses her hands to point to the board.) She stops at one point and asks for the next step. A different student responds with the next step: “Factor the denominator to find the common denominator.” Karen: “Find someone who doesn’t know how to do this and explain it to them.” Karen decides to go over this one very slowly at the board. Karen said, “I went around the room, and I heard your questions. I didn’t get to all of your questions so I will do the problem.”

Interpersonally, she had student introductions at the beginning of the semester and often asked students about their well-being. Throughout the semester, she promoted and welcomed one-on-one student interactions about mathematics and personal matters. Throughout daily instruction, she fostered students to be involved in their mathematical learning through board work, group work, and other activities.

Karen’s nonverbal messages (e.g., eye contact with students as she spoke, smiles, leaning forward when working with students individually, demonstrating interest, using a calm and patient voice) reinforced her verbal messages (i.e., verbal affirmations of belief and confidence in students). Through both her verbal and nonverbal communication, she welcomed and engaged students continually. Both the teacher and the students jointly participated in activities and appeared comfortable sharing ideas with one another. For example, they smiled and laughed with each other.

Teacher and Student Perspectives

Student involvement was not mentioned in-depth during either the teacher or student interviews. Informally, Karen said that her classes were “highly interactive” but did not mention this element during her formal interviews. Most of the time, there was a constant back-and-forth between her and the students.

In their interviews, students also did not focus much on the student involvement that occurred during the class. However, students were aware that there were many opportunities in class to get involved. For example, one student said, “She gets us up doing things.”

Clear Directions and Direct Instruction

Karen’s instructions were always clear and direct. In this study, clear directions refers to the teacher announcing a clear set of instructions or series of instructions for doing any kind of activity. Direct instruction refers to the teacher using a methodical, direct, explicit way of teaching in small steps. The teacher started with basic definitions or simple examples and was explicit about what students needed to know and do. This type of teaching promoted the idea: “This is how you do it” or “show me [the students] how to do it.” Karen covered examples or basic problems and then asked students to apply the rules or properties in an example. This method of teaching is contrary to the discovery method. Although related to the category of “scaffolding,” the distinction is that direct instruction does not require the teacher to ask students for prior knowledge (and a teacher can scaffold a discovery-based lesson). For *Clear Directions*, there were 12 episodes with this code out of the 186 total coded episodes. For *Direct Instruction*, there were 21 episodes with this code out of the 186 total coded episodes. The following episodes illustrate clear directions and direct instruction:

- (Episode #43): When discussing special forms of factoring, Karen introduces special forms. She said, “You just have to memorize these special forms. We have three of them.

$$a^2 - b^2 = (a-b)(a + b)$$

$$a^3 - b^3 = (a-b)(a^2 + ab - b^2)$$

$$a^3 + b^3 = (a-b)(a^3 - ab + b^2)$$

- (Episode #73): Karen addresses a question that was asked to her twice by students during the group activity. She wants the entire class to know the answer so she said, “There was

a good question asked twice and that is, ‘Should you reduce $9/6$?’ Karen said, ‘Always’. Every time in life that you see $9/6$, you want to reduce it because it can be simpler.”

Direct instruction follows a more “plug-n-chug” method and is more teacher-centered. Giving precise and clear instructions was part of Karen’s way of teaching mathematics, and it was also her way of delivering instructions of almost any kind to students: “Put your books away. Take out your homework.”

Teacher and Student Perspectives

Karen recognized that speaking and writing clearly was important to students. However, this was not emphasized during our interviews. Students also recognized that Karen’s instruction was very clear (as is evident in their descriptions of scaffolding.)

Connecting to Other Findings: Board writing/note copying

Karen’s clear, direct, and precise instructions also included her board writing. She covered many examples, homework problems, and mathematical procedures. She wrote everything on the board clearly so that students could have their own study notes. Students claimed that the note taking from the board was helpful. The previous classroom episodes show how much math was written on the board for students to copy into their notebooks. The following episodes demonstrate how Karen encouraged students to take notes from the board.

- (Episode #41): Karen said, “I want you to look around, and, if your neighbor is not taking notes, there could be a good reason why some people can’t take notes while they are learning, but if you think they don’t have a good reason, you might say ‘Hey, why aren’t you taking any notes?’” Students were asking others, “Why are you not taking notes?” Students were talking and laughing about the teacher comment. Karen: “Some people have good reasons, but some people are just not paying attention.”

Basically, everything that Karen said was also written on the board, including step-by-step instructions to solve math problems. After students worked in groups, Karen would also write and work out the problem on the board. Students believed that the material on the board

was helpful. Based on classroom observations, I noted that the instructor verbally told students “Write this in your notes.” This helped students know what was important.

Repetition to Aid Understanding

Another related finding is that repetition was used to help students understand the material. I saw many different forms of repetition used to help students learn mathematics. In summary, techniques included: regularly assigning homework that contained problems that were similar to lecture notes, repeating step-by-step verbal directions and what was said in class, writing on the board, giving numerous examples, going over homework and group work, going over the exams, and having review sessions.

- (Episode #104) Karen announces her plan for teaching word problems in section 1.2. She decided (and told students) that she will only teach word problems that deal with perimeters on rectangles. “I made the decision that we would only tackle one kind of word problem backwards and forwards so that maybe if you come out of this one, ‘If I can learn this kind of word problem, maybe I can learn a different kind of word problem.’ You know you guys still have to take Algebra . . . We can pick and choose and so I thought let’s cover only one kind of word problem. What that means is 9-15 is the only perimeter problems I could find in here. I would strongly recommend that, at some point, when you are studying for the quiz or the next exam that you would try redoing the worksheet again on your own and use that as extra practice.”

Clarifying Learning Objectives

An important aspect of Karen’s teaching that helped guide students through the lesson was her clarifying of learning objectives throughout and during the lesson. For the purposes of coding classroom episodes, I define this technique as the teacher verbalizing a preview of the new mathematical lesson for that day or stating the concepts taught the class session before and trying to relate it to the new material being taught. This included a schedule for class lecture or activities. There were 11 episodes with this code out of the 186 total coded episodes. The following were episodes that illustrate this technique:

- (Episode #36): As Karen starts a new lesson, she highlights the major points from the previous lesson. “We have gotten through factoring out the greatest common factor, and we have said we do that first no matter what kind of the problem it is; four terms, two terms. The very first thing we do is factor the greatest common factor and then we did factoring by grouping. This brings us up to trinomials.”

Although each lesson was not full transcribed, Karen clarified learning objectives at the beginning of every class to let students know what they would be learning that day. She also clarified learning objectives at the end of class to recap the lesson and to let students know what they would be learning the next day. Another helpful aspect of the clarifying learning objectives technique was that Karen included tips or clues about how to achieve the next step in their learning.

Teacher and Student Perspectives

Both the teacher and the students communicated either nothing or little on this matter. Karen did not mention anything about clarifying learning objectives during the interviews. The students mentioned very little about this topic during their interviews. The few who did said that they liked “knowing what the lesson was about.”

Theme II: Caring for Students as People

Building Rapport, Interpersonal Availability and Approachability

Another important attribute in Karen was her desire to make her teaching and her interactions with students much more personable and to show them that she cared for them as people. As mentioned in previous chapters, qualities of Karen’s personality touched students. I will refer to these qualities as building rapport and interpersonal approachability. There were 22 episodes with the *Building Rapport* code (*Humor, Personal Story, Nurturing*) out of the 186 total coded episodes. The instructor’s attempts to build rapport often included humor, personal stories,

or just checking in with students about their lives. There were 43 episodes with the *Interpersonal Availability/Approachability* code out of the 186 total coded episodes. The following episodes show Karen building rapport and nurturing students beyond mathematical learning.

- (Episode #1): At the beginning of the semester, for the first few days, Karen wanted to know if there were any new students. She asked the class if there was anyone there for the first time since this was the second day of class. She asked the new student [in the class] to introduce herself. The instructor smiled while she made this request to new students.
- (Episode #116): (f: While Karen started her lecture, she asked a student “Where were you? You were gone for awhile.” I find this to be interesting. She stopped the lecture and asked someone if they were sick.) A few minutes later she asked another student as well. There was another student who missed one class, and the instructor said, “Welcoming back all the sick people.” Karen names a student aloud, “Were you gone?” Student said, “I just missed one day.” (f: Karen can recall very well who was gone even though there is no attendance taken.)

I used one general term, building rapport, to describe Karen’s attempt to connect with students in a personal manner (regardless of context). Karen’s attempts to build rapport often included using humor, personal stories, or just checking in with students about their lives. She was stepping into the realm of friendliness and warmth and having a personal relationship with students. Concrete examples of building rapport include when Karen would ask, “How are you today?” or when she would ask, “How are you?” These episodes show that she cared about students and cared about communicating with students in a warm and interpersonal manner. She expressed her care for students in what and how she communicated. The following episodes describe how Karen used humor to build rapport in the classroom. This, in turn, made her more approachable to students.

- (Episode # 71): Students were asked to do a problem on their own. After a few minutes, Karen starts asking students to come to the board. She had three students readily come up to the board, but she had to wait a few minutes before she convinced a fourth student to come up to the board. . . . After this, she launches into a personal story. Instructor: “It reminds of the time of a roller coaster was held up because they were going to fill up every seat. They were not going to send the roller coaster until each seat was filled. They

needed someone who would go along. I was really big at the time so I didn't know if I was going to fit in the seat. I said, forget it. In front of everyone, I get seated because I was like 'I'll go.' I did fit."

- (Episode #117 and 119): Today is Karen's birthday, and I brought cookies for the class. At the beginning of class, she said to all students, "Weight Watchers is out the window today. . . . You are welcome to have cookies." I said, "Today is Karen's birthday." Karen laughs and says, "My birthday is today. Did she say how old I am? How old do you think I am?" Students try to guess her age. Karen goes on to talk about her gray hair. Instructor: "I am tired of dying my hair. I did it for years. If I was 55, this would be my last semester because I will teach part-time but, when you get 80% of your salary for nada, then it is kind of silly not to retire and Rosa would be in a lot of trouble because she would not be done with her dissertation."

Teacher and Student Perspectives

Karen and her students agreed that building rapport is one way Karen expressed care for her students. I use more general terms such as building rapport and non-verbal communication to explain Karen's caring. Karen and the students, however, used different terms. These terms included: humor, nurturing, personal stories, and personality. For example, Karen used humor to connect to students. Students concurred and liked Karen's personal stories.

Karen used humor to grab the students' attention because there were some students who had difficulty connecting to mathematics. This was another way for her to connect with students interpersonally. As one student said during an interview, "She is not all about math." Her attitude about "not being all about math" could make learning math much more enjoyable. Humor instilled in the classroom also showed that she cared about students' learning and communicating with them interpersonally. Students reacted positively and enjoyed the humor in the class.

Unexpectedly, students also used humor with Karen in a way that surprised all of us. For example, she said to the entire class while solving a problem that they needed to scrap their work and start from scratch. She tried to show students that trial-and-error was a legitimate form of doing mathematics. Several days later, while she was trying to solve a different problem on the

board that was not solved quickly, a student said, in front of the entire class, “You will need to scrap that idea and start from scratch.” This comment caused a riot of laughter from the entire class. Humor builds rapport, creates space for personal stories, and demonstrates teacher approachability. In addition, based on my observations and my interviews with students, students not only liked this but thrived within this interpersonal environment.

Verbal affirmation, Believing, and Confidence in Students

Another important quality in Karen’s teaching and personal interactions with students was verbal affirmation. She communicated belief and confidence in her students. This was another form of building rapport. As mentioned in her interviews, Karen thought that part of her job was to nurture students’ self-esteem. There were 24 episodes of the *Verbal Affirmation* code out of the 186 total coded episodes. The following episodes show Karen using verbal affirmation.

- (Episode# 76): During the lesson on radicals, Karen uses the following example: $(x-5)^{2/3}$. A student asked if it is incorrect with the parenthesis. Instructor: “That would be incorrect without the parenthesis. I am so glad you asked because the whole thing was under the radical, and if we didn’t have the parenthesis, it would look like 5 was raised to the $^{2/3}$. Yep, so you do have to have these parentheses.”
- (Episode #83): A student asked a question about canceling out loud to the entire class. Karen repeats the question to the entire class while she is at the board. She said, “That’s a very good question. Can we definitely cancel diagonal or straight up and down?” She continues, “It is really all straight up and down and here’s why: when you multiply fractions, you multiply straight across. They are all one fraction.”

As an instructor in mathematics, one can argue that it was not necessarily Karen’s job to give positive verbal reinforcements. However, she did think that the “good jobs” and “little successes” helped students improve how they approached mathematics and, ultimately, their ability to do mathematics. Students enjoyed hearing the nice things that Karen had to say about their work. This is evident in the student interviews. She supported their learning through

positively evaluating students. Verbal affirmation had the potential to increase the students' self-efficacy. Beyond the potential of benefiting students' learning of mathematics, she also affirmed students because she cared about them as individuals and wanted to communicate this care to students. Verbal positive reinforcement can also be an extension of coaching. The following episodes illustrate Karen's attempts to build up student confidence.

- (Episode #16): This is a new lesson taught on this day. Karen: "We will start with a real easy one. I know you'll know the answer to this. I want you to think about what property are we using." (1) $2x + 3x = (2 + 3)x = 5x$. Karen asks, "What property are you using? . . . Now, we can go to a more complicated one." (2) $(m^2 - 6m + 2) - (2m^3 + 4m)$. She completes this problem step-by-step on the board.

Believing and promoting confidence in mathematics is one specific form of verbal reinforcement. Students were aware of this and commented that this helped them. As discussed in Chapter 4 and during her interviews, one of Karen's ultimate goals in her teaching was that she wanted students to know that she believed in them. She wanted to promote their self-confidence in mathematics and in their learning in general. Most of this believing and confidence in them was communicated verbally and by being specific about their "little success." This showed students that she cared about them as people.

Conclusion

The analysis of the classroom data was presented in this chapter. Classroom observations were the main focus, with teacher and student perspectives also discussed. Overall, there was high consistency among all three perspectives, showing that the teacher, the observer, and the students agreed. We agreed on the type of instructional methods presented in the classroom and on interactions that occurred between the teacher and the students. The classroom episodes were used to illustrate the observer's understanding of what happened during the instruction.

A key reflection I made while examining and reviewing fieldnotes and audio recordings and examining Karen's verbal and non-verbal communication is that she employed a variety of modes in her teaching. She used a wide range of auditory and visual cues. She also used physical gestures to ensure the greatest possibility of reaching the students. For example, she used hand gestures to teach vertical and horizontal lines. The goal of all of this was to make mathematics more accessible to students. All of these endeavors also helped demonstrate Karen's caring nature toward students: she cared about their mathematics learning, and she cared about them as people.

There were many codes in this chapter that embody ideas similar to what students described in Chapter 5. The categorization presented in this chapter helped identify the different facets of Karen's caring in her instruction and in her personal interactions with students. Since Karen taught mathematics in a personal and caring manner, recognizing the difference between and among codes was difficult. Many of the episodes (and codes) presented show how Karen's teaching and personal interactions with students were intertwined. This is further discussed in the final two chapters of this dissertation

CHAPTER 7

DISCUSSION

In previous chapters, I analyzed the teacher interview data, the classroom observation data, and the student interview data. The current chapter discusses these results in the context of all four research questions.

Rationale for Research

College completion is a challenge for many, and a number of students who enter college are in need of remedial coursework (Bettinger et al., 2013).

Colleges have responded to the poor preparation of incoming students by placing approximately 35 to 40 percent of entering freshman into remedial or developmental courses, along with providing academic supports such as summer bridge programs, learning communities, academic counseling, and tutoring, as well as student supports such as financial aid and child care. (Bettinger et al., 2013, p. 93)

Retention and recruitment programs usually have special instructors who guide, mentor, and influence the academic development of these underprepared college students. The instructors in these programs have an important role in helping at-risk students succeed in college, and researchers believe that the role of “self” in the teacher is important. Witz et al. (2001) claimed that “teachers’ self-understandings, world-views, larger values, and social awareness seem to be important factors affecting their teaching practice and personal and professional growth and development” (p. 198). Jersild (1955) also states that the teachers’ understanding and acceptance of themselves are the most important requirement for teachers to help students. Therefore, closely examining instructors in college retention programs is important because it can ultimately help address the needs of at-risk college students.

The previous chapters focused on the major findings from the teacher, the students, and the observations of the classroom data. The major findings can be divided into two themes: “caring about students’ mathematics learning” and “caring about students as people.” The instructor uses both to make mathematics more accessible to students.

The current chapter presents a discussion of these major findings. The discussion is anchored using the research questions (below). The structure for each discussion is slightly different. The discussion about the first research question is mostly centered on the major themes from the teacher portrait with a few minor remarks from the students and the researcher. The discussion on the second research question is centered on the teacher’s caring for students as people, with the bulk of themes emerging from the student data and the researcher data. Most of these themes are focused on relationship building with a few minor connections to academic skills. The discussion regarding the third research question is centered on the teacher’s caring for students’ mathematical learning. The bulk of themes comes from the student data and the researcher data. The fourth question centers on a holistic examination of the study across all data sources and a review of the most important aspects of Karen’s caring that benefited students the most. After the discussion of the research questions, I explore and discuss the major findings in the context of the literature.

Research Question 1: In What Ways Can a Mathematics Teacher Be Caring? How Can Such Caring Develop?

As highlighted in the portrait in Chapter 4, Karen’s family background, early teaching experiences and spiritual development helped shape the caring teacher that Karen is today. Themes⁹ that illuminate the teacher’s caring nature repeatedly emerged from the teacher portrait.

⁹ I grouped similar themes found in the teacher portrait into larger themes that are presented in this section.

This section consists of two major parts. The first addresses the teacher's general caring nature and includes: (a) nonjudgment, (b) selflessness or sacrificing, (c) nurturing, (d) natural inclination to teaching, and (e) working with students one-on-one. The second part discusses these aspects of the teacher as reflected in the student interviews and classroom observation. The question of how such caring aspects can be developed in teachers is returned to in Chapter 8.

Nonjudgment

Being nonjudgmental is a moral, ethical quality that few people have. It is a higher aspect (Witz & Lee, 2006) that seems intrinsic to Karen. After conducting this study, acceptance of people emerged as an important part of Karen's caring nature for students. Her general attitude and approach to students is to be open and not incorporate a judgment one way or the other of their abilities or skills. This unfolded when she was a young child with her relationship with her mother. As a child, Karen recognized that she did something wrong when she judged her mother. Karen went against an intrinsic part of herself when she made a mistake of judging her mother. She became aware that she needed to treat people as worthy. For example, when she started teaching the first two-week summer period, she came in with no preconceived notions and a nonjudgmental attitude towards the football players. She refrains from making judgments on students (as a whole) and their math ability and skills. She treats students with respect and is accepting of their difficulties. She does not judge students for wearing gold chains and having tattoos. She does not condemn students for their lack of mathematical knowledge. Instead, she said these students were a good group.

Selflessness or Self-Sacrificing

Another general aspect that emerged from the study is Karen's selflessness or sacrificing attitude. This is also part of her caring nature. This is most evident in her unfailing commitment

to teach. For Karen, caring is intimately connected with teaching. In teaching and in her personal interactions, she is a servant to students. Throughout her teaching experiences, as demonstrated in the portrait, she thinks of students and their needs first. She has a high degree of selflessness because she is always acting on students' needs as soon as she becomes aware of them. One can see she put students' needs first in the portrait (e.g. teaching swimming even though she is ill, changing the teaching schedule for at-risk students even if it is not convenient for her). Her behavior shows dedication and commitment to her teaching, and she acts on the students' needs. Karen used the phrase "pops in my mind" as a way to describe how she figures out how to address students' needs. Specifically, when she taught swimming in high school, she said, "It came naturally to see that there was a need there for somebody to learn how to swim, and that was my job" (Tape 2, page 5).

Nurturing

Karen's role as a nurturer appears to be an intrinsic part of who she is, and it comes easily to her. Throughout all of her teaching experiences, she has worked very hard to cultivate the potential of all of her students. Nurturing is pervasive in her one-on-one interactions. Her nurturing nature can also be seen in group settings. Karen wants to encourage, foster, and support the students' self-esteem in mathematics. As Karen said, "I do think that nurturing students is kind of part of my job, and nurturing their self-esteem, especially in regard to doing mathematics" (Tape 2, page 1). However, her nurturing extends beyond their self-esteem. She cares about students as individuals and sees them as fully capable of learning mathematics. She demonstrates concern for students' growth and success. Karen gives students advice for future coursework and helps students graduate from college. One can see Karen's nurturing in how she carries herself and in her devotion to students.

Natural Inclination to Teaching

Karen's portrait as a whole conveys that she has a basic, natural inclination towards teaching, independent of her training in the teacher education program. She has also had this unexplained pull or gravitation towards teaching that was not initially driven by any person. Her affinity for teaching is seen throughout her 30 plus years of teaching and is apparent in both formal and informal ways of educating others. At an early age, she started teaching individual students (e.g., the young, wealthy man; Sophia S.). This inclination started as a seed. In later years, with more teaching experience, it developed more fully. She "took" to the classroom during student teaching from day one and gave the impression that she knew what was doing. "Natural" is the term she used to describe this teaching experience. Karen said that "natural" meant

I just wanted to dive in, and I just always knew what I wanted to tell them . . . and what I wanted them to learn . . . and what I thought that they needed to learn . . . felt natural . . . it felt like it was easy. (Tape 1, page 5)

With little college teaching experience, and without any teacher training, she spontaneously made the decision to teach at-risk students in the summer and the whole-year program. These situations contributed to her natural inclination for teaching. She shows many, if not all, of the qualities of an excellent teacher as demonstrated by her receiving numerous teaching rewards.

Interestingly enough, Karen's natural inclination to teaching raises questions regarding whether caring can be taught or is inherent to the individual teacher. Results of this study seem to suggest that both can exist. Karen appeared to have a "natural" inclination to teaching and to care about students, but experiences helped enhance her caring nature. For example, Karen worked one-on-one with students, and this experience helped her care for students mathematically.

Working One-On-One with Students

One common element in Karen's teaching is her one-on-one work with students throughout her career. When she started tutoring in high school, she taught one-on-one with Sophia S., students in Chemistry, and the young, wealthy man. Interestingly enough, she realized that she was not getting one-on-one interactions with students while she was teaching large mathematics courses to the university at large. She was not having any interactions with students. However, all of this changed when she taught at-risk students. She thrived in teaching and in her one-on-one interactions with at-risk students. In her interactions with individual students, she learned that even her struggling students were thinking mathematically. As Karen heard and understood student thinking, this gave her the opportunity to guide students' thinking. She also used the mathematical thinking of one student to address the entire class. Using students' mathematical thinking was a reoccurring theme in the classroom observations and the students' responses. During office hours, I saw Karen learn about and direct individual students' mathematical thinking. In subsequent classes, she would take this information and use it to teach the entire class.

*Students' Perceptions of Karen's Caring Nature*¹⁰

From a student perspective, students' interviews and their reactions in the classroom provide evidence of Karen's general caring nature. As noted in Chapters 5 and 6, students did not use the same terms that Karen or I used, but they identified aspects of Karen's nurturing, selflessness, etc. during their interviews. Students discussed her caring nature in surprising ways.

¹⁰ For a few of the teacher themes (e.g., nurturing, nonjudgmental), determining summative counts was difficult because some of these themes are not completely disjointed. Some of these themes overlap. This is apparent in the students' interviews.

Students talked about Karen's nurturing nature, and it was visible to students in different forms. The following are quotes from students.

She is very passionate about math. She makes even the person like me who really don't care about math or, er, don't like math have a basic respect for math. . . . She brings a very comfortable feeling. She doesn't belittle you for not knowing [something]. You feel very comfortable asking a question. (B23)

Sometimes it's hard 'cause you feel like you have a dumb question. You feel like everybody else is getting it but you, kind of thing. And Karen doesn't make you feel like that. She makes you feel like everybody might be struggling a little bit so I'll go over it anyway. (A30)

The quotes show how students think of Karen as nonjudgmental, selfless, and nurturing. These student responses also show the impact she had on them.

Observer Perspectives

One can also see Karen's nurturing in the classroom in how she handles herself with students. With over 200 hours of observation and being in different courses over several semesters, I was impressed to see how Karen's caring nature helped students. I also noted that this caring remained steadfast even in challenging situations. As a researcher, I did not use the same terms (nonjudgment, selflessness, etc.) to describe my observations because I wanted to use more concrete, common, everyday terms (e.g., building rapport, communication).

Karen's selflessness can be observed in how she accommodated students. Karen has always tried to be very accommodating with students, giving more mathematics examples, going back and repeating steps to solve mathematics problems, and always trying to adjust the daily lesson to fit the needs of the students. She also tried to be accommodating by scheduling individual appointments outside of office hours. She served in other ways; for example, she gave lecture notes to students. In a few situations in previous semesters, students were ill for most of the semester and could not come to class. After the semester finished, she retaught the material to these students who were ill. She did not get frustrated at the number of times she had to repeat

material throughout the semester. In summary, I felt that Karen's focus was always on the students and their needs. This was surprising because college instructors do not necessarily focus on students' academic needs in these ways.

Karen's nurturing nature was consistently present in the classroom. Her nurturing nature was important to students. A student said he "didn't feel belittled." Every day and in almost every interaction she expressed caring by the way in which she communicated. These demonstrations were consistent, and evident in both mathematical and interpersonal interactions. Although I did not record the elapsed time, I had a general feeling that every few seconds or minutes she was always trying to communicate care to students. For example, her question "Are there any questions?" showed an ongoing concern for students' learning. This question came regularly throughout the lesson. Her nurturing nature was also evident with her words when she showed concern for students in an interpersonal manner (e.g., asking a pregnant student how she was doing, asking students about their families), and this was also confirmed during the students' interviews. Asking students about how they are doing showed concern for their overall well-being. Nonverbally, she expressed care by giving students her complete and undivided attention (e.g. smiling, looking at them, and using an open body position). Seeing this day-in and day-out really touched me because I was coming to a classroom where students were respected and cared for regardless of their mathematical ability.

In regards to teaching mathematics, the way Karen walked through each problem showed sensitivity to the students' needs. Karen taught very slowly and showed patience to students when they were lost in the middle of a problem. I was surprised at how calmly and lovingly she responded to student questions. The repetition, the teaching of the material step-by-step, the slow pace, and the explanation shows that she was aware that students needed extra help. She was

never taken aback when students did not know that they needed to reduce fractions. This shows both her nonjudgment and her selflessness.

Students were more aware of the care and attention that Karen gave them than I had anticipated. In fact, students made me aware of the ways that Karen was helpful to them that went beyond the ways I had initially noticed. As will be discussed in the next section, Karen's caring affected her interactions with students and helped promote their general academic skills.

Research Question 2: How Can a Teacher's Caring Affect Her Interactions With Students And Promote General Academic Skills? (Results Chapters 5 and 6)

The structure of this discussion is centered on aspects of Karen's caring for students as people. The following discussion is not strictly focused on interpersonal aspects. However, any math-related aspects included in this discussion are there because they illuminate aspects of Karen's relationship building. This section begins with a general discussion of Karen's interpersonal communication with students and then moves to specifics, including personality, personal stories, approachability, nurturing, verbal praise, office hours, one-on-one interactions, and persistent attention to student understanding.

General

Based on observations, I found that interpersonal communication between the teacher and the students is critical in helping them learn mathematics and has been generally understudied in mathematics education research. As evident in the observations, Karen spent a large amount of time connecting personally with students. For example, she used humor, personal stories, etc. to build rapport with students. Research has shown that undergraduates experiencing rapport with professors is positively related to their enjoyment of the subject matter (Benson et al., 2005). Buskist et al. (2002) also found that 42% of students ranked rapport within the top 10 qualities of

master teaching. Karen's personal communication with students made her more approachable, and this was a vehicle to reel students into mathematics learning. Students articulated that Karen's communication is a strength that aids them in learning mathematics. Karen, as an expressive teacher, (e.g., physical movement, voice inflection, eye contact, and humor) influenced student perceptions of self-confidence and achievement (Perry & Dickens, 1984; Pintrich & Schunk, 1996).

More importantly, many of the following attributes mentioned in this discussion mirror Tarlow's (1996) eight characteristics of forging caring relationships with students. Although I did not use those terms, the principles behind my terms are similar to those of Tarlow (1996) and other scholarly work mentioned in Chapter 2. For example, Karen made sure she had time for students. She made sure to be there and talk to students. In many ways, she showed sensitivity to students, acted in the students' best interest, and promoted student success at school. I also think that Karen showed caring as a feeling towards students. Evidence suggests that Karen was in reciprocal, caring relationships with students.

Personality

From the student interviews, students articulated Karen's positive personal characteristics that enhanced teaching style and student relationships. Characteristics such as resourcefulness, helpfulness, a pleasant personality, patience, and always being happy were powerful tools that drew students to the teacher and the course content. Ultimately, these characteristics, not just her mathematical and teaching expertise, contributed to students' learning. These qualities made Karen approachable and this made it easy for students to ask her questions.

Personal Stories

Agne (1992) claims that “teacher belief of caring begin[s] with sharing. When teachers share who they are with students, as trustworthy friends, students are likely to choose to do the same” (p. 123). Another finding that emerged from the data was Karen’s use of personal stories. It included her talking about birthdays, family, retirement, and jokes.

These stories help students connect to Karen. Telling personal stories fostered relationships and drew students in. Karen had a level of trust and comfort with students. The use of personal stories continued to develop trust and enrich approachability. As one student said, “She’s not all math.” This seems to indicate that students realize that Karen cared about students beyond mathematical learning and wanted to connect to students as people. Based on observations and students’ responses, Karen tried to build a friendship bond with students. This helped students go to Karen with a number of problems. This mirrors findings found in K-12 education. Agne (1992) advocates that a friendship bond leads to learning because the teacher can automatically address student concerns. In addition, Collier (2005) argues that the base of the relationship between teacher and student is built upon friendship and trust.

Students could relate most to Karen’s role as a grandmother or mother. She demonstrated her role by her personal stories and by bringing in her grandchildren and her son to class. These were the elements that students remembered the most. There were a few students who were raised by their grandmother or who had parents who adopted children. These students could easily connect to Karen, and this idea emerged during the interviews.

In addition to talking about her family, Karen also used small talk in her classes. Defleur et al. (1998) argues that small talk enables the development of interpersonal relationships. I observed and recorded her small talk (e.g., “Happy Thanksgiving, Did you have a good break?”)

during instruction. Even though students did not mention small talk in their interviews, I think it is important to note that students recognized that Karen asked questions that addressed individual well-being. As a result of the personalized questions, students also said that they felt that Karen cared for them. I observed that students responded to her questions (e.g., “Did you have a good weekend?”). Small talk was one way Karen took a personal interest in students and tried to build rapport with them.

Approachability

In addition, all of these factors contribute to approachability and developing a personal relationship with students. From my initial observations, the way Karen spoke to students stood out the most, and more so than any instructional methods. I thought these techniques were ways of “drawing in” students to what she was saying. As recorded in my journal entry, I felt drawn in (as though she were speaking to me one-on-one about mathematics). The way Karen spoke made one feel that one can go to her with any problem. She spoke in a gentle, kind, happy, and personal way that made going to her easy. This made her approachable.

Karen was available and approachable to students for personal matters. Of course, other attributes such as personality, personal storytelling, and nurturing contribute to Karen’s approachability, but students talked specifically about her approachability. A student went so far as to call Karen a “counselor” which indicates trustworthiness, patience, openness, acceptance, warmth, genuineness, and a respectful interest in students and their learning. This indicated that students can draw near to her without fear of rejection or criticism. These character traits seem to support and align with what students mentioned earlier about Karen’s personality traits. Some students mentioned that they felt comfortable making contact with Karen because she did not

make them feel “dumb,” or “belittle” them. Since students found Karen approachable in general, this made her approachable for asking math questions.

Karen showed students in many ways that she was approachable, for example, by communicating to students that she likes them through her body orientation and other nonverbal immediacy behaviors. Defleur et al. (1998) claims that body orientation communicates “level of interest, liking, and openness” (p. 68). Karen’s posture indicated that her focus was on the students because her body was always facing students. She hardly sat while students were in the classroom. She also nodded her head when answering questions or when giving students the approval to come to the board. She used hand gestures to show mathematical concepts such as vertical lines and horizontal lines. She also used space to communicate with students; she walked over to their individual seats to help them, and she leaned over to see their work and to listen carefully to their request for help. Her uninterrupted and direct eye-contact with the class and individual students was steadfast. Her smile was her most apparent facial expression.

Students picked up on Karen’s efforts, as they articulated during their interviews. For example, her continuous smile helped them understand her emotional stance of being happy to teach and happy to be with students. This was evident in the teacher interviews because she self-reported that she was happy to be with them. Karen’s attempts to be liked by her students have many benefits. First, Defleur et al. (1998) maintained that “there are some professors who smile, joke, and give eye contact to reduce distance. Usually, the class reciprocates in like manner” (p. 79). I remember clearly when Karen factored an expression and said, “Let’s scratch this idea and start over.” Sometime later during the semester while working on a completely different problem, a student said the same thing, “scratch that idea and start over.” The student

remembered a technique to work mathematics using Karen's exact words. Everybody, including the instructor, laughed. Students respond with laughter to Karen's jokes.

In Karen's classes, she used immediacy behaviors to build rapport. Students reported having a close relationship with Karen and said that Karen was like a mother or grandmother. Karen appeared to be approachable to students. Students having a positive relationship with an instructor relates closely to affective learning (McCroskey, 1994). Allen et al. (2006) found a positive correlation between affective and cognitive learning.

Office Hours

Closely related to the issue of Karen's approachability, many students talked about *office hours* as important. Availability of office hours is an important part of Karen's educational philosophy on how students learn.

Karen was eager to find ways to provide all students with the extra help they need. Beyond office hours, she would offer individual appointment times to meet with students, and many students used this opportunity to get help. On several occasions, her office was filled with students. During class time, Karen would spend a lot of time talking to students about the importance of office hours.

Interestingly enough, students did not report on the availability that Karen had during class time. However, students did take advantage of the classroom availability (before or after class). During class time, students' had a constant need for individual attention. A lot of students asked questions, requested assistance during group work, etc. Students would ask questions on basic material that was taught in high school. Since her courses were small and classes were long, students inundated Karen with questions, and this was part of the routine. Students felt very comfortable asking Karen questions because she did not make them feel "dumb" or "belittle"

them. This is also supported in the K-12 literature. Brophy and Good (1974) found that students sought teachers for help when they felt that teachers responded with encouragement and help (Brophy & Good, 1974, as cited in Wentzel, 2009).

Nurturing

As discussed in the previous section, a key component of Karen's caring that emerged from the data was her nurturing nature. Students saw Karen demonstrating care and encouraging their growth as students and as people. This was independent of learning. Karen showed nurturing in a wide range of ways: being concerned for a student who was pregnant, counseling for future coursework in mathematics, showing concern for students, ensuring that everyone succeeds. Her nurturing fits with students' descriptions of her being like a mother or grandmother or second mom. Students reported thinking of Karen as a cheerleader and getting a comfortable feeling around her. As indicated by students' responses, Karen's nurturing also developed trust and rapport, enriched approachability, and supported teacher-student relationships.

Verbal Praise

Some significant expressions of Karen's nurturing nature were her verbal affirmation, believing in the students, promoting confidence, and little successes. Both the student interviews and classroom data show Karen praising students in a variety of ways. Classroom observations show Karen praising students' effort, praising good questions, and encouraging little successes. Students are praised for effort and awarded partial credit on tests, homework, etc. Supplying positive feedback is important because "these responses give people of sense of pride and pleasure in themselves and their work" (Gamble & Gamble, 2002, p. 199). Providing immediate positive feedback can positively influence students' self-image and morale (Defleur et al., 1998).

Karen's use of verbal affirmation (praises, encouragement, motivation, etc.) also pushed students forward in believing that they were fully capable of doing mathematics. According to Good and Brophy (2000), "effective praise calls attention to students' developing learning process or skill mastery" (p. 141). Teacher praise acknowledges students' efforts or their accomplishments. In addition, Agne (1992) states that "caring also means finding joy in someone else's individual success" (p. 123). Other scholars confirm that caring promotes an effective learning atmosphere (Chonko, 2007; deGuzman et al., 2008). In addition, Whitaker (2012) argues that understanding the power of praise is a quality of an effective teacher and Karen understands that students need to know what they are doing well even in the smallest of steps. Students know that Karen's praise is authentic and specific to their work. In several students' responses, they said that they thought they could do mathematics and be successful in the course because Karen believed in them.

Positive feedback is also important to fight against stereotypes. Good and Brophy (2000) assert that African-American girls, in particular are often viewed in ways that damage their academic achievement. For example, Delpit (1995) believes that many African American girls are good at nurturing others, which has caused them to have a "mommy" stereotype. These beliefs can lead to African American girls not being encouraged in academic achievement as compared to white female students (Good & Brophy, 2000). Although these specific beliefs were not the focus of this dissertation, recognizing such beliefs is important because Karen provided positive feedback for those who may think they cannot do well in school.

Karen was always accentuating the positive in students. In many ways, she promoted students' self-confidence so that they felt better about themselves as people who overcome barriers to working with mathematics. During the interviews, students said that they felt that they

could do mathematics because Karen was encouraging. Students were aware of Karen's encouragement. Students enjoyed hearing that they were doing well in mathematics even if their accomplishment was a small step in a larger problem. This positive verbal affirmation fulfills deep psychological needs and fosters a positive self-image (Defleur et al., 1998).

Persistent Attention to Student Understanding

Next, an unexpected characteristic that students saw as important was Karen's tenacity or persistent attention to student understanding. Other findings, such as repetition, support this idea because repeating material shows the students the instructor is not giving up on their learning. Students thought that stopping the lesson to help students understand the material, going over material on the board, or providing hints were indications of her persistent attention to student understanding.

Agne (1992) argues that an element of caring teachers is that it *does* matter if one student fails to comprehend. In Karen's classes, the focus was on ensuring that each student understood the material. Students felt that Karen's goal was to have everyone understand the material. The key idea among their responses was the notion of "us." The responses have no sense of individuality. Students were aware that Karen was looking for *everyone* in the class to understand. The following are students' words to support this idea: "every student," "if one person doesn't understand," "she keeps us all together," "takes her time for everybody to understand the concept," "she would not let nobody else go home." Since the majority of the students were freshman, the notion of "us" enhanced a sense of community among these at-risk students. In general, Karen was looking out for the *needs* of *all* students.

This speaks highly about Karen as a teacher and as a person. She tried to be patient and kind with everyone and not just a few individuals. She realized that one student may have needed

another example, so she did another example. This also shows that focus is first on the students, and not simply covering the curriculum. According to Whitaker (2012), focusing on students first can also help teachers maintain a positive attitude. This, in turn, can be helpful for students and the learning environment.

This finding also reveals a lot about students. At some level, students acknowledge that other students are at different places in their learning. Nearly no one complained about having to stop and do another example. One can argue that Karen made the class more communal because she is persistent in ensuring students' understanding. One or two complained about being bored at one point but did not seem to mind going over content again and again for another student in the class. This contributed to the idea of being in a community of learners.

Research Question 3: How Can a Teacher's Caring Affect Her Mathematics Instructional Methods? (Result Chapter 5 and 6)

This discussion is centered on aspects of Karen's caring for students' mathematical learning. Therefore, it is focused on instructional methods. This section begins with a general discussion on her instructional methods and then moves to specifics of her instructional methods, including scaffolding, diagnosing, assessing prior knowledge, checking for understanding, coaching, repetition, and board writing and the copying of notes from the board.

General

In general, data from my observations, the teacher, and the students reveal high levels of agreement on what happened in the classroom, the instructional methods, and the caring attributes of the teacher. Before we discuss Karen's instructional methods, reviewing general remarks about her teaching paves the direction for a larger discussion on this topic.

Karen demonstrated her knowledge of pedagogical and assessment strategies throughout the semesters that I observed her. She knew different techniques to help students learn depending on their difficulties. For example, at times, Karen would give only hints or get students “unstuck,” but she would not finish a problem. Other times she would do a similar problem to help students move on to a more complex problem. She also asked students about their prior knowledge on the new lesson in order to teach incrementally. In addition, she used an “interpersonal” approach that also anchored students. Ultimately, all of Karen’s strategies tried to promote the idea that each student was expected to understand mathematics. Karen also supported the students’ efforts to learn. Both expecting students to understand mathematics and a teacher supporting students are part of NCTM’s vision of learning mathematics (NCTM, 2000).

Scaffolding

Karen used scaffolding (or teaching incrementally) as the main technique used to teach students mathematics. The students, the teacher, and I are agreed that scaffolding was a substantial part of the instruction. Generally, in Karen’s class, teaching incrementally seemed to make learning mathematics more approachable and manageable to these at-risk students in her class because students took “baby steps” in learning new mathematics. This was Karen’s approach to most lessons: homework review, examples, etc. Students expected her to go step-by-step. As stated in Chapter 5, the class rarely involved discovery. Students did not have “opportunities to formulate, grapple with and solve complex problems” (NCTM, 2000, p. 52).

Interestingly, when Karen deviated from teaching incrementally, the students complained. An example of this is the lesson on the Babylonians’ method of completing the square. She wanted them to discover how to complete the square geometrically, and students got confused and frustrated. After a few minutes, students asked her to teach them the “algebraic

way” which meant more symbolic manipulations and “plug-n-chug” methods. Although using the algebraic method might have helped students feel comfortable about working with mathematics, using this approach limited students’ discovering mathematics.

Along with the idea of teaching material “step-by-step” and “breaking down” the content, students also articulated “pace” and “explanation” as part of scaffolding. These terms are not considered a part of the traditional definition of scaffolding. However, students responded with these precise words in the same phrases when discussing aspects of scaffolding. As part of the explanation process, Karen verbally communicated her thought processes as she completes examples on the board. She modeled appropriate mathematical procedures for solving problems as described in the *Communication Standard* (NCTM, 2000).

The pace of teaching content was important for students. As indicated by classroom recordings and student interviews, Karen spoke in a calm, patient voice. A slow rate of speech gave the students a chance to think about what Karen was saying. This is one reason for the long classes because students needed the time to grasp the material. Karen spoke more quickly in personal versus professional verbal communication. She spoke slowly in office hours and one-on-one interactions. In private, many times I had to ask her to slow down because I could not grasp everything she was saying. She made an adjustment in her speech to teach these students.

Assessing Prior Knowledge

Assessing prior knowledge was Karen’s technique for attempting to retrieve knowledge and or understanding that students may have been taught before this course. Karen used the term, “diagnosing,” to describe this technique. At the beginning of each lesson, Karen started with asking students, “What do you know about X?” or a similar question. After this, Karen moved on to the new concept that students need to learn. This technique helped Karen figure out where

students were in their knowledge of mathematics prior to teaching new or related material. Learning was treated as a little jump from knowledge students already had to the new knowledge Karen was trying to teach them. With this method, students did not perceive learning as a daunting or an overwhelming task, and they became aware that they had mathematical knowledge that could contribute to their learning.

However, one interesting finding is that students were not aware that Karen regularly asked questions about their previous knowledge. In the interviews, students did not mention she was employing this technique to introduce a lesson. There could be many reasons that students did not observe this behavior or why they did not talk about this technique during the interviews. Most of the students' responses (in the interviews) were about aspects that they could connect with personally in some way.

Checking for Understanding

Another important instructional technique is checking for understanding. Checking for understanding centers on finding out the students' mastery on more current, up-to-date content. Current homework, board work, group work, and independent practice helped Karen determine students' mathematical understanding. I observed Karen using a myriad of ways to assess students, including informal and formal methods. She did a lot of informal assessment as a part of daily instruction. She is always asking students what they know to determine what students do not know. She adapted the lesson with more or fewer examples, depending on how she thinks students are doing. Assessment as part of the daily practice can help improve student learning (Black and William, 1998; NCTM, 2000). Formally, homework, quizzes, and tests are used to aid in her understanding of where students are in their mastery.

One informal assessment method that was noted during data collection was her “check-in” every minute or two with students. Karen would ask students, “Are you getting this?” and “Did you understand this?” She showed enough interest and concern to start an informal conversation on what they understood and what their hang-ups were. This was also a way for her to start a conversation on students’ difficulties. Students frequently responded to her inquiries. Karen’s dialogue with students expressed concern and reassurance. Lane (2010) suggests that “reassurance and responses that express concern communicate that we care about our conversation partner” (p. 215). When Karen asks students questions, this shows concern for their learning, and she responds to their questions or comments.

Checking for understanding also speaks to the amount of student involvement. A lot of college teaching is lecture-based and Karen’s style was similar. However, students were engaged in a lot of verbal participation. The lecture was set up in a highly interactive manner with teacher and students. This let students know that they shared the learning responsibility (Silver, Kilpatrick, & Schlesinger, 1990). The students’ involvement also demonstrated their motivation in the course.

Students had opportunities to share their ideas, either individually at the board or at their seats, out loud, in front of the entire class when Karen asked questions or in a small group setting. When individual students were working at the board, Karen asked students to explain their work. Many times this was after students had a chance to work out the problems individually or in a small group setting. Many times Karen also asked students to justify their answers verbally. Any time that students communicated their mathematical ideas, it allowed both the student and the teacher to gain insight on the students’ thinking. This was an opportunity for her know what students know and to address misconceptions. Karen provided support and

encouragement for speaking and listening to mathematical ideas. She had in many ways built a learning environment in which students feel free to express their ideas regardless of the accuracy of their answers. Despite the level of student involvement, Karen used no hands-on activities, computers, or manipulatives during the course of my observation. Students' involvement was limited to answering questions and explaining and justifying their answers. They did not participate in higher-level discussions or activities and did not challenge Karen's or their classmates' reasoning. Despite much student participation, Karen was still the authority in the classroom. She initiated the mathematics problems to be solved, and she was the evaluator of students' reasoning and responses.

Coaching

One unexpected finding that emerged from the student and classroom data was Karen's "coaching" practices. One can argue that this technique is rare and not necessarily found in most teaching practices. Coaching was Karen's approach to mentoring students in learning mathematics and learning in general. She spent a lot of time and energy trying to mentor the students in skills they need to be successful in college, and not only in learning mathematics. Karen's coaching practices included using sports analogies to promote the students' and teacher's role and responsibility, explaining the purpose of using professors' office hours, advising/counseling on future math coursework, telling students to take notes and how to take them, trying different mathematical approaches that are atypical for the students' experiences (e.g., trial-and-error), giving study tips for exams, and verbalizing her own thought processes. Karen explained to students why notes were important and how to take notes. Interestingly, some of the techniques used to help at-risk college students are also helpful for struggling students in

K-12, including teaching note-taking and study skills explicitly (Jackson & Lambert, 2010; Thompson & Geren, 2002).

One can argue that several of Karen's other instructional methods were part of her coaching approach. She taught students "how to" learn mathematics. One common theme among many of these activities was Karen's accepting the responsibility of teaching students to be "students" (i.e. teaching them appropriate academic behaviors). Few college instructors likely take this role on when mentoring students, especially in a large state university. This shows caring on the instructor's part.

Repetition

Another instructional technique that emerged from the student data was the use of an extensive amount of repetition. This was also observable in the classroom data. Students heard the same material in many ways, and they said repetition was helpful. Repetition does serve as a means for students to retain what they hear and understand (Gamble & Gamble, 2002).

The way that Karen repeated step-by-step instructions was a form of repetition that I recognized during the observations. As an example, she repeated the lesson again while going over homework problems at the request of students. At the end of the homework problem, she would often go back again through the steps of solving the problem.

While present during instruction, I often observed repetition and did not think it was relevant to report. However, the topic of repetition was important to students. Although some students found repetition helpful, the ways that repetition was helpful and the extent to which repetition was helpful is an open question.

Board writing and the Copying of Notes From the Board

Students said that board writing and the copying of notes from the board was helpful for learning mathematics. Note taking is an important “soft skill” that helps students who struggle in school (Jackson & Lambert, 2010). Almost every student took notes from the board. Students who talked about copying notes from the board said they could refer to them while doing the homework because the examples were similar to the homework problems. Board writing also served as another method of repetition because students were reading mathematical material on the board, hearing, out loud, Karen’s thought processes, and reading the notes back at home. Board writing connects to many senses: writing, hearing the instructor, and seeing it on the board and notebook.

The importance of note taking in a notebook is substantiated in research. Gutiérrez (2012a), who studied mathematics education in México, discovered that students had experience taking notes and maintaining a *cuaderno* (notebook).

These individuals put a great deal of energy, labor, and dedication into taking notes while participating in the discipline of mathematics. In addition, the *cuadernos* serve as references in future mathematics course. For the most part, these notebooks contain very neat writing, and the writers often use colored pens for different meanings (e.g., black ink for a major topic or theorem, blue ink for examples, red ink for postulates). In most U.S. mathematics classrooms, note taking (a skill that involves knowing, e.g. when to take notes, how to take them, what to do with them after taking them) is somewhat vague, varies from class to class, or is something that only best students do regularly. Yet, taking notes and maintaining a *cuaderno* in mathematics is a very structured and rigorous process for most Mexican students. (p. 15)

In addition to note taking, every step being depicted on the board was also important.

One student claimed that,

When she [Karen] actually writes on the board and she also breaks every step, I see it, and then I’m, like, “Okay, this is how she did it.” So I follow her steps and do it the same way, and that’s how I get—you know, I actually understand it because that’s how I learn.

The note taking gave students a template or model from which to work while doing the homework or studying for tests.

Although the students found the board writing helpful for studying, one concern is that this method might encourage regurgitation without helping students to do meaningful learning. Students re-copied steps, and great emphasis was placed on taking notes from the board. This method may not be conducive to long-term learning of the material (deep conceptual learning). One may argue that this method is simply teaching students to copy the steps that Karen put on the board. However, Karen saw herself as trying to move students away from the idea that mathematics is memorization. Karen recognized in one of her interviews that students think math is a “show me how to do it” thing:

They [students] just want someone to say “Do this and get the answer,” and even in math, that isn't always, you know, it probably happens in math more than it happens in some disciplines, because it is very algorithmic, and that kind of thing, but um, even in math, it's not always that simple. (Tape 2, page 5)

Although Karen used teacher-centered approaches (i.e. the board writing), she also used some problem-solving techniques. During the classroom observations, Karen often highlighted “trial-and-error” as a mean to solve mathematics problems. She advertised this method repeatedly when students encountered problems they do not know how to solve. She also asked students about their use of methods for solving problems. A few of the classroom episodes also showed that Karen and students would “apply and adapt a variety of appropriate strategies to solve problems” (NCTM, 2000, p. 53). A lot of these strategies can be found in the work of Polya (1957). Karen utilized a variety of problem solving practices advocated by NCTM. “Listing all possibilities, trying special values and cases, guessing and checking, creating a simpler problem” (NCTM, 2000, p. 54) are examples of problem solving practices that Karen used. She mostly highlighted such problem solving techniques through her own modeling of these strategies and thought processes during lecture. Karen asked students to practice some of the skills during independent practice.

Still, Karen's overall instructional method centered around interactive lecture with relatively little emphasis on student problem solving and inquiry. Other mathematics educators place greater emphasis on challenging at-risk students and problem-solving in the classroom, including, Moses' "Algebra Project" (1989). The project's mission is to push students to complete a college preparatory mathematics curriculum in high school. The classroom is a climate of learning where Moses tries to show students problem-solving skills explicitly in non-threatening ways. Although some specifics and details of the instruction are scarce, the instruction seems to develop students' greater self-reliance in finding solutions (Moses & Cobb, 2001). The instruction is relatively student-centered and inquiry based (Moses & Cobb, 2001). Moses' work in the Algebra Project is an indication that mathematics can be taught through a problem-solving approach to at-risk students. This is a sharp contrast to the majority of Karen's teaching. Even though Karen used some problem-solving techniques, she focused more on teacher-centered approaches (e.g., the board writing, copying notes from the board).

Research Question 4: How Do Students Feel They Benefit From a Teacher's Caring?

Under research question #2, I discussed approachability and office hours because they were ways in which Karen's caring promoted general academic skills. Under research question #3, I discussed repetition and scaffolding because they were ways in which Karen's caring affected her instructional methods. Now under this current research question, I revisit these themes in the context of students' mathematics learning. I examined the major themes throughout the entire study, and I found that the following four themes appear to be the aspects of Karen's caring that benefited students the most. The themes are based on student responses and observations. The following themes are not in any order of importance.

Approachability and Office Hours

Examining the student interview and classroom data as a whole suggests that approachability and office hours were beneficial for student learning. Regardless of the type of approachability (mathematical or interpersonal), this seemed to be an important aspect that helped students be successful in the course. Karen's use of personal story, humor, and her personality also helped students feel comfortable with her. This enabled students to go to Karen with a number of questions on mathematics, and they constantly sought Karen's assistance.

An ongoing struggle I had, as a researcher, was observing the distinction between mathematical and interpersonal approachability. I believe that students did not see this distinction, and I am not sure that a distinction exists. If there is a distinction, I am not sure about the relationship between the two types of approachability. Are they two disjointed types of approachability? Is one type of approachability a subset of another? Based on my observations and other research on approachability (Faranda & Clarke, 2004; Roediger & Thorsten, 2006), I think raising questions on this distinction is important.

Each type of approachability may be more important to some students and less to other students. Some students may want teachers who are only available for content approachability. Some students may not value a teacher's interpersonal approachability. I wonder what kind of approachability leads students to ask questions. Does the type of student (e.g., at-risk, high-achieving) determine the type of approachability that leads them to ask questions?

Some teachers might only care about mathematical approachability and not about interpersonal approachability. However, being mathematically approachable could be dependent on interpersonal approachability, at least for some students. How do teachers make it clear to students that they are only available for mathematical approachability? Does the teacher display

any signals or cues that tell students that this professor is only mathematically approachable? If so, what are these signals and cues, and how do students read these cues? For this type of teacher, how does this change the students' view of general approachability?

Scaffolding and Repetition

In this study, these at-risk students wanted to be comfortable working with mathematics. In this study, students had both a teacher and instructional methods (scaffolding, repetition, checking for understanding, board writing and note taking, assessing prior knowledge, etc.) that boosted their confidence and made them feel more secure in working in mathematics. Karen's nurturing aspects were important to students' personal and mathematical success. Students felt cared for and respected. Students repeatedly stated that scaffolding helped them understand the material, made them feel more secure, and boosted their confidence in working with mathematics. Repetition gave students a chance to see the material over and over and get accustomed to it.

More generally, students said in their interviews that all of Karen's instructional techniques (except for assessing prior knowledge, which they did not seem to notice) helped them learn mathematics. However, given the lack of pre- and post-assessments in the data analyzed for this study, I cannot validate whether these instructional methods actually helped students learn mathematics. I questioned whether or not students gained a deep understanding of mathematics because, at the end of the semester, students were not able to solve mathematics problems that were taught to them at the beginning of the semester. For example, Karen was still teaching factoring and canceling at the end of the semester, but perhaps this would have been true regardless of method used, particularly since Karen would review content if even just one student struggled with it.

This study raises a lot of questions regarding the use of scaffolding and repetition. Students and I agree that there was a lot of repetition and scaffolding during class. Was scaffolding and repetition used too much? How should teachers make choices about when to use repetition or scaffolding? As an instructor of mathematics, I wonder how using less or more scaffolding could maximize student learning.

I do not know how much Karen thought about the use of scaffolding. However, I know Karen was worried about students' being lost, so she thought teaching step-by-step was important. At-risk students might need scaffolding to learn mathematics. These at-risk students believed that scaffolding was helpful. Would another type of student find scaffolding helpful? Does the type of student (e.g., high achiever, low achiever, or low-SES) influence how much scaffolding is used or should be used?

In this section, I discussed scaffolding in the context of Karen's class, including its possible impact on students and possible tradeoffs of her instructional choices. In the next section, I discuss scaffolding in the context of research, including the advantages and disadvantages of scaffolding according to others (e.g., researchers, teachers). I give added attention to self-efficacy, an important benefit of scaffolding according to some literature. I then discuss the other major finding of this study in the context of research, namely the importance of mathematics teacher caring.

Major Findings in the Context of the Literature

Karen's attempts to restore students' emotional and academic self-concept were admirable, especially since she worked with students who carried different types of difficulties with them to college. This study illuminates various ways she tried to make mathematics more

accessible to them. As Berliner (1993) stated, “Education is irrelevant to those without hope, and succeeds, remarkably well, for those who have it” (p. 32). Karen has, in many ways, tried to restore hope to these at-risk students. However, based on research, some critical tensions and questions relating to mathematics instructional methods need to be considered.

Different Strengths of Scaffolding, Repetition and Teacher Lecture

Generally speaking, Karen used a teacher-centered approach in her teaching. She stood in front of the classroom at the chalkboard as the expert in mathematics knowledge. Overall, she “told” students how to work with mathematics. Still, Karen did have an interactive lecture style. She led students through examples to follow and solicited responses from students. The main instructional technique she used was scaffolding. Scaffolding can generally be used with a problem solving approach or with traditional teacher-centered teaching, and each style has potential advantages and disadvantages.

On the one hand, problem-solving approaches usually allow students to explore, think abstractly, or analyze mathematical ideas. One possible advantage of using project-based or discovery teaching is that students have a much better opportunity to gain mathematical power. For example, in the project-based approach, students pursue learning by asking questions while teachers facilitate learning through the use of scaffolding to help students become independent thinkers (Bell, 2010). Evidence exists that project based approaches promote students to become better researchers, problem solvers, and higher-order thinkers (Gultekin, 2005). Second, in standardized testing that measures proficiency, students in project-based instruction outperform students who are taught using traditional methods (Geier et al., 2008). Boaler (1999) found that students taught using a project-based approach were able to answer applied and conceptual problems better than students taught using traditional math methods. Third, Boaler (1999) also

found that students taught with a problem solving approach were less likely to view math as a set of independent facts. Additionally, NCTM (2000) is a strong advocate of the problem solving approach.

However, for some students, learning through solving problems (instead of following procedures laid out by the teacher or textbook) can be frustrating because students struggle with the mathematics (Lubienski & Stilwell, 2003). Lubienski (1996) stated that a problem solving approach in mathematics could frustrate low-SES students. Low-SES students, in Lubienski's (1996) study, used the word "confused" to describe their experiences when being taught mathematics through problem solving. As students struggle in mathematics, they may internalize their perceived failure (Lubienski, 1996).

The teacher-centered approach has its own advantages and disadvantages. Rote, traditional teaching, the "plug-n-chug" approach, emphasizing a rule-based approach, and explicitly telling students how to solve a problem, is a common form of teaching in classrooms (NCTM, 2000). Boaler (1997) states that a purpose of traditional teaching is for students to memorize procedures. One advantage is that students tend to feel safe with teacher-centered approaches. Lubienski (1996) stated that, in her study, "low-SES students preferred drill and practice—there is little risk involved" (p. 242) because students are told "the right way to think and do things" (p. 251). On a related note, students tend to feel that they can do mathematics, and students may think it is easier. The disadvantage with traditional mathematics teaching is that it leads to low mathematics performance on problem-solving and reasoning (Hiebert & Stigler, 2000; Hirsch, 2001; Stigler & Hiebert, 2004). In her research, Boaler (1997, 1998, 2000) found that students taught with more traditional methods felt that mathematics was meaningless, and they felt disconnected from mathematics. Boaler (1997) also argues that students who learn

mathematical procedures using teacher-centered approaches will find this knowledge of little use when faced with new or difficult math problems. This suggests that traditional methods of teaching mathematics do not promote higher-level thinking.

Karen used scaffolding as regular form of instruction. She gave a lot of structure to students, and gave additional help and structure when students struggled. All data sources were in agreement that scaffolding was used for students to help them feel that they can do mathematics. Students took “baby steps” to learn math, and this enabled them to feel that they could do mathematics. This is important because low SES students can be “less confident in themselves as problem-solvers and mathematical sense-makers” (Lubienski, 1996, p. 251). Based on my experiences and what students articulated during the interviews, Karen’s use of scaffolding made mathematics “easier” for students, and students felt like they could do it. However, despite the focus on teacher-centered approaches, Karen also attempted to teach students problem-solving techniques. Yet on the few occasions when students were asked to do problem solving, students did not take to it well.

Dilemma

A tension lies between Karen’s practices of teaching mathematics and NCTM’s reform movement promoting “mathematical power for all” through teaching mathematics with a problem solving approach. Karen’s approach gives at-risk students what they want in the short-term (e.g., self-confidence, clear and direct instruction, and help). Students learned to follow teacher-given procedures that they copied into their notebooks. However, they did not seem to be learning to make sense of mathematics. Karen’s way of teaching addressed the immediate needs of the students and the course (e.g. boosting self-confidence, being able to learn a procedure for the next test, coverage of content to prepare them for the next course).

However, these students' needs are in contrast to what NCTM believes students need, namely "mathematical power." In some sense, Karen is not teaching mathematics through problem solving. At the end of the course, students had not learned how to work with mathematics independently. For example, students had not thought critically or discovered mathematical patterns or relationships on their own. At the end of the semester, most students still had trouble with mathematical content from earlier in the semester.

There are different views on what constitutes good teaching for at-risk students. Karen won many awards for her teaching of at-risk students, but she did not adhere to what NCTM considers as central to good teaching. This raises the issue of what is considered good teaching for at-risk students. While teaching mathematics through problem solving may be a worthy goal, one should also see the reasons why teachers, like Karen, prioritize building confidence and giving step-by-step instruction. In this case, building students' confidence through scaffolded teacher-centered instruction seemed to help these at-risk college students in this mathematics course. Students stated this in their interviews. In addition to this research study, Lubienski and Stilwell (2003) note that at-risk students are not always ready to independently learn mathematics through problem solving, and so this raises dilemmas for teachers about how much scaffolding is too much.

Given the advantages and disadvantages of both problem-centered and teacher centered approaches, this raises the question of whether a combination of the instructional methods used in this study along with other methods (e.g., problem-solving approaches) that foster conceptual learning can help students achieve mathematical power. For example, in Lubienski and Stilwell (2003), Stilwell stated that she gave more structure to students so they could focus on working with the higher ideas in mathematics. Stilwell tried to combine direct instruction with problem

solving approaches (Lubienski & Stilwell, 2003), with the goal of moving students over time toward more mathematical independence. Based on other research (Lubienski, 1996; Lubienski & Stilwell, 2003; NCTM; 2000) and this study, I hypothesize that students might have gained additional conceptual understanding and problem solving skills if Karen had combined problem-centered instruction with her efforts to scaffold instruction and boost students' confidence with mathematics. However, her case helps us understand the pull teachers of at-risk students may feel toward use of repetition and "step-by-step" methods with students who have had years of struggle with mathematics and who arguably need enhanced self-efficacy in order to engage with mathematics in any meaningful way.

Teaching Practices Move Students' Self-Efficacy

According to numerous student comments, one primary benefit of Karen's way of teaching mathematics is that it promoted their self-efficacy. Self-efficacy is a "[belief] in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, pg. 3). These are the "can do" beliefs. Many students said they understood and felt that they could do mathematics as a result of Karen's teaching. Specifically, when students spoke about Karen's teaching practices, they spoke about how it helped them understand mathematics. They also said that mathematics was easier and they felt more secure. Karen tried to raise students' self-efficacy by improving their emotional well-being and reducing negative states. She largely accomplished this by altering students' thoughts and feelings about themselves and towards mathematics. Research supports both of these actions (Schunk & Pajares, 2009).

There are four main ways to increase self-efficacy: (a) personal accomplishments/mastery experience (e.g. engaging and successfully solving mathematics problems), (b) vicarious

experiences (e.g. exposure to successful role models such as other students or the teacher), (c) social/verbal persuasion (e.g. feedback from the teacher), and (d) addressing and interpreting physiological/affective states (e.g. anxiety while attempting a task; Bandura 1986, 1997).

According to Schmidt and Shumow (2012), classrooms provide a context for promoting self-efficacy:

Teachers play an important role in creating classroom contexts that can shape students' self-efficacy judgments in multiple ways. Teachers build classroom structures and supports to facilitate students' mastery experiences. They provide vicarious experiences for their students, serving as models for different academic tasks and facilitating student collaboration. They are also the principal source of verbal persuasion in the classroom, sending explicit and implicit messages about competence. Finally, through the classroom environment they create, teachers can influence students' positive affect and anxiety during learning texts. (p. 56)

Many of these aspects were apparent in Karen's teaching of underprepared students.

Using scaffolding allowed students to learn mathematics step-by-step and slowly. This made learning mathematics attainable to students, hence increasing their self-efficacy. Also, the students had exposure to other students who were successful in the course. Students received a lot of verbal affirmation from the teacher. Students had a lot of anxiety before the course and while completing some of the tasks (e.g., tests). Research confirms that these aspects do influence self-efficacy (Lent et. al., 1996). Beyond increasing self-efficacy in mathematics, Karen's teaching practices may have had other effects on her students. Riggio (2012) along with others (Bandura et al., 1996; Berry & West, 1993; Maddux & Meier, 1995) have found that people with "strong feelings of self-efficacy are more persistent, more academically successful, less anxious, and less depressed" (p. 10). Many of students that I interviewed finished their college degree, and a few are now in graduate school.

As a consequence of promoting self-efficacy, Karen may have made a difference beyond students' learning of mathematics. For example, her students might have been more likely to

finish college. This was not a longitudinal study and I cannot confirm this. However, the literature indicates that a number of benefits are associated with self-efficacy: interpersonal competence, self-esteem, coping ability, and feelings of self-control (Bandura 1997; Chen et al., 2010; Luszcznska et. al., 2009; Riggio, 2012). Other research concurs that academic self-efficacy plays a role in performance (Chen & Kaplan 2003; Robbins et al. 2004). Hence, self-efficacy may help explain one avenue through which a caring teacher can help at-risk students in school. Karen's caring about her students' success appeared to increase their self-efficacy as mathematics learners, and as college students more generally.

Results of my study suggest that self-efficacy may also help address issues of math anxiety. Hellum-Alexander (2010) states that teaching methods can help students overcome math anxiety and help students' increase their self-efficacy. Karen's use of scaffolding seemed to directly assist students with their math anxiety. Karen taught slowly and step-by-step, and students said that this made them confident. Karen did not allow negative self-talk, distrust of student's own ability, or loss of self-esteem. Many of these aspects were addressed either individually or in a whole-class setting.

Hence, again, although NCTM (2000) and other mathematics education scholars would likely argue that Karen's students would have gained more from additional problem-centered instruction, it is unclear if Karen's mathematically anxious students could have immediately engaged with such instruction as intended. It is clear that Karen's efforts to scaffold instruction and boost students' confidence with mathematics, were helpful to students in important ways. Karen's case helps us understand why some of the most caring teachers might be drawn toward more teacher-centered methods, and it highlights tensions involved with moving students toward more independent forms of engagement with mathematics.

Conclusion

This study focused on how caring is expressed in a mathematics classroom and the impact a teacher's caring has on her mathematics instruction and on her students. This chapter discusses these results in the context of all four research questions. In the following chapter, I explore the limitations and implications of this study.

CHAPTER 8

LIMITATIONS AND IMPLICATIONS

In general, teachers are gatekeepers to success in college, and succeeding in school improves students' chances at having a better quality of life. Instructors who teach at-risk students have a unique position within the growing number of programs attempting to recruit and retain underprepared students attending colleges and universities. These instructors have the challenging task of both ensuring that at-risk students learn remedial content and preparing students to succeed in subsequent college coursework.

These instructors often serve in different roles beyond the capacity of teacher to aid at-risk students so they can succeed in college. Cramer and Prentice-Dunn (2007) argue that faculty mentorship should involve caring for the whole person and not only developing students professionally or academically. This perspective involves caring for students in and out of the classroom. DeGuzman et al. (2008), citing Rosiek (2003), asserts that "teachers deal with students as whole human beings and need to respond to them as emotional, moral, social, cultural as well as cognitive beings" (p. 489). Teachers should be interested in their students at the personal level (Ferreira, 2000).

Ultimately, the goal of most undergraduate retention programs is to have at-risk students obtain a bachelor's degree. A lot of work remains in this area. Learning more about the instructors in recruitment and retention programs can illuminate the kind of teachers and the qualities needed to work successfully with at-risk students. In learning more about these instructors, one also discovers more about the needs that at-risk students encounter in a college setting. In this dissertation study, I learned more about the qualities of instructors and instruction that can be helpful to at-risk college students.

The previous chapter discussed the major findings across all results chapters. The chapters identify the different facets of Karen's caring in her instruction and in her personal interactions with students. Karen teaches mathematics in a personal, caring manner. The results also show how Karen's teaching and personal interactions with students are intertwined. The major findings can generally be divided into two themes: "caring about students' mathematics learning," and "caring about students as people." The instructor uses both to make mathematics more accessible to students.

The current chapter has three major sections. The first section presents a discussion of the limitations of this study. The second major section focuses on how this research advances the field of caring. The third section discusses the implications of this study to the wider education community. Specifically, the implications are for teacher education programs, college teachers, administrators, policymakers, and researchers.

Limitations

Each study has its limitations. The following are the limitations of both data collection methods and the study. The subsequent section discusses how the limitations were addressed in this study.

One limitation involves the use of student interviews. Students might be overly swayed by a particularly good or bad experience in class during the week of the interview, and so one interview might present a biased picture of a student's experiences. However, many students were interviewed a second time, and the responses were either the same or similar. Different students repeatedly stated similar thoughts, or even used the same words, to describe Karen.

Interviewing a diversity of students (males and females, freshmen and sophomores) also helps limit some of the potential response bias.

The second limitation is that this study is based on only one college mathematics teacher. Other qualified teachers may have different techniques or ways of working with at-risk college students (see Thomas, 1998). However, there is literature that supports the importance of teacher-student relationships, including studies explaining the influence of caring on students' learning (Hackenberg, 2010; Wentzel, 1994, 1997, 2009). The results of this study are consistent with prior literature yet go beyond existing research to illuminate the ways in which various aspects of caring can be expressed in a college mathematics classroom and perceived by at-risk students. Additionally, it should be stressed that the goal of this study is not to document a full range of effective instructional practices, but to show what is possible by closely examining the case of a teacher who is known as a highly caring remedial mathematics college teacher.

The third limitation is with the reliability of the results of the study. Since this dissertation did not have outside funding, the data were not all independently coded by multiple researchers. However, I, as the researcher, took measures to ensure reliability of the results, as explained below.

Addressing the Limitations

First, repeated findings and prevalence of codes in the study address some of the limitations. I have repeatedly worked with the data over a span of several years. Even as I write the result chapters, discussion, and conclusion, I am still having re-coding sessions to ensure the accuracy of classroom episodes and student data. I recoded the data from scratch without reviewing the previous results. In coding multiple times, I discovered that the same findings and the same themes emerged from both the student and the classroom data. A few misplaced

comments from students (or classroom data) would not have altered the major findings in this dissertation because the themes and major codes are similar and highly related to each other.

Second, the data were triangulated. Chapter 3 outlined four ways of triangulation (Denzin, 1970). They are data, investigator, theory, and methodological triangulation. In this study, data, investigator and methodical triangulation were performed. For the purpose of methodological triangulation, there was more than one method of gathering data. There were interviews and observations with field notes and tape recordings. The student and teacher interviews double checked my observational codes and vice versa. Triangulation “gives a more detailed and balanced picture of the situation” (Altrichter et al., 2008, p. 147). The interviews gave details about the teacher’s perspectives on her instructional practices. The observational data also gave details and an outsider’s picture of the claims that the teacher had about her instruction. According to O’Donoghue and Punch (2003), triangulation is a “method of cross-checking data from multiple sources to search for irregularities in the research data” (p. 78).

Besides methodological triangulation, there was investigator triangulation. Two members of my dissertation committee examined and coded some of the classroom and interview data. There was substantial overlap in how the data were coded. There were a few discrepancies, but they dealt primarily with definitions. These members helped create new terms or adjust definitions.

Finally, there was data triangulation across time and space, as I studied multiple courses over a large period of time. As stated in Chapter 3, generally, irrespective of the course, the teaching style was the same. There were repeated patterns of the same teaching, and this shows consistency.

Advancing the Field of Caring

Caring in the education field has received substantial attention among scholars (Dempsey & Noblit, 1993; Mercado, 1993; Owens & Ennis, 2005; Tarlow, 1996; Wentzel, 1994, 1997, 2009). Caring has been established as an important characteristic with teaching at-risk students. Research (Rolón-Dow, 2005; Smokowski, et al., 2000; Valenzuela, 1999) documents the importance of caring for at-risk students in the K-12 setting. The need for nurturing is important characteristic for at-risk students because they face many challenges (Valenzuela, 1999; Bae, 2008). Many urban schools have large minority population that live in disadvantaged economic situations (Bartell, 2011; Darling-Hammond, 2007; Ladson-Billings, 2006) and are less likely to have qualified teachers and sufficient resources (Bartell, 2011; Hill & Lubienski, 2007; Oakes, 2005). Although this dissertation did not explore fully the challenges students face, many of the at-risk students in my study students came to college with similar challenges. Based on student interview data, a few students came from broken families, others had limited English proficiency, and many were of low SES. A few mentioned that they lived in high crime neighborhoods and were in schools that had high violence. Poor educational experiences in elementary and high schools were described by many of the students. Many students faced challenges as the first generation to attend college. Therefore, the need to have caring instructors in college seems critical, particularly in entry-level mathematics courses.

As discussed in Chapter 2, there are many different perspectives regarding research on caring. Table 12 outlines the main perspectives relevant to this study. The following sections discuss these main perspectives and my contribution to the caring field, which brings together the various perspectives in the table.

Table 12

Overview of Existing Perspectives on Caring in the Classroom

Focus	Key authors	Context and goals (How does caring look like in the classroom)?
<p>Holistic caring about students as people (Without focus on subject matter)</p> <p>Extension: Caring about students in the context of race, culture, and power</p>	<p>Examples:</p> <ul style="list-style-type: none"> - Noddings - K.R. Wentzel <p>Examples:</p> <ul style="list-style-type: none"> - Tonya Bartell - R. Rolón-Dow 	<ul style="list-style-type: none"> - Caring about students so they learn to care. - Focus on African American students' status, identity, and prior knowledge. - Critical care asks teachers to center issues of race and ethnicity in their relationships with students. - Teachers should learn about the students' communities.
Caring about Mathematical Achievement	<ul style="list-style-type: none"> - Uri Treisman - AJ Hackenberg - NTCM <i>Teaching Principle and Equity Principle</i> 	<ul style="list-style-type: none"> - (Collegiate Level) Focused on Calculus students going to STEM related fields (Group work as opposed to teacher-student relationships) - Focused on caring for individual students and their mathematical learning in small one-on-one interactions. - Focused on competent teachers and teaching strategies.
Caring expressed through immediacy behaviors	<ul style="list-style-type: none"> - P. Witt, L. Wheelless, M. Allen 	<ul style="list-style-type: none"> - Collegiate levels: Across all subject matter—Teacher expresses care by eye contact, smiling, facial expressions, and conversational style.

Many researchers have studied caring in grammar school (Noddings, 1992, 1993, 1994, 1995, 1996; Wentzel, 1994, 1997, 2009). Some of the foundational views of caring are centered on holistic caring and student-teacher relationships. Views include nurturing students and their interests even when their interests don't fit standard curriculum content (Noddings, 1992, 1993, 1994, 1995, 1996), and ultimately striving to create caring, well-adjusted human beings. One way in which this holistic caring view has been expanded in recent years is to include attention to students' race, ethnicity and identity in the classroom (e.g., Bartell, 2011; Rolón-Dow, 2005).

Despite their attention to caring for students and their development, typically researchers in the holistic camp, including Noddings, Wentzel, and Rolón-Dow, give little or no attention to ways in which caring intersects with the teaching of specific subject matter and students' academic achievement. These researchers do not focus on how caring looks in the context of teaching typical academic content.

Another form of care different from holistic caring is to care for students' mathematical achievement. For example, Treisman (1992) focused on helping African-American students in Calculus and pushed them toward success in STEM related fields. Treisman cared for his students' mathematical achievement, but his work did not demonstrate a personal one-on-one interest in students. Hackenberg (2005, 2010) studied caring in small one-on-one interactions or teaching experiments with the teacher and White students, focusing on fostering students' mathematical achievement. Muller (2001) investigated and found weak associations between high school teachers' caring and the mathematics achievement for most students. For students who were considered at-risk of dropping out, Muller (2001) found that at-risk students who had caring teachers achieved higher mathematics proficiency and growth in test scores. However, the

research on caring in a mathematics classroom is limited. These two studies (Hackenberg 2005, 2010; Muller, 2001) focused on White students and quantitative measures.

NCTM's (2000) *Principles and Standards* guidelines focus on caring for students' mathematical achievement. Despite its emphasis on mathematical power for all students, NCTM gives little attention to ways in which mathematics teachers should relate to, and care about their students. In fact, issues related to caring in a mathematics classroom are not commonly found in mathematics education research. As stated in Chapter 2, there is research on caring. However, the research on caring is rarely blended with mathematics education, and the few studies that do examine caring in a mathematics classroom are limited in scope.

NCTM's *Equity Principle* describes general guidelines for teaching mathematics to under-represented minority students. The main idea from the text is that mathematics teachers must be "competent and well-supported" (p. 12). "Competent teachers" refers to mathematical knowledge and teaching strategies. However, the statement leaves out other aspects of the teacher. For example, NCTM does not mention any personal qualities (e.g., caring, humorous, and able to build rapport) that can help teachers reel students into their mathematical learning. The following few statements are taken from the principle.

The Equity Principle demands that high expectations for mathematics learning be communicated in words and deeds to all students. . . . Well-documented examples demonstrate that all children can learn mathematics when they have access to high-quality mathematics instruction.

Having high expectations for at-risk students is very important and should always be communicated through words and deeds. However, these beliefs fall under the idea of having competent teachers who believe that their students can learn mathematics. This shows that the teacher cares for their mathematical learning, but there is no indication that teacher's care goes beyond teaching mathematics. This type of caring lacks a personal interest in the student.

Noddings (1984), Rolón-Dow (2005), and Valenzuela (1999), argue that schools focus mostly on aesthetic caring.

Aesthetic caring focuses on attention to things and ideas concerning the technical aspects of teaching and learning such as standardized curricula, goals, and teaching strategies. Individuals who care aesthetically are committed to the school-sanctioned practices and behaviors believed to lead to educational achievement. (Rolón-Dow, 2005, p. 86)

Valenzuela (1999) argues that aesthetic caring either ignores or derogates students' ethnicity. I argue that the focus on aesthetic caring (i.e., focus on mathematical achievement) ignores the whole student and not just their race/ethnicity. The NCTM (2000) guidelines give little attention to how teachers should work with at-risk students outside the scope of teaching mathematics. For example, the *Teaching Principle* focuses more on teacher's behavior in teaching mathematics and teaching strategies:

Selecting and using suitable curricular materials, using appropriate instructional tools and techniques, and engaging in reflective practice and continuous self-improvement are actions good teachers make every day. . . . Teachers establish and nurture an environment conducive to learning mathematics through the decisions they make, the conversations they orchestrate, and the physical setting they create. Teacher's actions are what encourage students to think, question, solve problems, and discuss their ideas, strategies, and solutions. The teacher is responsible for creating an intellectual environment where serious mathematical thinking is the norm. More than just a physical setting with desks, bulletin boards, and posters, the classroom environment communicates subtle messages about what is valued in learning and doing mathematics. (p. 18)

The above passage does not mention the qualities that the teacher may bring to help students learn mathematics. My research suggests that teaching is more than just content. Teachers communicate care beyond posters, bulletin boards, and other physical artifacts in the classroom. The passage is centered on aesthetic caring, and not on authentic caring for the student. Students can recognize the difference in caring, as articulated by one student in Rolón-Dow's (2005) study:

Most of the teachers, all they want to do is teach the kids and that's it. . . . But I don't really think they actually care, care. Like I'm always there for you and you can talk to

me, no. . . . What I'm trying to say is that they care about the kids' schoolwork, not their personal lives, like what happens at home (Rolón-Dow, 2005, p. 95).

My study supports the idea that at-risk students want teachers who will care for them personally. Even though developing and achieving mathematical power with at-risk students is NCTM's mission, NCTM overlooks any relational or interpersonal perspectives that teachers should have to engage students in learning. NCTM should address specific concerns of the at-risk student population that may need a caring teacher. My study suggests that many of these at-risk students desire and are in need of someone who believes in them and cares for them holistically.

Most of the work on caring has focused on K-12 education. Research on caring at the collegiate level has generally focused on teacher immediacy behaviors. Immediacy behaviors can be considered the physical expressions of caring, such as smiling, eye contact, or a friendly voice. According to McCroskey and Richmond (1992), "immediacy creates a more engaging atmosphere for the teacher-student relationship" (p. 102). Research on caring expressed with immediacy behaviors has shown positive results. For example, LeFebvre and Allen (2014) found that teacher immediacy positively correlated with cognitive learning. In a meta-analysis of many studies involving teacher immediacy, Witt et al. (2004) found a positive and substantial relationship between overall teacher immediacy and overall student learning. Interestingly enough, when instructors use both verbal and non-verbal immediacy behaviors, this accounted for the highest perceived student learning (Witt et al., 2004). As the use of verbal and nonverbal immediacy increased, students perceived that they were learning more (Witt et al., 2004). One important feature of immediacy behaviors is that they allow researchers a way to study caring. However, caring expressed through immediacy behaviors raises a few concerns. Are the instructor's expressions of care through immediacy behaviors authentic? Does it matter whether

or not the instructor is “faking it” or authentic? These are lingering questions that have not yet been explored.

My Study

My study furthers the field of caring by examining caring beyond the high school level in a remedial mathematics course. This type of research has not been done before, and intersects the fields of mathematics education, caring at the collegiate level, and the general field of caring. This study unifies the area of caring and communication into the context of a mathematics classroom, and I incorporate views of caring at the collegiate level because, at this level, there is little or no research on caring that includes attention to a specific subject area. My research is not meant to be exhaustive in its scope. Instead, my research is designed to contribute to our understanding of how caring looks in the classroom of one remedial college mathematics teacher who is known for being caring.

My study combines both views of caring—specifically caring for students as people and caring for students’ mathematical achievement. Generally, Karen’s caring gives a concrete, genuine exemplar of Noddings authentic caring. However, Karen extends the views of authentic caring because she also cares deeply about students’ academic achievement.

Karen’s care for at-risk students’ mathematics achievement looks different than Triesman’s. Instead of focusing on students’ achieving high level of mathematics, she is more concerned with helping students finish their basic quantitative requirement for a college degree. Another important distinction between Triesman and Karen is how they care for students’ mathematical achievement. Triesman (1992) focused on how African-American students study and learn mathematics as a collective group. He compared how Asian and African-American

students learn mathematics within study groups. Hence, his focus was more in what happened outside of the classroom.

Karen focused her care on students and their learning both in and outside the classroom. Based on her experience of working with individual students and a long period of working with this population, she knew the mathematical difficulties students tended to have. Karen knew how to diagnose students and their lack of knowledge prior to coming to the course. This anchored Karen in the way she taught and interacted with students during lectures and office hours. Even though the study didn't focus on care specifically in conjunction with students' demographic backgrounds, there is evidence (interviews, observations) to suggest that Karen was fully aware of her students' race/ethnicities. However, unlike Treisman, she did focus on differences in her students' by race or ethnicity.

In addition to combining both authentic caring and caring for academic achievement, my study extends views of a caring teacher. Noddings' work on caring tends to be theoretical and abstract. My study shows a genuine, concrete, authentic caring teacher as she relates with at-risk college students. The combination of student and teacher interviews and classroom observations allows a close examination of a caring college instructor, as exemplified by this quote from Student #23:

She carries herself in a very respectful manner. She is always being caring. You just get a very loving and comfortable feeling around her. . . . It shows through her teaching. She is very passionate about math.

This student sees Karen's caring as intertwined with her teaching of mathematics. Noddings' conceptualizes the view of a caring teacher in the context of a caring relationship and focuses on defining this relationship. My research shows a teacher who doesn't necessarily fit into Noddings' scheme of a caring teacher, but rather a teacher who seems to naturally exude

caring in forms of nonjudgment, selflessness, and nurturing while focusing on helping students learn mathematics.

Implications

This study shows that caring matters when teaching mathematics to at-risk college students in a remedial course. In this section, I discuss the implications that this study has for members of the education community. Many stakeholders in education underestimate the power of caring. There are implications for the larger community, which include teacher education programs, college teaching, administrators, policymakers, and future research.

Possible Directions for Teacher Education Programs and Research in Teacher Education Programs

One fundamental question raised from this study is whether caring can be developed in teachers, or if the degree to which teachers care about students is “natural,” and fixed. Although part of Karen’s story suggests that she was “naturally” a caring teacher, other aspects suggest some ways in which this caring was developed through her experiences. The following sections describe opportunities that can be made available in teacher education programs that could enhance teachers’ caring for students. These suggestions are based on the findings of this study, and further research is needed to determine if these experiences will truly develop teachers’ care for students on a broader scale.

Knowing Students as Learners

Pre-service teachers need to learn to respect and care about students and learn to adapt instructional methods to meet students’ needs. One possible way to promote this learning among pre-service teachers is to have them work with individual or small groups of students. This kind of experience was a major influence on Karen, as she learned to work with at-risk college

students. Through working closely with individual students, she learned that even struggling students think mathematically and are worth investing in.

Through her intensive interactions with students early in her career Karen also learned to adapt her instructional approach to meet students where they are. As explained in Chapter 3, when Karen worked with a few students during office hours, she gained information about the misunderstandings students had on the content. She used this information to help guide student learning and address students' confusion during the next class period.

Research has shown that focusing on student thinking is helpful in student learning as indicated in studies of Cognitively Guided Instruction (Carpenter et al., 2000). In addition to learning about students' mathematical thinking, teachers are able to change their perceptions of children and to offset any negative experiences students may have (Amin, 2001). Rabin (2008) found that focusing teachers on individual students helps to develop an ethic of care.

Similarly, Vithal (2003) found that pre-service teachers who worked closely with small numbers of homeless students "change[d] their deeply held values, beliefs and attitudes in ways that also impacted their knowledge and skills for teaching mathematics" (p. 167). The student teachers were able to employ reflective practice and progressive pedagogy, and all the girls improved their results in mathematics. One possible reason for this is because the student teachers "learned to work from where the learner was, listening and carefully drawing on their main concerns and interests in planning their teaching" (p. 176). Students showed a greater commitment to school tasks. Teachers were kind and sympathetic, and there was evidence of strong bonds of care and compassion between the student teachers and the students.

Finally, Moses and Cobb (2001), in their work with "The Algebra Project," found that working with one child can be a powerful experience for a mathematics teacher:

Working with Ari [the student] gave me a sense of what is going on in the mind of a student who is trying to grapple with mathematics that is usually reserved for just a few students . . . Ari helped open one little conceptual window to a whole approach to teaching Algebra, namely, that you have to approach the child's idea of number through questions that the child has about number. (Moses & Cobb, 2001, p. 102)

Based on the results from this dissertation study and other studies, having pre-service teachers and college instructors work closely with one student or a few students may be a promising avenue for promoting greater caring among teachers and focusing their attention on students' strengths and needs.

Knowing Students as People

Karen knew students in extraordinary ways, and her students expressed, in many different ways, that Karen's relationship with them helped them be more engaged, confident learners. As indicated in previous chapters, Karen used her humor, personal stories and her friendly one-on-one interactions with students to get to know students in a personal way. Karen got to know students because she cared about them as people and she wanted to address their learning needs. Her understanding of students as both learners and people enabled Karen to use this information to design lessons plans and create mathematical examples to increase learning.

Karen's case suggests that teacher education courses should emphasize the importance of getting to know students in a personal way beyond simply being a teacher of academic content. In fact, some mathematics education scholars have recently argued for the importance of teachers knowing their students in deeper ways. For example, Bartell (2011) notes, "knowing a student's situation requires, but is not limited to, knowing something about the student's home life, cultural history, and the political situations that she or he confronts outside of the classroom" (p. 59). Gutiérrez (2012a) argues that "effective teachers of Latin@ students get to know their

students in deep ways that allow students to express their identities (e.g., culture, language, interests, experiences, goals)” (p. 121).

Karen was in a collegiate setting, which limited her ability to interact with students’ families and home communities. Perhaps this limited her attention to the more political and cultural aspects described by Bartell and Gutiérrez. Although she seemed to give little explicit attention to political and racial/ethnic issues surrounding her at-risk students, Karen’s case exemplifies the importance of developing personal relationships with students that go beyond traditional teacher-student relationships.

Teaching How to Communicate Care

Karen cared for students in multiple ways and consistently expressed this care to them. Teachers in Valenzuela’s study (1999) considered themselves as caring, but unconsciously communicated a different message, making occasional negative comments on students’ dress, behavior and motivation. Whitaker (2012) states that effective teachers “don’t make cutting remarks or issue smart retorts. . . . Quite the opposite: the best teachers consistently compliment and praise students” (p. 66). Wentzel (2009) argues, “teachers who communicate high expectations for individual students can bring about positive changes in academic accomplishments” (p. 306). Comments that make students feel negatively about themselves provoke a certain level of defensiveness (Gamble & Gamble, 2002) and “threaten” the students’ academic self-concept, creating a wall between the students and the teacher

In addition to nonverbal immediacy behaviors, verbal communication is a key way in which care is expressed and can provide emotional support and a feeling of safety. Davis (2001) posits that secure relationships help students have positive social self-concept and promote self-efficacy. This can help students learn mathematics.

Wentzel (2009) argues that effective qualities of teacher-student relationships include, “emotionally supportive interactions [that] have the potential to provide strong incentives for students to engage in valued classroom activities” (p. 307). Teacher education programs need to help future teachers understand the damage that even marginally negative remarks can cause and help teachers learn to consistently communicate caring and emotional support to their students.

Helping Balance Students’ Needs

Teachers who deeply care about their students and want to show them support can encounter dilemmas when it comes to pushing students to think hard and persevere when solving complex problems. In accordance with the NCTM *Standards* (2000), mathematics methods courses tend to encourage teachers to move away from lecture and demonstration as the staples of instruction and to move toward methods centered on student reasoning, problem solving and discussion. However, like Karen, pre-service teachers might grow concerned about at-risk students’ lack of mathematical confidence and decide that teaching in an incremental, structured way is most helpful for at-risk students. This can lead to a tension of, on one hand, wanting students to increase their mathematical reasoning and complex problem solving skills, and on the other hand wanting students to increase their mathematical confidence through “little successes.” Given the tension embedded in the differences between Karen’s instructional approach and the ideals of much of the mathematics education community (e.g., NCTM, 2000), mathematics methods courses may need to help pre-service teachers grapple with this tension, and discuss ways to help students move away from their dependence on the teacher. In Lubienksi and Stilwell (2003), high school teacher Stilwell explains how she manages this tension, including her use of modeling and providing some forms of structure while her students learned mathematics through problem solving and reasoning.

Use of Teaching Videos in Education Classes

Karen consistently expressed care for her students both as mathematical learners and as people. Pre-service teachers might find it helpful to see examples of what this care looks like on a day-to-day basis during difficult times. Since the use of teaching videos in the teacher education program is pervasive, watching videos can be one way that pre-service teachers learn to interact with students in caring ways. However, mathematics classroom videos tend to be heavily edited and focus strictly on math-focused interactions with relatively well-behaved students. This seems very limiting to future teachers and their understanding of student-teacher interactions.

The many facets of Karen's role as a caring teacher suggest that the videos we show pre-service teachers should go beyond traditional instructional interactions. Videos should allow for an examination of the ways in which teachers build caring relationships with students and how teachers respond to students when difficulties arise.

However, simply watching a video might not be enough to draw preservice teachers' attention to critical elements of a caring teacher. Pianta et. al. (2008) developed an extensive rubric to document aspects of caring classrooms that sometimes go unnoticed, such as a positive environment (e.g., humor, respectful language), teacher sensitivity (e.g., awareness of student needs, responsiveness, providing for student comfort), the quality of teacher feedback (e.g., encouragement, affirmation, prompting students' thought processes), and teacher's regard for student perspectives (e.g., allowing choice, opportunities for student expression, incorporation of student's ideas). These aspects were important to the students in Karen's classroom, and yet many of these aspects can go unnoticed by a casual observer. Pre-service teachers should be prompted to attend to these elements while they watch videos, taking note of teachers'

immediacy behaviors and using a rubric to attend to the ways in which teachers communicate care to their students while effectively teaching mathematics.

Belief Systems in Teacher Education Program

Karen strongly believed in the full potential of her at-risk students. Her feelings and behaviors in the classroom followed these beliefs. However, many teachers, like those studied by Valenzuela (1999), express a deficit view of their at-risk students' potential. The sections above discuss specific components that could be included in mathematics methods courses. However, perhaps greater emphasis on the importance of teacher caring needs to be woven throughout pre- and in-service teacher education programs.

Owens and Ennis (2005) argue that current teacher education programs do not necessarily address caring perspectives or their influence on education. They suggest that the ethics of care should be part of pedagogical content knowledge. In addition, Goldstein and Lake (2003) argue that pre-service teachers enter student teaching with limited views of caring that come from their personal relationships. Pre-service teachers may need help in seeing the potentially powerful role they can play as caring educators.

During the teacher interviews, Karen mentioned that educational policy coursework influenced her beliefs about whether at-risk students should receive an education. The coursework pushed her thinking about teaching at-risk students, including the importance and feasibility of doing so.

Based on Karen's experiences, teacher education programs have the potential to impact the perspectives and motivations of pre-service teachers. As in Karen's case, courses in educational foundations and policy can help preservice teachers see the "big picture" of where their efforts as a teacher fit within larger, structural issues, including persistent inequities within

our society. This heightened awareness may lead to more committed, caring teachers for traditionally marginalized students. However, more research is needed to determine the extent to which such courses can create a more caring teacher work force, and the content and experiences most important to include in those courses. This is particularly true, given the specifics of Karen's background, including her family and spiritual experiences that deepened her commitment to the well-being of others and shaped who she is as a person and teacher today. The extent to which a committed, caring nature can be fostered in the context of postsecondary education, after early social and spiritual development has occurred, remains an open question.

Implications for College Teaching

There may be a difference between college students' and professors' views about what constitutes effective teaching (Meyers, 2009), with professors focusing more on clear lectures and students focusing more on caring for students and their thinking and learning. Bain (2004), after conducting research for over 35 years in a wide variety of fields and universities, found that lesson plans and lecture notes matter less than having a special understanding of the subject and valuing human learning. Most importantly, professors need to hold two critical beliefs: teaching matters and students can learn. Lowan (1994, 1995) argued that rapport is key to college teaching effectiveness, and Benson et al. (2005) found a positive relationship between rapport-inducing teacher behaviors and college students engaging in proacademic student behaviors as well as positive affect toward the teacher and course content.

These studies are consistent with research on teacher immediacy behaviors, as well as the findings in this study. Specifically, Karen strongly believed that students can learn and that teaching matters, and she clearly showed this through both her verbal and non-verbal immediacy

behaviors. She worked to build rapport with students, and students viewed her as caring for them as people and as students.

Professors should not assume that their expressions of care, such as clear lessons and syllabi, are central to what students view as good teaching or caring. College teachers should seek feedback from students and be aware of what their students view as effective teaching. This is particularly important for at-risk students in foundational college courses, who may need extra guidance from caring instructors in order to become acclimated to and succeed in a university setting.

Implications for Administrators

Whittaker (2012) argues that there are two ways to improve a school significantly: “get better teachers, and improve the current teachers” (p. 7). Based on the findings of this study, administrators need to realize the importance of both hiring caring teachers and further developing teacher care among their staff in order to enhance academic achievement, particularly for at-risk students.

Using the term broadly, administrators (e.g., principals, college program directors, mathematics department heads) should consider teacher caring as an important concern when hiring teachers, especially in university recruitment/retention programs for at-risk students. During an interview, micro-teaching can aid in determining teacher effectiveness, rapport with at-risk students, and the expression of care. One could tell whether the prospective teacher is engaging students as both learners and as people during a micro-teaching lesson. This is a first good indicator that the prospective teachers has genuine concern for students and their learning.

The results of this study also suggest the importance of fostering an environment where existing faculty are more likely to express care for students. Administrators should care for

teachers as well, which in turn, can trickle down to students (Noblit, 1994). Additionally, Agne (1992) maintains that caring should also be part of teacher evaluation systems. For example, teacher observation instruments should be developed to assess caring as one important component of instruction. Making care a component of teacher evaluation would indicate the importance of caring as a key part of high-quality teaching.

Many recruitment and retention programs at the college level focus on the completion rates of at-risk students. Research on these programs has tended to focus on mentoring and acclimating students to college life (e.g., resources on campus, libraries, etc.) and other issues outside the classroom. Recently, however, interest in remediation coursework has increased (Bahr, 2007; Bettinger & Long, 2008; Perin, 2004). Still, little attention is given to the instructors who teach courses to at-risk college students and effective instructional approaches for these students. As shown in this study, a caring teacher in a retention program does make a difference to at-risk students in these programs. Administrators should give more attention to the type of instructors who work with at-risk students at the college level, and the role they play in retention. Teachers can provide academic support in formal and informal ways. This is important because academic support given to students can help students succeed in college (Tinto, 2005).

However, Boyer (1997) argues that there are competing demands of research, teaching, and institutional service. Bok (2006) also states that a complaint among faculty is that they are so preoccupied with research and other job responsibilities that they “neglect teaching and ignore their students” (p. 31). This raises the question about what type of teachers teach at-risk college students. Wentzel (2009) claims that “little is known about teacher characteristics that predict their willingness to help students” (p. 307). Administrators should be aware of the importance of the instructors and instruction in remedial courses because while a number of factors might

contribute to failure and success in school, instructional and classroom learning environments are critically important factors (Waxman et al., 2002; Waxman, 1992; Waxman & Huang, 1997; Travis, 1995). If an institution is deeply committed to helping its at-risk students succeed, then remedial course instructors need to be hired carefully and given ample time to devote to their students.

Implications for Future Research

Based on this dissertation study, more research needs to be done on caring, bringing together perspectives emphasizing caring for students as people with those focusing on caring about students as learners of academic content. The findings of this study also need to be confirmed and extended with further research.

One way is to conduct research that would convert the major findings (e.g., nurturing, building rapport) in this study to discrete categories. Conducting a statistical analysis could add credibility to the results of this study. This could lead to more general claims about the teacher's caring nature and its relation to at-risk students' outcomes. However, even specific aspects of caring would be difficult to measure because caring is subjective. Closely related to measuring caring is measuring student-teacher relationships. Wentzel (2009) states, "understanding the significance of teacher-student relationships in students' lives is also dependent on careful examination of how these relationships are assessed and studied" (p. 312). Irrespective of the ease of measuring and assessing concerns, this study and other research on caring indicates that teacher caring does impact other social and academic behavior and therefore merits further study, despite the difficulties.

Second, in order to see if the themes identified as important in this study generalize to other contexts, future research can include a larger sample of teachers teaching at-risk students at

the college level. Most of the research on teachers' caring is conducted in a K-12 setting and not centered on teaching academic content. Remedial mathematics teachers are commonly found in community colleges and large state universities, and their courses serve as key gatekeepers to college success. Hence, it is particularly important to study instruction in these courses and ways it can become more effective for at-risk students. However, research in other educational contexts (e.g., non-remedial college settings) could also increase our understanding of caring.

Third, future research should examine aspects of caring that go beyond student contact in the classroom and office hours. Teachers can express caring outside of the classroom, and students (regardless of school setting) conceptualize caring in different ways as stated in Chapter 3. For example, Karen counted every step in every math problem on every test. She did this to ensure that each problem on each version of the test has an equal number of steps, in order to make sure each question on each math test was fair to students. This was done behind closed doors without students even realizing this. In Rolón-Dow's (2005) research, students felt cared for by the amount and quality of institutional resources. Nieto (1998) confirms that both individual and institutional acts of caring are important. These notions of caring would expand the theoretical framework of aesthetic/authentic caring (Noddings, 1984, 1992, 1998, 2002). Caring does exist outside the classroom and there needs to be more research that focuses on times when students both are and are not present because teachers can express care in extraordinary ways.

Next, the effects of caring are still understudied. Little is known about the impact caring can have on the lives of at-risk students beyond academic achievement. Karen's caring helped at-risk students finish their mathematics requirement and many graduated from college. However, one does not know the total effects of Karen's caring outside of the classroom. For example, how

does Karen's care effect students' happiness or students' potential anger and hostility when facing challenges in school? This is difficult to conceptualize and therefore difficult to investigate. However, Moses (Moses & Cobb, 2001) who worked with at-risk youth, argued that relationships are a key part of student success in the Algebra Project.

Part of the answer is that you need older people who are in constant enough contact with a small group of young group that you can develop, penetrate their cultural barriers, and become a relationship that can help them grow. In our target population, this requires contact over time and contact outside of school. Trust has to anchor these relationships, the belief that a grown-up person is not going to disappear in one way or the other I think generating this kind of security is critical to populations of young people who have been hurt in different ways in their basic relationships with adults. (Moses & Cobb, 2001, p. 133).

Even though student relationships are generally thought to be helpful to students' academic success, the extent to which they matter when other factors are taken into account merits more attention. There is more to learn about the conditions in which caring might play a particularly important role in helping students succeed in school, and what other effects caring might have on students in the long run.

Finally, future research should examine teachers' nonverbal immediacy behavior in K-12 settings because research in this area tends to focus on the collegiate level. There are also other limitations with research on teacher's immediacy behaviors. Knapp and Hall (2010) argue that research data do not provide consistent and conclusive evidence that students actually do learn more from teachers who show more immediacy behaviors. Knapp and Hall (2010) continue by acknowledging that it is reasonable to assume that teacher immediacy can help some students' learning but not others, and that the type of students who will benefit from teacher immediacy is unknown. In general, the area of teacher immediacy is still understudied.

Final Thoughts

Caring is an important topic but has not received the attention it deserves in mathematics education. This study illuminates specific ways in which a teacher's care can enhance the mathematics learning of at-risk students. This study suggests that caring for students as both learners and as people is important and can help enhance at-risk students' confidence and competence as learners in a college setting. With its implications for teacher educators, mathematics teachers, administrators and researchers, this study contributes to efforts to improve instruction and academic outcomes for at-risk students.

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Appendix A

December 2009 Committee Meeting

Mathematical Learning/Caring

- Promotes working with others (i.e., “check with your neighbor”), gives students time to work with their partner or do group work• Provides answer keys, practice tests
- Models mathematical processes with Karen’s thoughts. She thinks out loud to students.
- Gives students time to come up with their own conclusions
- Uses student information to teach (e.g., uses sibling information to teach the concept of functions)
- Goes over homework but doesn’t go over homework problems/material twice for students who are absent. She requests that they go to her office hours.
- Advises students on which math classes to take
- Mathematical questioning: “Explain why [this is a function] or why not.”
- Asks students to read problems out loud to get them involved
- Promotes and piques student interest and students show enthusiasm
- Invites and encourages students to attend office hours on a constant and consistent basis.
- Uses students’ knowledge to relate to math topics (e.g., graph theory to parking meters)
- Demonstrates non-verbal techniques (hand gestures, points at things at the board)
- Reveals personal information:

Karen: “I must have spent an extra hour at Wal-Mart buying a silly Nerf ball, but it had the incredible hulk, which my grandson really likes, but they couldn’t find a valid code. Every time that they tried putting in a code, it wouldn’t ring as a valid check digit. They

couldn't find another one in the store. The last digit is to make sure the other 10 digits are valid.”

Verbal Affirmation/Caring

- Stops and greets students as they walk in (even if they are late)
- Karen: “Those were great examples.”
- Karen: “You guys did a great job! Do you have a question that you want to see on the board? There wasn't one problem that everyone bombed. You guys did a great job. I was really impressed.”
- Demonstrates non-verbal care (looks at students, smiles)

Appendix B

Teacher Interviews

Interview #1 Topic: History (Timeline of Karen's life)

1. Tell me how it all got started for you.
2. What happened afterwards, after you were done with high school?
3. Tell me about your student teaching. Where was it at? What courses you did take? You did sixth, seventh, and eighth grade?
4. Why did you want to do it [the graduate degree] then?
5. What courses were you interested in?
6. How was graduate school like? How did it feel like? What did you sense? What was going on in your life during that time?
7. What made you believe it [in Christianity]? Follow-up questions:
How did it feel during that time when you were praying?
How did your life change after that?
8. What happened in the spring when you were pursuing your Master's degree?
9. What made you, uh, do that instead of going back to high school? I mean, was there anything that motivated or interested you about teaching college vs. high school?
10. Why you decide to teach college?
11. How were your first two years of teaching college, full time? Follow-up questions:
You said the students were like what?
In the 90's, the classes were they still lecture?
12. When was the program developed? In 1986?
13. How did you get involved? Follow-up questions:

And, now, was Pam the director at the time?

How did it [teaching at-risk students] feel?

14. Tell me at what point during this time span did you adopt, and how was that like, 'cause you didn't mention that and so I wanted to know [more]? When did it all get started? How was it when you picked him [your son] up? How was it like?
15. At this time [of the adoption], you were still teaching for the Math Department?
16. Do you notice, or did you realize that the time in which you got Nick [your son] was about the same time you started the Bridge program? Do you think it was a coincidence that when you got Nick it was about the same time you started Bridge?
17. Do you have any examples of breaking down barriers [with students since your son is Black]?

Interview #2 Working with At-Risk College Students

1. I'm basically looking at two things, and one largely is, um, how you see them and how they see you, and I think that a good place to start is to see how you see them. You've been in this program for a long time; you nourish these students; you are the mother of a program, and you're probably a mother to some of these students.
2. How does that make you feel when you have somebody who tells you, you know, "You've been like a mom," or, "I wish you were my mom?"
3. What are some important ways in which you are with students? Can you give me any specific examples?
4. What were you doing in the classroom that really helped them?
5. How do you let them know that you're excited about being there?
6. What do you feel are the needs of at-risk students? You've mentioned some of them, but what do you think are the needs of the students of this program? Follow-up: How do you address those needs?
7. What's the difference between learning how to think and problem-solve? Can you give me examples of how you would teach them how to problem-solve?
8. How is teaching them, teaching this group of students, you know, vastly different from teaching any other group of students to think critically?
9. You did mention several things you do emotionally, scholastically to help. What are ways you help mathematically?
10. How, how did this all start for you? I mean how did you get to know at-risk students so well? You can pick up, you have the ability to pick up, very quickly, that students need something.

11. When did you notice, I mean when you were teaching, when was the first time?
12. How was it that you picked up on students' needs really quickly? Follow-up questions:
How did you know that you needed to do whatever you needed to do for at-risk students?
How did you see these students' needs?

Interview 3: Topic Christianity, College Education, Family Background

1. Can you describe the first thought or first time that you heard about church?
2. Did your parents talk to you about the Bible?
3. Do you not remember how young you were when you first went [on vacation]? Where else did you go?
4. What did you do after you went on this trip in terms of your walk with the Lord?
5. What made you want to go to that church, or any church at all? What age did you start going to church with your friend?
6. [When you went to college], how did you feel as a person? How did you grow? Take me down memory lane when you went to college.
7. What happened when you decided to go from straight math to math education?
8. Do you know what that was like when you declared to be in Secondary Education Math?
9. Do you remember when you started the education courses? What was that like for you?
10. During your teacher education career, did you feel a sense of calling, a sense of, “Yes, this is what I want to do?”
11. Do you think the education courses reinforced your calling? When you were in your methods class, did you get more or less excited about the career?
12. You talked a little bit about, that you realized that your parents were not spending a whole lot of time together. What was it like?
13. You said that you were like your dad’s sidekick. How did you feel getting your dad’s attention?
14. Do you know at what age you took the bunch of kids and went to Colorado skiing, and you took the family van?

15. When did you become aware that you were drinking that much?
16. Do you have anything to add?

Interview #4: Family History and Community College Teaching

1. I know very little of your mother's death. Can you tell me more about that?
2. What happened after your mother said she wanted to accept Jesus into her heart? When did she die after this? Where was your father all this time?
3. How did you handle being on your own?
4. In December, do you think your mother already knew that she had cancer?
5. You said at some point that you felt like you were treating your mother as worthless. And you mentioned that part of it was your father. How did you become aware of this?
6. How did [community college teaching] all come to be? Where were you at in life? What had you already done and accomplished? How did it get started?
7. I realize Nick was two already, but in terms of your teaching load at the university, you were already teaching in the at-risk program when you started teaching at the community college?
8. How has your experience at the local community college—did it shape or mold, influence your ability to teach students in the at-risk students?
9. What actually caused you to go to them [the administration]? Was it something that happened?
10. Is there anything you would like to add?

Interview #5 Topic: Teacher Evolution and Teaching Large University Class

1. How did you evolve over time as a teacher?
2. When did you start realizing these teaching aspects for yourself?
3. When did you start reflecting as a transition teacher?
4. While you had students had over the summer, did you realize any other insights that has made a difference now?
5. What do you do in the teaching of mathematics that would be different because of these at-risk-students?
6. Did you notice that they [at-risk students] needed more time, an hour-and-a-half or whatever more, while you were doing the summer component? How did you know?
7. When you said you entertained that idea [going to the administration], what were the thoughts in motion?
8. Talk to me more about the emotions—this idea pops into your head—and also just the emotions about going to the administration and taking this big leap.
9. Do you think there was anything else besides that in your life that helped you evolve?

Interview #6: Topic: Member Checking

Interview #7: Topic: Follow-up on Teaching, Family, and Education

1. An associate professor said “This is a rough crowd.” In a previous conversation, you made a comment that a professor at the university made a comment (“This is a rough crowd.”) to you about your class. Please remind me what that comment was, and a rough timeline of when it happened, and sort of the background information of the event.
2. Did you ever ask this teaching associate why she made this comment?
3. Have you had, in your teaching experience, students say, “You’re different, Karen? You don’t treat us like the rest of the professors do. You don’t look at our skin.”
4. When you hear that comment, what does that make you aware of?
5. When did you start noticing your dad’s brainwashing (if you can call it that)? When did you realize that he was sort of [brainwashing you]?
6. When you started realizing that your dad was subconsciously brainwashing you, it was when he left the house. Were you living with your mom at that time?
7. Between the time that you became aware and the time your mother made that comment, how did you change your behavior? What did you do that was different?
8. When you changed, how did you change with your mother? What did that look like?
9. Did you take the educational policy courses while you were an undergrad or a grad student?
10. Do you remember the other coursework while you were undergrad or grad student?
11. When you thought that the central question of who should receive an education, and who decides who receives an education, those questions, those thoughts, did they happen during your teaching? Or, did you have those—did you raise those questions in class, whatever, while you were an undergraduate?
12. How did you teach students such a wide range of ability? How did you compensate for that?

13. What at made you aware you were losing people [students]?
14. Did you do anything to intervene with them [students] personally?
15. How big was the class?
16. In reference to Algebra, how exactly would you fix having a big class? Did you have TA's?
17. How did teaching those courses prepare you for teaching transition students all the time?
18. When you teach in increments, do you mean that you teach things piecemeal or is that increments that you teach topics very basic? Or, do you mean just missing knowledge that students are missing?
19. What has been the feedback that you received from students?
20. Have the found the incremental teaching to be effective? When have you seen it most effective, like most helpful, for what kind of students?
21. Let's go back to your majors. You talked about the fact that you had three majors: computer science, accounting, and math. Were these majors unofficial? I thought you came in officially with three majors as a freshman.
22. Regarding computer science, how did that interest arise?
23. Didn't you take programming in high school?
24. How much familiarity did you have [with programming] before coming to college?
25. Do you remember when you dropped the whole major [accounting]?
26. Do you remember at what point you dropped the tax accounting course?
27. Were you conscious or unconscious of the fact that you did do a minor in education, or were you just a straight math?
28. Do you remember when you officially declared to be a math teacher?

Appendix C

Student Interviews

Interview #1

- 1) Tell me about yourself.
- 2) How is it that you got to this university?
- 3) Tell me how was early kindergarten. How was elementary school like for you, and high school like for you?
- 4) Were you involved in high school, in clubs or sports?
- 5) Was your high school in a bad neighborhood?
- 6) Do you remember what areas you were struggling with? What areas were hard for you in elementary school?
- 7) Did you have other siblings that were with you at the school?
- 8) What happened when you went to high school? How was the transition, and what did you do?
- 9) Did you think you had the better math teacher or a worse one, compared to what you had before?
- 10) Tell me about high school math. How were your teachers back then? What did you take in high school?
- 11) Do you like math?
- 12) How did your high school teachers teach in the classroom? Did they lecture, or did they make you do things on your own?
- 13) What did you find helpful?
- 14) What do you think made you learn more?

- 15) Do you think that these teachers prepared you enough for college math? In what ways do you think they prepared you?
- 16) Let us talk about mathematical knowledge. Do you think that the material that you are covering in Algebra is a review from what you learned in high school?
- 17) Why do you think you are struggling [now in Math]?
- 18) What do you think about mathematics? What do you think it is? How would you explain it to someone?
- 19) Do you enjoy the mathematics you are learning now?
- 20) What are you planning when you graduate? What are your goals for college?
- 21) Tell me what you think about Karen.
- 22) Do you think Karen is a good teacher?
- 23) What makes her excellent according to you?
- 24) Did Karen do anything to make you comfortable?
- 25) Do you think Karen is very personable with you?
- 26) Do you think Karen is better than your high school teachers?
- 27) Are there any ways that Karen cares for you?
- 28) What are your perceptions and thoughts about her?
- 29) Why did you decide on this university?
- 30) Have you enjoyed your relationships with your graduate advisors?