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TEACHING MATHEMATICS:
THE STORIES OF SIX TEACHERS

by

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Bachelor of Arts, College of St. Catherine, 1978
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A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

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This dissertation, submitted by Kathleen Ann Champion in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Title Teaching Mathematics: The Stories of Six Teachers
Department Teaching and Learning
Degree Doctor of Philosophy

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Signature Kathleen Champion
Date 12-6-84

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ABSTRACT

Mathematics is recognized as an area in which we see significant teacher shortages at both the middle and secondary school level. The purpose of this qualitative study was to identify personality characteristics of six mathematics teachers by interviewing those teachers and having them relate traits they perceived in themselves that helped them teach effectively.

The study's participants were in-service teachers currently practicing in public school settings in North Dakota. Two teachers from the pool of potential participants were chosen for their certification at each of the following grade levels: elementary, secondary, and dual certification in elementary and secondary education. Both of the dually certified teachers were teaching at the secondary level.

The following three themes were developed from analysis of the interviews of six mathematics teachers. Theme one: certain personality characteristics contribute to positive learning environments for students. Theme two: certain teaching methods encourage students to take responsibility for their learning. Theme three: role models, favorite teachers, family, and/or coaches influenced the teachers' decision to make mathematics teaching their career choice. Recruiting efforts to find more mathematics teachers to address shortages would be greatly enhanced by identifying students with an aptitude in mathematics and comparing their personal characteristics with those self-identified by selected mathematics teachers.

CHAPTER I

INTRODUCTION

“When I grow up I want to be a teacher.” How many times have we heard a young child voice this dream? Many children do go on to teach. Every year, colleges and universities across the United States prepare students to become teachers by instilling in them knowledge of subject area, children, assessment strategies, and other aspects of pedagogy (the art of teaching). In spite of all these programs to produce more teachers in our country, we are experiencing shortages of teachers in several subject areas (Darling-Hammond, 1999).

In the summer of 2001, in each state of the United States, directors of teacher licensing in a state’s department of education or licensing board were surveyed to gather data on possible areas of teacher shortages. Thirty-nine states that collect data on state staffing needs responded to the survey (Meyer, 2002). Results are in Table 1.

Table 1. State Reported Teacher Shortages

<i>Category Experiencing Shortage</i>	<i>Number of States (N^a=39)</i>	<i>Mean Level of Need^b</i>
Subject Area Mentions:		
Mathematics	31	3.77
Science	30	3.77
Other Mentions:		
Bilingual	30	3.47
Special Education	35	3.94

^a N = Number of States Responding to Survey

^b A scale of 1 - 4, with 4 = great need; 3 = moderate need; 2 = little need; 1 = no need was used (Meyer, 2002).

Recently, the federal government has become active in addressing the problem of quality of available teachers. Federal legislation entitled “No Child Left Behind” was passed in January of 2001 and is the centerpiece of an agenda by the federal government to address problems in the U. S. educational system. It proposes that our public schools are failing in their mission to educate and that part of the failure of our public schools lies in the quality of the teachers. One recommendation by the Congress attempting to alleviate this alleged problem, is to ensure that teachers are only licensed to teach in their major areas of study (their concentrations). This new legislation is heavily dependent upon the use of tests to measure the success of schools and the quality of teachers.

“No Child Left Behind” may exacerbate instead of alleviate teacher shortages that exist. There are many provisions to this new law, but the one that deals with “highly qualified” teachers may have the most impact on teacher shortages. The federal law demands that “highly qualified” teachers must possess a major in the subject area in which they teach. States have scrambled to articulate how currently licensed teachers who have taught in subject areas in which they hold a minor can demonstrate that they are “highly qualified.” It is up to the individual states to specify the process whereby current teachers can qualify to teach in the areas in which they already teach. North Dakota’s plan to qualify teachers include options such as taking subject area tests, having teachers develop portfolios, or going back to school to complete majors and/or advanced degrees in the subject area (North Dakota Education Standards & Practices Board [ESPB], 2004).

Is there really a shortage of teachers in our country? Educational researchers argue that there is not an overall lack of teachers, but a mismatch between where teachers are needed, mainly urban and rural areas, and where teachers prefer to teach (Darling-Hammond, 1999). Attrition is a dominant factor that can lead to teacher shortages. Thirteen percent (13%) of teachers leave the profession due to retirement annually and roughly one in three newly hired teachers leave the field within the first three years of entering the classroom (Ingersoll, 2003). Darling-Hammond (1999) described the existence of archaic systems for hiring new teachers in overworked personnel departments of various school districts across the country as creating what might be artificial shortages of teachers. Her explanation is that the hiring systems were so inefficient that teachers might apply for open positions, but the available positions would go unfilled because applications were lost. Also there was inefficiency in the scheduling of interviews that resulted in losing viable candidates for the positions.

How can we solve the shortage of teachers in America? How do we prepare teachers to cover high need subject areas and how do we get teachers to locate in high need geographic areas?

Many strategies have been explored in an attempt to respond to these questions. These include: alternative licensure programs, fifth year programs of study in universities or colleges which may be graduate programs or simply licensure programs, a program called Troops to Teachers aimed at retired military personnel, Pathways to Teaching Careers programs, college scholarships, educational loan forgiveness programs, signing bonuses, "minority" recruitment programs, and

mentoring programs (Feistritzer, 1999; Feistritzer, Hill, & Willett, 1998; Clewell & Villegas, 2001; Meyers, 2002).

The alternative licensure programs typically recruit students that already hold a bachelor's degree in a subject area. The student enters an alternative preparation program and completes an internship in a K-12 school setting to earn a teaching certificate. Fifth year graduate programs are similar to the alternative licensure programs because students must possess a bachelor's degree in a subject area to take graduate education courses leading to teacher licensure. Troops to Teachers recruit military men and women to be teachers (Ingersoll, 2003). Pathways Programs have had a measure of success in training teachers to teach in urban areas because they recruit urban paraprofessionals, predominantly with racially diverse backgrounds, to continue their education and remain in the urban area (Clewell & Villegas, 2001). College scholarships, loan forgiveness, and signing bonuses have become many states' most popular responses to teacher shortages. However, these strategies have shown limited effectiveness (Meyer, 2002) and few of them have been designed specifically to target the high need subject areas, such as mathematics teachers.

There are numerous hypotheses as to why there is a national teacher shortage in mathematics. A combination of increased student enrollment in middle schools and secondary level schools and increased teacher retirement is one possibility (Hussar, 2003). Overall shortages in mathematics teachers are exacerbated because college students with mathematical ability often choose fields for careers like engineering that offer better salaries than teaching (Ingersoll, 2003). For example, the accounting, actuarial, and real estate fields are all examples of areas of business that require

knowledge of mathematics and typically attract students with mathematical abilities and potential.

A challenge we face is how to recruit talented individuals to the field of mathematics education. By exploring the characteristics of mathematics teachers, we may be able to better understand what type of individual is inclined to become a mathematics teacher. For example, knowledge of mathematics and comfort with mathematics subject matter are two possible factors that might identify a person as having characteristics necessary to be a successful teacher of mathematics. Obviously, mathematics teachers should be comfortable with their computational ability. It is also imperative for teachers, no matter what subject they teach, to like their students and truly be interested in teaching them (Davis & Bloom, 1998).

One group of potential teachers that exhibits characteristics of both “knowledge of mathematics” and “a desire to teach” is pre-service elementary teachers pursuing a minor in mathematics (Capraro, R., Capraro, M., Parker, Kulm, & Raulerson, 2002). Elementary teachers are not listed as a shortage area nationwide (Meyer, 2002). Perhaps pre-service elementary teachers, pursuing a mathematics minor, could be recruited to be secondary mathematics teachers. They would need to complete a mathematics major to meet “No Child Left Behind” guidelines. Recruiting pre-service elementary teachers may be one way to alleviate mathematics teacher shortages.

Purpose of the Study

The purpose of this qualitative study was to identify personality characteristics of successful mathematics teachers by interviewing those teachers and having them

relate traits they perceived in themselves that helped them teach effectively. By studying selected teachers who are currently mathematics teachers, a list was generated of common characteristics present in selected mathematics teachers that one could use to identify potential mathematics teachers.

In this study, six in-service mathematics teachers, four at secondary grade levels and two at elementary grade levels, were interviewed and asked the following core questions. Depending upon the participants' responses, other questions sometimes followed the core questions.

1. When and why did you decide to become a teacher?
2. What personality characteristics do you possess that you feel help you to teach?
3. How would you describe elementary, middle school, and high school students?
4. What satisfaction do you get from teaching and do you see yourself teaching five years from now?

Results of this study identified common characteristics of practicing mathematics teachers. This information could be used to identify similar characteristics in college students, especially students showing a potential interest in mathematics or teaching, such as pre-service elementary teachers, students in upper level mathematics courses, and any other students showing an aptitude in mathematics, science or teaching but as yet undecided in their career direction.

Need for the Study

Concern over shortages of mathematics teachers, on the part of educators who

prepare pre-service teachers to teach and who wish to increase the number of mathematics education candidates, is warranted. Alleviating the shortage of secondary mathematics educators is widely considered a matter of high importance in the education field. This study, by adding to a body of research, may illuminate the possibility that a pool of pre-service elementary teachers or other college students showing interest in mathematics, and who possess an aptitude for mathematics, might be persuaded to consider secondary mathematics as a teaching field.

Delimitations

1. This study was exploratory like many qualitative studies, so the study's results will not be able to be statistically generalized to a population.
2. This qualitative study focused on teachers of a predominantly rural state in the upper Midwest.

Assumptions

The study was based on the following assumptions:

1. It was assumed the teachers responded honestly during the interview.
2. It was assumed that the selected teachers were not necessarily representative of the entire teacher population in the state.

Definitions

Characteristics: For this study, characteristics is defined as “a distinguishing trait, quality, or property” (Merriam-Webster [dictionary], 2004).

Class A schools: At the time of this study, Class A schools were described as having 325 students or over enrolled in grades 9-12 (North Dakota High School Activity Association [NDHSAA], 2004, p.6). The communities

where the Class A schools were situated had populations ranging from approximately fifty thousand to a hundred thousand.

Class B schools: At the time of this study, Class B schools were described as having less than 325 students enrolled in grades 9-12 (North Dakota High School Activity Association [NDHSAA], 2004, p.6).

Communities in which the Class B schools were situated were rural small towns with populations ranging from three hundred to twelve hundred people.

No Child Left Behind Act of 2001 (NCLB): is a law passed in January of 2001 by the 107th Congress of the United States. The law is part two of the original law titled Elementary and Secondary Education Act (ESEA) passed in 1965. The law's purpose is "to close the achievement gap with accountability, flexibility, and choice, so that no child is left behind" (No Child Left Behind Act of 2001, 2002, p.1).

Rural or Urban: Whether a school is rural or urban depends on why one needs term defined. The following quote explains the options.

There are at least three major classification systems used by Federal agencies to classify the urbanicity [or rural] of particular geographic or governmental units. The choice of which classification system to use is often determined by the desired outcome or the level of geographic aggregation that is required (U.S. Department of Education, 2004, p.1)

In the 1990's, one definition of "rural" for the purposes of the U.S. Department of Education was defined as areas with population centers under 2,500 (Claycomb, Louie, Bogden, & Kysillko, 1996).

Organization of the Paper

This study examined six teachers' self-reported common characteristics. In chapter I, an introduction to the study and rationale was provided. The guiding questions for the interviews were presented along with delimitations and assumptions. A review of the literature providing the background for the need for the study is presented in Chapter II. Methods for the study are described in Chapter III and the results are reported in Chapter IV. Interpretation of the results and recommendations for future study are discussed in Chapter V.

CHAPTER II

LITERATURE REVIEW

Despite a range of recruitment strategies, research shows that there continues to be a need for teachers in many subject areas, including mathematics. The purpose of this study was to identify personality characteristics of successful mathematics teachers by interviewing those teachers and having them relate traits they perceived in themselves that helped them teach effectively. Learning more about characteristics unique to currently practicing mathematics teachers may help us develop better systems for recruiting and retaining mathematics teachers in the field in the future.

According to Bragg (1998), elementary school enrollments have been rising dramatically and two million new teachers will need to be hired within the next ten years. The National Education Association reiterates that the United States will need more than two million new teachers in the next decade because of rapidly rising enrollments and that more than a million veteran teachers in the United States are nearing retirement (National Education Association [NEA], 2004). Feistritzer (1998) argues that the term, “new teacher,” does not mean teachers who have never taught before. Out of the 139,000 teachers newly hired in public schools in 1993-1994, thirty-four percent were actually former teachers coming back into the profession. The National Education Association reported that the nation hired approximately 45,000 newly trained teachers in the academic year of 1995-1996. Feistritzer (1998)

states, "That is a far cry from the 200,000 the 'crisis in teaching' proponents would have you believe we are facing" (p. 1).

What does it mean to have a shortage of teachers? Why are there teacher shortages? There are several perspectives on the issue.

Why Are There Teacher Shortages?

Problems In Distribution

Some researchers suggested that there is not actually a shortage in the numbers of currently practicing teachers; it is simply that the teachers may not be located in areas where they are needed. One prominent researcher in the field of teacher education, Linda Darling-Hammond, looked at the shortages of teachers experienced by schools on a nationwide basis and addressed the issue of supply and demand:

We do not actually have an overall teaching shortage in the country. We have a big distribution problem of teachers. We have states that have surpluses of teachers. And, we have states that have shortages of teachers. But we also have a hodge-podge of licensing requirements across the states that make it hard to get teachers from the places where they train to the places where they're needed. So part of your issue is not just production, but it's also distribution . . . (Darling-Hammond, 1999, p. 2).

Both rural and urban areas in the United States face teacher shortages. While there may be some common reasons for the shortages, there are also reasons unique to each situation.

Rural

Rural districts and schools have faced problems with geographic, social and professional isolation; small size; and lack of resources for the last century (Claycomb, Louie, Bogden, & Kysillko, 1996). In addition, the literature suggests that rural

administrators have difficulty finding qualified teachers that will stay with the job and that fit into rural schools. In Alaska, the teacher shortage is aggravated by the state's early-retirement incentive program, low salary levels, and procedural difficulties with certification (Collins, 1999). The specific areas of shortage may be as varied as the reasons why teachers leave. For example, Oklahoma's supply and demand study of 1998 showed that the greatest need for teachers in rural districts, which account for two-thirds of Oklahoma's school districts and one-fifth of the educators, is in the area of early childhood and elementary education teachers (Collins, 1999). In North Dakota, the teacher licensing agency lists all teaching areas as critical shortage areas except social studies, physical education, and elementary education teachers (Education Standards and Practice Board [ESPB], 2001).

Urban

Many urban schools, sometimes called inner-city schools, face persistent problems of low student achievement and high staff turnover (Williamson, 2000). Schools in urban areas serving economically disadvantaged and minority students experience difficulties in attracting and retaining teachers. Many teachers leave urban schools to teach in suburban schools for higher salaries. Hanushek, Kain, and Rivkin (2001) studied data on Texas public elementary schools to gain an understanding of the effects of salary and other school factors on teacher transitions. Results indicated that teacher mobility was more strongly related to the race and achievement of students than to salary. Non-black/non-hispanic teachers systematically prefer to teach non-black/non-hispanic students while the opposite is true for the minority teachers (Hanushek, Kain, & Rivkin, 2001).

Teacher Attrition and Retention

According to Bragg (1998), the United States Department of Education predicted that forty percent of current public school teachers would retire or leave the profession by the 2003-2004 school year. In the last two decades, researchers have focused on determining what kinds of teachers are more prone to leave teaching and why. The research showed teacher turnover is strongly correlated with individual demographic characteristics of the teachers. One of the most important findings has been that teacher turnover is strongly affected by academic field. Special education, mathematics, and science were found to be the fields of highest turnover (Ingersoll, 2001).

Violence may be a factor in teachers leaving the field of education. According to a 1991 survey conducted by the National Center for Education Statistics (NCES), violence towards teachers is slightly more prevalent in urban schools, however it exists to some degree in all schools. In the NCES survey, 99% of teachers responding indicated they felt safe or moderately safe in their school building during normal school hours. Both urban and rural teachers were surveyed, as were elementary, middle school, and secondary education teachers. This does not mean teachers are immune from verbal or physical abuse from students. The survey found that half of all teachers responding had been verbally abused and seven percent had been physically attacked (Stevens, 1993).

According to McCreight (2000), "Teacher attrition is the largest single factor determining demand for additional teachers in the U.S." (p. 4). Also, when approximating how many newly hired teachers leave their field within the first three

years of entering the classroom, researchers give similar estimates; Ingersoll (2003) states twenty-nine percent; Darling-Hammond (2003) states thirty percent.

Turnover is not equally spread over the teaching force. Beginning teachers have very high rates of departure. The departure rates significantly decline through the mid-career period. For example, after five years the cumulative attrition rate is thirty-nine percent. The attrition rate had slowed from approximately ten percent a year for beginning teachers to five percent a year. After five years, teacher-exodus rates started to level off (Ingersoll, 2003).

Ingersoll argued that large numbers of teachers leave teaching for reasons such as job dissatisfaction or to pursue other careers. Teacher turnover is a large phenomenon. Ingersoll's (2003) study showed that with a turnover rate of 14.3% in 1994-1995 over 417,000 teachers from a force of about three million departed their teaching jobs. Total teacher turnover was about evenly split between migration (movers) and attrition (those who left the profession) (Ingersoll, 2003).

Ingersoll pointed out that research on teacher supply and demand has often addressed only teacher attrition and neglected teacher migration. However, teacher attrition and migration had the same effect because they result in a decrease in staff that must be replaced. School staffing cutbacks (20.4%) accounted for a larger proportion of total turnover in teachers than does retirement (12.9%). School staffing cutbacks more often resulted in migration to other teaching jobs. Personal reasons for departures such as for child rearing, health problems, and family moves (40%) were more prevalent as reasons for turnover than are either retirements or staffing cutbacks. Pursuing other jobs (26.8%) was another source of turnover. The last source of

turnover was job dissatisfaction (29%). When job dissatisfaction was broken down, in to the top three reasons for leaving, half of those dissatisfied indicated poor salary and the other half indicated poor administrative support. Several factors that were not serious enough to lead to much turnover were large class sizes, intrusions on classroom time, lack of planning time, and lack of professional advancement (Ingersoll, 2003).

Salaries are often associated with retention issues in education. "Average nationwide annual secondary teacher salaries in 2003 (\$46,000) [were comparably lower than other professional fields like] registered nurses (\$51,000), computer programmers (\$65,000), and actuaries (\$85,000)" (Bureau of Labor Statistics, 2003).

Approximately one-third of the 105,000 college students graduating certified to teach in 1998 didn't go into teaching due to low pay. Salaries start at a national average of \$26,000, which is considerably below the starting pay for college graduates in other fields. Teachers with higher salaries stay in education longer than those with lower salaries (Darling-Hammond, 2003, p.8).

Mathematics Teacher Shortages

Ingersoll wrote that mathematics teachers leave the profession for many of the same reasons that other teachers leave the field, but they leave at a greater rate. Table 2 compares rates of departure for all teachers leaving their jobs versus rates of departure for mathematics teachers leaving their jobs. Note that mathematics teachers were significantly more likely to leave their jobs as a result of job dissatisfaction than teachers in general. Mathematics teachers were slightly more likely to leave their jobs to pursue other jobs than were teachers in general.

Table 2. Attrition Rates – Mathematics Teachers Versus All Types of Teachers

<i>Reason for Leaving Job</i>	<i>Attrition Rates Nationwide</i>	
	<i>All Teachers</i>	<i>Mathematics Teachers</i>
Job Dissatisfaction	29.0%	40.0%
Pursue Another Job	26.8%	27.8%
Retirement	12.9%	11.4%
Staff Cutbacks	20.4%	20.2%
Personal (Child Rearing, Health, Family Moves)	40.0%	37.5%

(Ingersoll, 2003)

Mathematics teachers listed the same top three reasons for job dissatisfaction in the same order of priority as teachers in general: poor salary, poor administrative support, and student discipline problems. Also, mathematics teachers gave poor student motivation as a reason for job dissatisfaction more often than teachers overall (Ingersoll, 2003).

A History of Teacher Shortages

Despite a variety of recruitment strategies to meet teacher shortages, there continue to be shortages in many areas, including mathematics. As described in Chapter I, in the United States, directors of teacher licensing in each state were surveyed in the summer of 2001 to gather data on the areas of teacher shortages. On a scale of 1-4, with 4 = great need; 3 = moderate need; 2 = little need; 1 = no need; thirty-one states reported a mean level of need of 3.77 for mathematics and 3.47 for English as a second language (ESL). Thirty five states mentioned special education with a 3.94 mean level of need (Meyer, 2002). The mathematics teacher shortage is not simply a reflection of federal legislation, but has a history that goes back more than fifty years. A review of the roots of this history may help us better understand

the current situation and provide insights into how to meet the increasing demand for teachers.

With the launch of the Russian satellite Sputnik in 1954, the United States government infused money into public education to increase the study of science and mathematics so that the United States could compete in the space race. In the 1970s, the Teacher Corps and NDSL (National Defense Student Loans) offered incentives to people who would go into teaching. This resulted in an increase in the number of science and mathematics teachers until 1981 when the programs were dropped and not replaced (Darling-Hammond, 1999). In the mid-1980s, the growth of a whole new industry based on computers gave mathematics teachers new computer courses to teach and a new career field to enter with better pay. In the 1990s, college students with an aptitude for mathematics could choose the engineering fields or the "dot com" computer field, both with substantially better pay than the teaching field (Darling-Hammond, 1999). Between 1994 and 1999, the number of workers employed in mathematical sciences and computer sciences grew by a margin of 56% while total employment increased by 8.5% (Shaul, 2001).

In 1994, schools were beginning to have difficulty filling teaching positions in mathematics with about 20% of all schools reporting having trouble filling mathematics vacancies (Darling-Hammond, 1999). Haycock (2002) reported that the number of bachelor's degrees given in mathematics every year dropped by more than 50%, from 24,937 in 1970-1971 to 12,070 in 1999-2000. In fact, it was projected that if all the mathematics graduates in 2002 became teachers of mathematics; we would still not meet the critical shortage of teachers in this subject area (Haycock, 2002).

Strategies to Relieve Teacher Shortages

Many strategies have been explored in attempts to relieve teacher shortages. These include the Pathways to Teaching Careers programs, alternative certification programs such as Troops to Teachers, and state incentives. Some of these attempts to relieve teacher shortages have targeted specific shortage areas. For example, Troops to Teachers targets low income populations, and gives priority to placing former military personnel with backgrounds in mathematics, science, special education, and vocational areas in teaching positions. Pathways to Teaching Careers programs have been most successful in providing teachers for urban shortage areas, though the program's target areas are both urban and rural areas. Though both of these programs have had a degree of success in relieving teacher shortages, their successes do not totally alleviate the need to develop further programs and incentives for recruiting new teacher candidates.

Pathways to Teaching Careers

Pathways to Teaching Careers programs have had a measure of success, since their inception in 1989. The purpose of the Pathways program was to enlarge and diversify the pool of well-prepared public school teachers in difficult-to-staff urban and rural areas. A secondary purpose was to build strategies to prepare and certify teachers from non-traditional backgrounds. The Dewitt Wallace-Reader's Digest Fund supplied the funding for the Pathways programs by providing fifty million dollars towards the initiative. By the end of the 2000 academic year, Pathways programs had recruited 2,593 participants. In 1999, the Pathways programs operated out of 42 sites across the U.S. The rate of completion for participants in Pathways

programs was higher than the national rate of completion for students in traditional pre-service programs (75% versus 60 %). An average of 84% of Pathways graduates taught in rural or urban settings versus 39% of traditionally trained teachers (Clewell & Villegas, 2001).

The Pathways programs worked with colleges to develop effective strategies for recruiting and preparing teachers to complete all requirements for teacher certification. The Pathway program had four strands, each recruiting from a different portion of the population. The four strands were: 1) a precollege strand; 2) an undergraduate strand; 3) a Peace Corps Fellows strand; and 4) a strand that targeted paraprofessionals (who provided classroom support to teachers), non-certified teachers, and emergency certified teachers (currently teaching on a temporary certification basis or as substitute teachers) (Clewell & Villegas, 2001).

The precollege strand targeted middle school and high school students in an effort to encourage the students to develop an interest in teaching careers. One project in this strand was funded at a university that collaborated with a public school system. This effort involved: recruiting African American students from middle schools and high schools into the programs, establishing a formal eighth grade course to expose students in up to 30 middle schools to professional careers in teaching, establishing an elective teacher preparation course at the 12th grade level in 20 schools, and establishing a magnet school to draw students from a wide area with its specialized curriculum focus of teaching (Clewell & Villegas, 2001).

Barnard College worked with a group of 16 private liberal arts colleges in the Northeastern United States with teacher education programs to develop an

undergraduate strand for recruiting teachers. The program aimed to recruit undergraduates from the participating colleges and to interest them in teaching in urban middle schools. Barnard College provided program participants with supervised field placements in New York City middle schools; offered them an intensive four-week summer program in New York as well as seminars in New York on teaching students at the middle level; implemented follow-up activities at individual college sites and in New York City; and linked program participants, middle school students, and teachers via a telecommunications network (Clewell & Villegas, 2001).

A Peace Corps Fellows strand included 14 projects, all of which were coordinated by the Peace Corps Fellows/USA Program. The goal of this strand was to identify and support potential teacher candidates from among returning Peace Corps volunteers. "The projects placed selected Fellows in full-time salaried positions in urban and rural school districts, and provided a two-year graduate level program leading to teaching certification and a master's degree" (Clewell & Villegas, 2001, p. 7).

The fourth strand that focused on paraprofessionals, non-certified teachers, and emergency-certified teachers was the most comprehensive of the four. It recruited paraprofessionals and emergency-certified teachers presently working in public schools by offering them scholarships and support services to obtain bachelors degrees and/or to meet other requirements for certification. A follow-up survey administered to Pathways graduates showed 81% had remained in teaching for at least three years after completing the program compared to the national three year retention rate of 70%

for newly prepared teachers graduating from traditional programs (Clewell & Villegas, 2001).

Alternative Certification Programs

Alternative certification program participants take a different path to be licensed to teach than their counterparts trained through traditional college or university programs. These trainees already possess at least a bachelor's degree and have histories of successful employment in other non-teaching fields (Feistritzer, 1998). Frequently these trainees serve an internship for a year under close supervision but they are solely responsible for teaching their students.

Troops to Teachers

Since 1994, the Troops to Teachers program has recruited military men and women to be teachers (Ingersoll, 2003). Troops to Teachers is an example of a state alternative certification program, which was initially administered by the Department of Defense in conjunction with state education offices (Shaul, 2001). In 2001, the program was transferred from the Department of Defense to the U.S. Department of Education. Troops to Teachers helps former military personnel become certified teachers and employees of school districts servicing low-income populations. Funding for the Troops to Teachers program has increased every year since its inception with the 2003 fiscal year budget of close to \$29 million (U.S. Department of Education, 2004).

Military personnel who wish to receive the program's assistance for placement must have a baccalaureate or advanced degree. Priority for participation in the program is given to those military personnel with educational or military experience in

mathematics, science, special education, or vocational/technical subject areas and who agree to seek a teaching position in a subject area in which they already have background. In 2003, the Troops to Teachers target number of enrollees for participants earning teacher certification in the high need areas of mathematics, science, and special education was 999 participants. In 2004, Troops to Teachers planned to increase their 2003 target of enrollees by 25% (U.S. Department of Education, 2004).

Thirteen thousand seven hundred and fifty-six (13,756) former military personnel were accepted into the Troops to Teachers program between the years 1994 and 2000. During those years, 3,821 graduates of the Troops to Teachers program were hired as teachers in the United States. Nationwide, a higher percentage of Troops to Teachers graduates taught classes in mathematics, science and special education classes than the percentage of graduates from traditional programs teaching such classes; and, a higher proportion of Troops to Teachers graduates taught in inner-city schools than the proportion of graduates from traditional training programs. Sixteen states were participating in Troops to Teachers by 1995 and eight more had joined by the year 2000. Many of the states were in the eastern United States with the exception of Texas, California and Washington (Feistritzer, Hill, & Willett, 1998).

A Texas study researched the attrition rates of teachers prepared in alternative certification programs and modified university programs compared to those prepared in traditional teacher preparation programs. For the Texas alternative certification program, which began in 1984, participants already possess a bachelor's degree and they receive intensive professional training during a year long paid internship serving

as a classroom teacher. Texas began another program called Centers for Professional Development of Teachers (CPDT) in the early 1990s. CPDT's involved university programs that reformed the field experience component of teacher field preparation and ended with the development of a professional development school. Research that compared the two Texas programs to teachers trained in traditional programs was carried out for five years and ended in the year 2000. The study showed that alternatively certified program teachers meet the short term goal of providing teachers who enter the classroom after training, but those teachers do not remain in the classroom as long as their peers trained using CPDT and traditional teacher preparation programs (Harris, 2003).

State Incentives Programs

Are state incentive programs for recruiting teachers effective in reducing shortages? In 2001, data indicated that state spending on incentives for recruiting teachers had jumped to almost \$217,000 up from \$100,000 offered in 1999. State incentives programs mostly involve college scholarships, forgiveness of undergraduate loans and/or signing bonuses (one-time monetary rewards for signing a teacher contract for a hard to fill position). Little research has been done on the effectiveness of these incentive programs.

The study [conducted by the National School Board Association] found a consistent disconnect between the shortage areas states have identified and the incentive programs they have adopted. For example, thirty-five states say they have a shortage of special education teachers, yet only four have programs aimed to steering teachers into that field (Meyer, 2002, p. 1).

College Scholarships

College scholarships are rewarded to undergraduate and graduate students who fill out applications to a particular funding source and who meet the criteria to qualify for funding. Scholarships can be either privately funded or funded by the government. In the case of state incentive programs, scholarships are funded by the states. Scholarships differ from loans in that the student does not have to pay the funds back. Scholarship funds can cover tuition, books, and living expenses such as room and board depending on how the scholarship is set up (Meyer, 2002).

States who wish to recruit teachers in a certain field or for a certain area can set up a scholarship program as a state paid incentive (American Federation of Teachers [for all the U.S. states], 2004). The state would supply funding for a person to become qualified as a teacher in a certain field (for example, a high need area such as mathematics) or if the person receiving the scholarship would agree to teach in a certain location for a specified period of time after graduating.

Forgiveness of Undergraduate Loans

When students do not have the funds to pay for their education they can either qualify to receive a scholarship as was discussed before or they can borrow the money in the form of a loan from a federal, state, or private source. Sometimes lending organizations such as the military, the Federal government, and certain states may forgive all or part of an educational loan in return for a teacher agreeing to teach in a high need area. Some loan forgiveness programs, both at the federal and state level, forgive a percentage of the loan depending on the years of teaching service. Each state can tailor its own loan forgiveness program to its own specific needs. For

example, a Mississippi State program forgives one year of an educational loan in exchange for one year of teaching service. It forgives two years of a student's loan if they teach in a shortage area.

North Dakota's plan seeks to reduce a student's loan indebtedness for individuals teaching in North Dakota at grade levels and/or in subject areas identified by the Department of Public Instruction as having a teacher shortage. The North Dakota University System Office notifies all funded recipients by July 30th. "Funding recipients are eligible to receive up to \$1000 per year in continued loan forgiveness for each consecutive year they teach in a teacher shortage area, up to a maximum of 3 years or \$3,000" (North Dakota University System, 2004, p.1).

Signing Bonuses

Signing bonuses are amounts of money offered to certain job candidates to convince them to accept a position. States or districts that wish to offer signing bonuses can offer signing bonuses of any amount that the state or district chooses and for teaching positions in subject shortage areas and/or geographical shortage areas.

In 1998, Massachusetts garnered national attention for instituting a \$20,000 signing bonus. The unprecedented size of the signing bonus put Massachusetts on the map as a state taking bold action to address concerns about teacher quality and expected teacher shortage (Liu, Johnson, & Peske, 2003, p.1).

The findings of Liu, et al. (2003), suggested that the Massachusetts signing bonus did not have the effect on teaching shortages the state legislature assumed it would. The extra \$20,000 had been expected to attract people into teaching. All but one of thirteen students interviewed, who received the signing bonus, had considered teaching prior to receiving it. The interviewed recipients said they responded to the

program's accelerated route to certification, which provided quick access to a paid teaching position. Finally, although the signing bonus was paid out over four years to encourage retention, the bonus payments played virtually no role in teachers' decisions about whether to stay in public school teaching or in Massachusetts. In fact, eight of the thirteen bonus recipients had already left public school teaching within four years (Lui, et al., 2003).

Teacher salaries may also impact teacher shortages in both rural and urban United States (Darling-Hammond, 1999). In the United States, salary differentials often pit one state against another. Two states, Kentucky and Connecticut have equalized salaries statewide to lessen regional differences (Collins, 1999).

Potential Impact of "No Child Left Behind" Legislation

The federal government passed legislation in January 2001 titled, "No Child Left Behind." The rationale for the passage of this legislation was and is: to ensure that all children have a fair, equal, and significant opportunity to obtain a high quality education, and reach at a minimum, proficiency on challenging state academic achievement standards and state assessments (No Child Left Behind Act of 2001, 2002). No one can argue that the goal of the law is well intended and that no child left behind is something that all of us in education wish to achieve. However, the methods for implementing the law have resulted in controversy and frustration on the part of educators.

The new law has several provisions. A substantial provision uses standardized assessments to measure the success of schools and the quality of teachers. This may have a large impact on areas of teacher shortages. The "No Child Left Behind" law

mandates that penalties be given to those schools that fail to have their students make adequate yearly progress on tests, that measure student achievement in mathematics and reading. Students will be tested in science in 2006. The law mandates testing every year for students in grades 3-8 and once in grades 10-12. Schools on the failing list for two consecutive years must use twenty five percent of their Federal title money for teacher improvement programs, (No Child Left Behind Act of 2001, 2002). This reallocation of Federal title money might create a hardship for schools that utilize the money for other necessary things such as salaries of teachers, class size reduction, and for reading and/or mathematics tutoring for special education students.

A second major provision in the law that deals with “highly qualified” teachers may have a serious impact on areas of teacher shortages. Schools must provide “highly qualified” teachers in every classroom. The “No Child Left Behind” law does not define what is meant by a “highly qualified” teacher. It leaves that for the states to determine for themselves. The law does make reference to a “highly qualified” teacher as any one who has a degree in the subject area in which they teach. The law allows for the states to determine what is meant by a degree and to submit a plan to the Department of Education outlining how a degree can be obtained in that state.

Thirty eight states required teachers to have a major in their particular subject area before passage of the “No Child Left Behind” law went into effect. For those states, the issue of whether or not teachers need a major in their area of concentration to meet the definition of “highly qualified” was a mute point (Wise, 2002). The other twelve states have instituted plans to require newly certified teachers to have a major in their subject area beginning in 2006. The twelve states have also delineated how

previously certified teachers can meet their state's definition of a "highly qualified" teacher (North Dakota Education Standards & Practices Board, 2004).

Several researchers have studied the link between achievement levels of students and whether or not their teachers are adequately prepared to teach the subject area they are teaching. One of the correlations that researchers investigated was whether or not in-service teachers had a major in the subject area they were teaching. According to Ingersoll (2001), inner-city students who had low scores in mathematics tests frequently were taught by teachers who had a minor in mathematics or no college mathematics courses at all.

Other support for the link between achievement levels of students and whether or not their teachers are adequately prepared to teach the subject area is provided by Greenberg, Rhodes, Ye, and Stancavage (2004). Greenberg et al., used data from mathematics scores of the 2000 National Assessment of Educational Progress (NAEP) taken by eight graders and focused on differences in teacher qualifications, both their certification and their college or graduate school major. Among the questions the researcher asked was whether mathematics achievement of at-risk students was related to the qualifications of their teachers. When high poverty students and students in low-ability classes were taught by teachers who were fully certified and who had a mathematics major or a mathematics education major, their scores on the eighth grade NAEP mathematics test were generally higher than students taught by teachers lacking those attributes (Greenberg et al., 2004).

In the predominately rural state of North Dakota, the state board of teacher licensing (ESPB) created major equivalency teacher requirements to meet the law.

These “major equivalency requirements” have been approved by the U.S. Department of Education. The state’s definition of a “highly qualified” secondary education teacher for grades seven through twelve, beginning in July 1, 2006, includes several different options. The first option applies to newly certified secondary teachers in core academic areas. To be considered “highly qualified,” secondary teachers must hold a major or major equivalency in their core subject areas and complete a subject area test in the initial licensure area. For currently practicing (not new) secondary teachers, to be considered “highly qualified,” secondary teachers must hold a major or major equivalency in the core area in which they are teaching. Currently practicing teachers who do not have a major must demonstrate a major equivalency in their subject area through one of the following options: a) undergraduate and/or graduate coursework equivalent to a major; b) a minor or a minor equivalency in the area with successful completion of a subject area test; c) existing state licensure with a minimum of three years of successful teaching experience in the subject area, and successful completion of a portfolio (until June 30, 2006); d) existing state licensure in the subject area with a minimum of one year of successful teaching experience in the subject area, and successful completion of a subject area based competency test; or e) national board for professional teaching standards certification in the major area (North Dakota Education Standards & Practices Board, 2004).

Some practicing secondary teachers in North Dakota believe that the new requirements of the “No Child Left Behind” law, as determined by the Education Standards and Practice Board, make it more difficult to stay within the teaching profession. They point out that there are teacher shortages throughout the state and

they ask why the state has chosen to create standards that cause such a large number of currently practicing teachers to fail to meet the requirements (W. Sigette, personal communication, July 27, 2004).

Teacher Characteristics as Defined by the Literature

As a result of preexisting teacher shortages and new federal provisions, we are still not achieving our goals of providing a sufficient number of educators in some geographical areas of our country and in some subject areas. Current strategies for resolving the shortage of mathematics teachers have not totally solved the problem. Perhaps we need to develop different methods for recruiting mathematics teachers. A better understanding of characteristics unique to mathematics teachers may help us develop better systems for recruiting and retaining mathematics teachers in the field.

Much of the literature regarding teacher perceptions and characteristics is not specific in regards to any subject area. Therefore, a number of studies that explore teacher characteristics in general will be reviewed.

Schutz (2001) conducted a study focusing on the goal of becoming a teacher. The desire to become a teacher has come to be referred to as a life task goal. Goals are defined in Schutz's study as representations of what one would like to have happen. Goals provide direction for thoughts, behavior, and strategies. The researcher's objective in this study was to understand, from the students' perspectives, how the student came to realize that they wanted to become a teacher. The main question investigated in the study were what factors influenced goals as they emerged and were defined (Schutz, 2001).

In Schutz's (2001) study, forty-nine students were given a questionnaire asking, "When did you decide you wanted to become a teacher?" The survey yielded four categories of responses: 1) They decided to become a teacher during elementary school or said they always wanted to become a teacher; 2) They decided, during high school; 3) They decided, during college; or 4) They were making a career change. Of the forty-nine students originally given the questionnaire, eight were randomly chosen to participate in additional interviews (Schutz, 2001).

The results from interviews of the eight students revealed four sources that influenced students in their decision to become a teacher. These sources included: 1) family, 2) teachers, 3) peers, and 4) teaching experiences. These sources influenced students in their decisions by providing encouragement, modeling, suggestions or exposure to teaching situations. Teaching-type experiences, in particular, often provided the critical incident or turning point in a person's decision or goal to become a teacher (Schutz, 2001).

Another study (Minor, Onwegbuzie, Witcher, & James, 2001) examined trends in educational beliefs of teacher candidates over the time frame of one semester. Eighty-four candidates for teaching degrees at a Georgia university were administered the Witcher-Travers Survey of Educational Beliefs (WTSEB). The WTSEB scores indicate transmissivism, progressivism, or eclectic philosophy. The teaching philosophy of transmissivism means the teacher sees their role as a transmitter of knowledge. Progressivism means the teacher sees their role as a facilitator to help the students learn for themselves. The eclectic philosophy is a combination of transmissivism and progressivism. An interesting outcome of this research was the

identification of the characteristics of effective teachers by asking participants to identify three to six characteristics that they believed effective teachers possess (Minor, et al., 2001).

Minor, et al. (2001) found the following seven themes to represent characteristics that many of the teacher candidates considered to reflect effective teaching: student-centered (55.2 %), competent instructor (39.3%), effective classroom and behavior manager (36.9%), enthusiastic about teaching (26.2%), ethical (29.9%), knowledgeable about subject area (16.7%), and professional (13.1%) (Minor, et al., 2001, p. 7).

Aagaard and Skidmore (2002) conducted a similar study that used the same six themes of teacher effectiveness as those identified in the Minor study. The study quoted from 448 half page descriptions of pre-service candidates' best and worst teachers from elementary and high school. The results indicated the most prevalent theme in the descriptions of good teachers was student-centeredness followed by teaching methodology (Aagaard & Skidmore, 2002). Aagaard and Skidmore's study, like Minor's, used pre-service candidates' descriptions. Additionally, Aagaard and Skidmore's study uses descriptions of the best and worst teachers.

Personality has been researched as having an impact on the effectiveness of teachers. Gabrielatos' (2002) study is not specific to mathematics teachers and instead studies language teachers in Greece, however it does deal with personality. For example, Gabrielatos (2002) lists the following factors as contributing to personality: self-awareness; interpersonal skills; ability to observe, think critically and use experience; sensitivity to context; attitude towards change, development, diversity,

quality, cooperation and authority; and, perception of learning, teacher/learner roles and professional development.

Research conducted in Texas focused on 1) personality type as a predictor of teaching efficiency, and on 2) beliefs on how to maintain control in a classroom. The research studied teachers that were certified through emergency certification programs. The one hundred and twenty teachers participating in the study were in their first year of teaching, held at least a bachelors degree and were pursuing teacher certification. Participants took the Myers-Briggs Type Indicator (an inventory to measure personality), the Attitudes and Beliefs on Classroom Control Inventory, and the Hoy and Woolfolk (1993) Revised Teacher Efficacy Scale. The results indicated that there was a small relationship between those teachers with extraverted personalities and their belief in their efficacy of classroom management (Henson & Chambers, 2002).

Summary

To summarize, though some researchers have argued that a nationwide teacher shortage does not exist in all curricular areas, they do not dispute that some areas of the country are experiencing a shortage of mathematics teachers. Numerous states have devoted funds into various programs in an attempt to alleviate these shortages. Programs to alleviate shortages have shown limited effectiveness for a variety of reasons. By identifying characteristics of practicing mathematics teachers one may be able to identify characteristics in potential teachers that indicate those persons would be successful in teaching mathematics. Such knowledge could be used to affect pre-

service teachers, mathematics majors, or other college students showing pre-dispositions towards mathematics and teaching to choose to teach mathematics.

CHAPTER III

METHODOLOGY

Qualitative Procedures and Methodology

The purpose of this qualitative study was to identify personality characteristics of successful mathematics teachers by interviewing those teachers and having them relate traits they perceived in themselves that helped them teach effectively.

Elementary teachers were included in the study: 1) to compare characteristics of elementary and secondary grade level teachers and identify any similarities or differences in their dispositions; and 2) to gain a better understanding of elementary mathematics teachers and so formulate an effective appeal to pre-service elementary education teachers when recruiting them to be secondary mathematics teachers.

Using qualitative methods, six mathematics teachers were interviewed with the following objectives in mind:

1. to determine key personality characteristics of participants in this study as perceived by those participants,
2. to document education of participants, and
3. to determine how participants perceived/viewed their students.

Research Design

There are two types of research: qualitative and quantitative. Educational and

social science researchers increasingly have directed their attention towards qualitative research.

In 1987, editors of the American Educational Research Journal announced that particular emphasis in qualitative methodology would become more evident in future manuscripts and in future issues of the journal. Shortly thereafter, a plethora of books, articles and presentations on the trustworthiness of the qualitative paradigm materialized. All behavioral research is made up of a combination of qualitative and quantitative constructs. A conceptualization of the dichotomy (using separate and distinct categories of qualitative and quantitative research) is not consistent with a coherent philosophy of science and, further, the notion of a continuum is the only construct that fits what we know [of behavior] in a scientific sense (Newman, 1998, p. 99).

Creswell (1997) defines qualitative research as follows:

Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting (p.142).

Research Setting

The participants for this study were in-service teachers drawn from schools in North Dakota. Three of the schools had large enrollments and were classified as Class A schools. The communities in which the schools were located were mostly populated by Caucasians of Scandinavian and Western European background. In one community, a major university and an Air Force base brought some diversity to the

region. In the other community, a major university and a small immigrant population brought diversity.

Three of the schools in this study had smaller enrollments and were classified as Class B schools. The people living by these small town schools were largely Caucasian of Scandinavian and Western European background. There was a small university and two major universities within driving distance of all small towns in the study.

Participants were chosen for this study partly because of their locations in certain size districts and based on the recommendations of educators in the area. Settings for the interviews were an empty classroom or an office in the school where teacher participants were employed. In addition, the locations for interviews were chosen to allow for a semi-private conversation to take place.

Selection of Participants - Sampling Technique

Six participants were chosen for this study. Possible participants were identified from a list of licensed teachers provided by several educators familiar with in-service teachers in the area and their educational backgrounds. Maxwell (1996) explains "purposeful" sampling as a strategy in which settings, persons, or events are deliberately selected in order to provide important information that cannot be obtained from other choices.

Five criteria were used for the selection of participants. The first criterion was that the in-service teacher was voluntarily participating in the study. Each teacher participating in the research project completed consent forms, as required by the UND Institutional Review Board. The consent form (Appendix A) explained that

participation was purely voluntary and could be terminated at any time during the course of the study. The consent form also ensured that the participant's identity and interview data would be held confidential. The consent form included a required statement that the only people who would have access to the data would be representatives of the Institutional Review Board, this researcher's supervisor, and the researcher. Anonymity of the participants was ensured by assigning numbers to all participants. All interviewees were treated with respect. The identities of schools in which participants taught were kept confidential.

The second criterion was that the participants were in-service teachers currently practicing in a public school setting. The third criterion was that two teachers from the pool of potential participants were chosen for their certification at each of the following grade levels: elementary, secondary, and dual certification in elementary and secondary education. Both of the dually certified teachers are currently teaching at the secondary level.

The fourth criterion was that one female and one male teacher were chosen to represent each of the three education levels. The results of this study in regards to gender influence on the research topic were not statistically significant because of the low number of participants. However, some balancing of the attributes of the three educational groups was desired.

The fifth criterion was the general size of the schools in which the teachers taught. Three teachers representing each of the three education levels were selected from rural, Class B schools. Three teachers representing each of the three education levels were selected from schools with larger enrollments, Class A schools.

Data Collection/Procedures

Individual interviews were conducted with each of the six teachers. The interview is a method, a tool, of qualitative research. Listening is the most important skill in interviewing according to Seidman (1998). Seidman explains that there are three levels of interviewing. Listening to what the participant says is the first level. The second level involves listening to see if there is more to what the participant is saying. Asking for clarification or paraphrasing of what one thinks has been said can help to release more information. The third level of listening involves the interviewer being aware of the process of interviewing. The interviewer must keep in mind what information is left to cover, how long the interview has lasted, and the participant's level of fatigue.

Six teachers were interviewed for approximately sixty minutes at least once and at most on two different occasions. The interviews were initiated with the set of questions listed below. Follow up questions may have been asked based on the interviewee's responses. The four guiding questions asked of each interviewee were:

1. When and why did you decide to become a teacher?
2. What personality characteristics do you possess that you feel help you to teach?
3. How would you describe elementary, middle school, and high school students?
4. What satisfaction do you get from teaching and do you see yourself teaching five years from now?

All of the interviews were scheduled around participants' teaching schedules. Participants were allowed to choose a month in which they felt they had the most time available for interviewing. Interviews with each of the six teachers were audio taped and transcribed verbatim at a later date. Verbatim transcripts are preferable to taking notes during an interview where often one cannot write quickly enough to capture all relevant data in the interviewee's speech. Some field notes were written in the event that the tape recording equipment did not work. The field notes proved to be useful for describing teachers and the settings where the visits took place.

All transcripts of interviews were read to gain an overall picture of the data and to look for emerging themes. Notes and the transcripts were read immediately after each interview to formulate questions for further inquiry, to substantiate thoughts about themes, and to identify missing information that needed to be filled in during later interviews. All notes and audiotapes were kept in a locked box in a secure location.

Data Analysis / Coding Procedures

Assigning codes to transcribed interview data was the next step. Ethnograph qualitative research software version 5.08, written by John Seidel (2002), was used to code and analyze the interview data. The Ethnograph software program allows one to type (i.e., transcribe) data directly into the program or to import data already typed using another word processor. Taped interviews were typed directly into the Ethnograph program. As each transcript was read on the computer screen, the lines containing factual responses were highlighted and assigned codes to different thoughts in a passage. Key elements, key thoughts, key pieces of information were identified in

each passage and each piece of information was assigned a code. Some of the information was assigned a particular code because the teacher(s) used that exact word.

The codes in the Ethnograph software are held to a maximum length of ten characters. Some codes that were easily decipherable, for example SENSEHUMOR. This code meant having a sense of humor. Many times the codes were very cryptic, for example STND=COMPN. This code meant standard equals computational skills. A need to be able to decipher codes on first readings made code descriptions necessary. After each interview was coded, descriptions of each code were entered into the software's code book. This code book is simply a list of all codes used in the project. The code book can be printed out at any time and since each interview was entered into a separate file, code words unique to a particular interview could be listed. Initially, almost every phrase was coded. This coding resulted in more than four hundred different codes. The coding of incidental information was done for analysis and future studies.

The Ethnograph software allows one to display the frequency of each code occurrence in a particular set of data. In this study, the frequency display showed that some codes were found across many interviews, but the vast majority of codes only appeared once in the study. When examining the descriptions of the codes, it was found that several codes had identical descriptions. At that point, the corresponding passages across interviews were recoded. The recoding resulted in greater frequency counts for some codes and the identification of many more codes that appeared in at least two interviews. Appendices B, C, and D list the frequencies of the codes. The

categorizing of codes is listed in Appendix E. Appendix F lists the grouping of interviews into projects for further analysis of the data.

The codes for all interviews were sorted and counted for number of occurrences of each code in the data. Codes occurring in the data most frequently were found in the category, Self-Description. The Self-Description category included examples of personality traits most frequently identified by participants in the study as helpful to teaching. These traits included: a sense of humor, well-organized, loves mathematics, has clear expectations, believes explaining is exciting, knows [teachers and students] are human, kid driven [likes kids], has fun teaching, likes to teach mathematics, can't leave teaching [because likes teaching so much], gives their best effort, dedicated, and flexible.

Several elements can increase the trustworthiness of ones' research findings. "The question of trustworthiness asks to what extent can we place confidence in the outcomes of the study" (Maykut & Morehouse, 1994, p. 145)? The use of different methods of data collection, building an audit trail, and working with another researcher can all contribute to trustworthiness. The documentation of original interview transcripts and field notes contribute to an audit trail. "This documentation allows you to walk people through your work, from beginning to end, so that they can understand the path you took and judge the trustworthiness of your outcomes" (Maykut & Morehouse, 1994, p. 146).

A member of the doctoral committee served as the auditor of the study, because of her experience in reviewing research studies both for grant submissions and conference presentations. She validated the process by reviewing the interview

transcripts, reading the codes, and reviewing the parent codes used to categorize and sort the data. She also validated the themes and assertions presented in Chapters IV and V. "Validating findings means that the researcher determines the accuracy or credibility of the findings through strategies such as an external audit" (Creswell, 2002, p. 280). The auditor performs the service of reviewing different aspects of the research and writes or communicates an evaluation of the study.

Chapter IV will describe the research results and the patterns or themes among the categories that emerged. Direct quotations from interviews will be shown, wherever possible, to substantiate and expand on given results

CHAPTER IV

RESULTS

The purpose of this study was to identify personality characteristics of successful mathematics teachers by interviewing those teachers and having them relate traits they perceived in themselves that helped them teach effectively. This study adds to the body of research and may illuminate the possibility of identifying a pool of pre-service elementary teachers, students in upper level mathematics courses, and other students undecided as to a career who have an aptitude for mathematics and might consider secondary mathematics as a teaching field.

All of the participants chosen for interviews in this study met the criteria for selection. All of the participants met the first criterion by voluntarily participating in the study. They met the second criterion because all were in-service teachers currently practicing in a public school setting. The third criterion was met through the even distribution of the certification of the six teachers across the three areas of elementary, secondary and dual certification in both elementary and secondary. Participants met the fourth criterion because one female and one male teacher were chosen to represent each of the three areas of certification. The fifth criterion for selection of participants deals with the general size of the schools in which the teachers taught. Three teachers representing each of the three areas of certification taught in Class B schools and three teachers taught in Class A schools.

Each participant was individually interviewed. The following four questions served as guiding questions asked of each participant, with other follow up questions:

1. When and why did you decide to become a teacher?
2. What personality characteristics do you possess that you feel help you to teach?
3. How would you describe elementary, middle school, and high school students?
4. What satisfaction do you get from teaching and do you see yourself teaching five years from now?

Review of Methods

Assigning codes to transcribed interview data was the next step. Ethnograph qualitative research software version 5.08, written by John Seidel (2002), was used to code and analyze the interview data. Taped interviews were typed directly into the Ethnograph program. Each transcript was read on the computer screen, different thoughts were highlighted, and codes were assigned to the different thoughts. The codes that appeared most frequently across all the interviews were analyzed and the patterns that emerged became three themes.

In this chapter, each participant and the results of the interviews will be described as themes. First, a brief biography of each participant will be provided. Participants are identified by number, gender, and certification level. The quotations from the interviews are cited with each participant's code. For example, the first teacher is cited as 1-M-SEC. The second teacher is cited as 2-M-ELE. The fourth

teacher is cited as 4-F-DUAL etc. Secondly, the three themes will be discussed and applicable quotes will be provided for substantiation.

Biographies of Teachers

Teacher Number One

Teacher 1-M-SEC originally intended to follow his father's footsteps and become a farmer. However, he soon realized that there was not enough work on the farm to support him farming in addition to his brother and father on the family farm. When he enrolled in college, he did not intend to be teacher but had given consideration to getting a mathematics degree and then going on to be an architect. Those plans changed, however, when an older brother became a teacher. The stories his brother told, along with stories from aunts and uncles who were teachers made 1-M-SEC reconsider his career choices and as he describes it:

And I thought if my brother can be a teacher so can I . . . I can be a better teacher. I think that was when I decided (1-M-SEC).

Teacher number one (1-M-SEC) was a male, secondary teacher in a Class B school with twenty four years of experience. His youthful appearance belied his age and he always seemed to be in a good mood, smiling frequently. He had coached in almost every semester in which he had taught. He appeared physically fit and I wondered if his physical fitness and his youthful appearance were related to being active in coaching. 1-M-SEC had completed coursework for a masters' in mathematics education and was writing his thesis. He was teaching mathematics to students in grades seven and grades nine through twelve. 1-M-SEC admitted that he

loved teaching middle school students simply because he had fun teaching them and “they are still young and excited about school” (1-M-SEC).

When you entered the classroom, the old wooden floorboards broadcasted your every step, but this teacher’s sunny greeting made you forget the floorboards. The classroom had a homey feel and was decorated with student created posters on mathematics topics such as pi, how to divide, and polar coordinates. Even the window curtains had little geometric shapes on them. Depending upon the lesson, 1-M-SEC often moved his students’ desks into different configurations, to accommodate their special learning needs. He reported that one of his favorites as “matinee seating,” in which rows of eight desks sitting side by side formed aisles, because with this arrangement he could readily assess a student’s progress and help each student as the need arose.

Teacher 1-M-SEC explained that he doesn’t think he could leave teaching.

...So it was originally, I could do that (teaching) for a few years and enjoy it for a few years and then step out of it. But I couldn't see myself leaving it. Even at that time, after a few years, that was a hard decision. I don't think I could leave it (1-M-SEC).

Teacher Number Two

Teacher 2-M-ELE did not know what he wanted to do when he started college, even though he had thought about education when he was younger. Someone told him he would be more marketable as a male elementary teacher, so he went into teaching.

At first I was in Social Studies and Phy. Ed and then I was told you are a lot more marketable as a male elementary teacher. So I and a friend switched and the rest is history I guess (2-M-ELE).

Teacher number two (2-M-ELE) was a male elementary teacher with thirty years of experience. He was distinguished looking and had a reserved manner, looking much younger than his age. At the beginning of his teaching career, he coached junior high sports for six years but was not coaching at the time of our visit. 2-M-ELE taught in a Class B school and had taught fifth graders for many years.

Teacher 2-M-ELE had experience teaching both elementary and middle school students, and he uniquely contrasted them as: “[middle school students are] those who think wrong behavior is more fun . . . while fifth graders will believe black is white” (2-M-ELE).

2-M-ELE spoke enthusiastically about staging a mathematics fair every spring where students showed parents what mathematics topics they had been working on. During one of my visits, I had the opportunity to attend his fair. The students were extremely excited to share their projects with me.

Many years ago, 2-M-ELE received a masters for specialized coursework in teaching mathematics to elementary students. He described his enthusiasm and attitude about mathematics as being due to his notion that the fun was in “getting there”. He passed that on to his students by exploring exciting ways to introduce geometry and so when a mathematics specialist program emphasizing hands-on mathematics and geometry became available, 2-M-ELE took advantage of it because as he described it . . . “I slid into that and really liked it.”

Teacher number two had a difficult time responding to a question about the satisfaction he receives from teaching. He jokingly said, “For the money”

(2-M-ELE). Then he related the following story, which contains many feeling statements about how he enjoys working with students.

I'm always happy to get to my room in the morning when there are kids there to greet...I always feel good when I hear about how well a former student is doing as an adult... I love making the kids laugh...I enjoy the innocence that most still have in the 5th grade...and I get satisfaction that they are happy to see me when they meet me outside of the context of the school (2-M-ELE).

Teacher Number Three

Some teachers seemed to be “born into teaching” and know from a very early age that they want to be teachers and teacher number three was one such teacher. For example, teacher 3-F-SEC mentioned “love” four times in her reason for becoming a teacher. She also illustrated her journey of being an accounting major but wanting to not just deal with numbers because she liked people and loved high school age people in particular. The following quote is rather long but it reflects her energy and excitement about teaching and learning:

I've always wanted to be a teacher. But when I went to college, I started out as an Accounting major and as a junior I realized I still wanted to become a teacher. Why I wanted to be a teacher is, I think, I've only had only good teachers, inspiring teachers. I've always loved learning, always, and I love school. I never just liked school. After I went to college and was in accounting, which definitely dealt with mathematics, I knew I wanted to be more than just behind numbers all the time. I wanted to work with people and I love high school age people. I've always loved working with teenagers (3-F-SEC).

Teacher number three (3-F-SEC) spoke very quickly. She confided that she constantly rewrites her lesson plans so that she slows down her teaching for her students. She exuded a lot of energy and liked to talk about mathematics in particular.

Her enthusiasm must have been an elixir for youth because she appeared to be quite young with vibrant dark hair.

This teacher taught tenth, eleventh, and twelfth grade mathematics. 3-F-SEC had taught approximately twenty years and taught in a Class A school. She had received her masters in mathematics education after initially being certified in business education.

Her classroom was modern and not overly decorated. Her motto of, "I think, so I am," was prominently displayed to urge students to think before they answered questions. There was a large poster on one wall of a graphing calculator, describing the function of each of the calculator buttons. This teacher enthusiastically pointed out student projects along the back wall of the classroom. She said that she took a workshop on projects last year and each semester was trying to have students complete a project in one of her classes. She reported that former students frequently asked her why she did not require projects when they took a course from her to which she replied, "I am doing baby steps."

Teacher Number Four

Teacher 4-F-DUAL reported that she played school as a little girl and believes she has always wanted to be an elementary teacher. When she was in high school, two female mathematics teachers influenced her to get a double major in secondary mathematics and elementary education.

I saw myself as being an elementary teacher... I enjoyed learning in general, but as a freshman in high school, I got really turned on to Algebra. I had a teacher that made the class really interesting and at that time, I realized I really liked math. As a senior, there was another instructor and I remember watching her one day and saying, I could see

myself doing that someday. So the role models had a lot of influence on me. It was that day that I decided to add mathematics to the elementary ed, so I had the option of doing either one (4-F-DUAL).

Teacher number four taught tenth, eleventh, and twelfth grade mathematics.

She had taught for thirty years. When she said she was close to retirement, I could not believe it. She looked to be in her early forties. 4-F-DUAL was in a Class A school. She was one of two teachers in this study who were dually certified in elementary and secondary education. During the interview, 4-F-DUAL explained that she would probably retire in a few years because teaching took an enormous amount of her time. She said, because of her initial elementary teacher certification, she was very focused on each and every student in her high school mathematics courses. 4-F-DUAL corrected their homework every night, which took many hours. She looked for each student's improvement over the course of the semester. In our discussion of students who were challenged to learn mathematics, she related that she had taught basic mathematics to adults for many years. Her prescription for remedying students' mathematics anxiety was to explore what grade or teacher had traumatized them in the past. She said that once she helped the student over the trauma, they were better able to learn mathematics.

This secondary teacher also shared her insight from having the same students when they were preschoolers and when they were high school students. In the quotation below, 4-F-DUAL describes how she has learned from watching the same students at different times in their life.

I had two of my Head Start students years later in high school and the summer I had them, they were 3 year olds and then later, they showed up as sophomores. I was amazed at how much the three year old was

still in the sixteen year old. Some of the same characteristics they had as a three year old were still there. And that too was a learning moment for me... And there is a whole lot of that child in the teenager. They are very vulnerable (4-F-DUAL).

Teacher 4-F-DUAL talks succinctly below about sharing something she finds so enjoyable and the fact that she knows she will make a difference in her students' lives.

The satisfaction that comes from kids making sense of it [mathematics], and the light comes on. And although many of them don't know it, but the satisfaction I know I will make a difference in their lives is important. A lot of times they don't realize [the importance of mathematics] until they have left . . . [their school] . . . and moved on. Sometimes you hear back from former students . . . You know you have made a difference (4-F-DUAL).

Teacher Number Five

Teacher number five decided to be a teacher at an early age and was a daughter of two teachers. She worked at a bank for five years, decided she was missing something and went back to school for education.

When I was in the second grade, I was playing school with all my animals. I decided, then, that would be a fun thing to do and I've always loved being in charge. As I got older, I worked at [a] bank for five years and loved what I was doing but didn't feel quite fulfilled, so it was a redirection to [go] back to school for education (5-F-ELE).

Teacher number five taught fifth grade elementary school. 5-F-ELE coached high school tennis for a time, but did not presently coach. This youngest of the teachers interviewed spent half of her eight year career teaching first grade and the rest teaching fifth grade. She was in a Class A school. 5-F-ELE received her masters in education. This teacher was the most enthusiastic about being part of this study. She had taught at the college level and enjoyed showing her college students pictures of her elementary students, for learning purposes. She felt that her experiences in the

classroom would be very helpful if she eventually decided to go into full time college teaching.

5-F-ELE's classroom walls exhibited her energy. Every inch of her classroom walls was covered with some sort of poster or words of encouragement. During the last two years, she had studied and used multiple intelligences as a way to boost the self-esteem of her students. She said that hormones kick in as early as grade five and she explained her coping strategy. "Knowing that sometimes they cry for no reason. It is just understanding the self-esteem the personal part of them." (5-F-ELE)

She had incorporated a way of changing her teaching strategies in the last few years to include more group work. Sometimes she needed to teach all the students at once, which one student called "one-size fits all" and other times she helped students in small groups.

5-F-ELE confided that she would not like to teach high school mathematics because of the difficulty of higher-level mathematics. She had many mathematics courses in college up to and including Calculus along with the inclusion of elementary mathematics teaching courses.

Teacher number five gets satisfaction from helping students think on a higher level. Teacher 5-F-ELE's story about students asking her for more work lets her know she is inspiring her students. "How do you say no to that? A student who is asking you for more? So to me, knowing that I can get the kids to think outside of the box is extremely satisfying" (5-F-ELE).

Teacher Number Six

Teacher number six decided to teach while still in high school. A former

teacher and coach were his role models that influenced him to pursue a career in education. Teacher 6-M-DUAL tells the story this way:

My senior year in high school, my high school basketball coach and social studies teacher was a great influence on me and he just retired two years ago from [close by school]. I thought that would be a good profession to go into (6-M-DUAL).

Teacher number six taught mathematics to students in grades seven through twelve. He had coached throughout his entire teaching career and continued to coach year round at the time of this study. He had taught for twenty five years. 6-M-DUAL was teaching in a Class B school. 6-M-DUAL was one of the two teachers in this study who was dually certified in elementary and secondary teaching. He related how he began his teaching career in a high school and only lasted one semester due to homesickness. He returned to college to become elementary certified and taught fifth and sixth grades at the elementary school level for fourteen years. When another elementary teacher needed a teaching position, he agreed to fill the high school mathematics position that became vacant due to a retirement.

The classroom that he had inhabited for his entire high school teaching career was noticeably painted in different shades of green. If one remembers that green is a calming color, the decor of this room was appropriate to creating a calming atmosphere (possibly helping reduce mathematics anxiety in the students). The classroom lacked posters, but had ample white board space for student writing. 6-M-DUAL related how he utilized the white boards during every class by having students work out mathematics problems under his guidance. His desk was uncluttered and he had no trouble finding a test for a student who had been recently absent for a class. In

the following quotation, he describes how teaching elementary school students has helped him to teach high school students.

Oh, yes, there are things I learned from the elementary mathematics books that I apply to the high school. Especially things like fractions. The basic adding and subtracting fractions. A book showed something that was never shown in the high school books. And it made it much easier. Just little things (6-M-DUAL).

Students catching on to an idea was a source of satisfaction for teacher number six as well as his ability to pass on an idea and have students understand.

Themes

Once the data was coded and analyzed, interpretation of the data began. While reading the various coded interviews, patterns or themes emerged and assertions were made. Diagrams showing how the codes became themes and how assertions were developed from the themes can be found in Appendices G and H. The themes will be outlined here. They will be discussed in Chapter V along with their underlying assertions.

Three major patterns or themes emerged from the coded interviews: certain personality characteristics contribute to positive learning environments for students; certain teaching methods encourage students to take responsibility for their learning; and role models, favorite teachers, and/or family influenced the teachers' decision to make mathematics teaching their career choice. Each of themes reflects "clusters" of comments that were made by the teachers. The clusters reflect comments made by the teachers that after analysis of the data were "related" and therefore grouped together to form the themes. Each theme and its clusters are described below.

*Theme One: Certain Personality Characteristics Contribute to
Positive Learning Environments for Students*

It was clear that the teachers recognized that they had an impact on the learning of their students in many ways. During the interviews they addressed several personal characteristics that they felt positively impacted their teaching. The analysis of the interviews resulted in the clustering of these comments and the emergence of the first theme (Table 4). As is demonstrated in the table, the clusters focus on different aspects of certain personality characteristics that contribute to a positive learning environment. Some personality characteristics were used by teachers to describe how they relate to their students in a positive way, some were used to describe how the teachers relate to their subject area and teaching in general, and some were used to describe how the teachers create learning environments in their classrooms.

Table 3. Theme One: Certain Personality Characteristics Contribute to Positive Learning Environments for Students

<i>Clusters</i>	<i>Personality Characteristics (codes)</i>
<i>Teachers relating to students</i>	Sense of Humor Admits Mistakes Being Kid Driven Respect for Students
<i>Teachers relating to mathematics and teaching</i>	Loves Mathematics Has Fun Teaching Math
<i>Teachers creating the learning environment in the classroom</i>	Clear Expectations Flexible Organized Flexible

Cluster One: Teachers Relating to Students

There were several references to characteristics that all related in some way to the teachers relating to their students. Relationships the teachers have with students are described in Cluster One and include the characteristics of: having a sense of humor, admitting mistakes, being kid-driven, and respecting students.

A sense of humor was described by the teachers both in terms of them finding humor in situations and also finding humor in themselves. Humor was viewed as a tool for helping the teachers cope with some of the stressors of teaching. It also contributed to their sense of having fun in their teaching. Humor helped the teachers relate to their students by using jokes to lighten up the sometimes too serious subject area of mathematics. The following quotes from the interviews describe what the teachers mean. 1-M-SEC said, "I just told one of my classes . . . I told a joke and no one laughed and I said I just entertain myself. If there's no laugh, I'm still having fun." 6-M-DUAL explained, "Oh yeah, they know I make fun of myself quite a bit. So especially, when I'm at the board and make mistakes I tell them [the students] . . . "that's not right," . . . "oh my first mistake this year."

Teachers also felt it was important that they view themselves as human, that they could make mistakes, and they were not infallible. "Admitting mistakes" was seen as important by some of teachers both as a way to build relationships with their students and to make students feel more comfortable and safe in their classroom. For example, one of the elementary teachers shares her way to build the classroom community. "And they see me mess up. I tell them, I'm human. I think that is . . . core of building that community in the classroom" (5-F-ELE).

One concept that was mentioned by the teachers was the idea of being student centered. The teachers made comments on how important it is that they recognize that they are not just teaching mathematics, they are teaching the young people sitting in the classroom. One teacher alluded to this when she used the term “kid driven” to describe how important it was for her to focus on the students. At times, this student centeredness came out through comments about the teacher’s feeling toward the students. One teacher referred to his love for the students. In that case, he said that he felt he could be an effective teacher because he could easily bond “very well with kids,” and as a result would be able to reach them in his teaching.

“Respecting students” also deals with relationships. The teachers in this study had respect for their students but they discussed it in different ways. For example, teachers explained that one of their goals was for their students to understand mathematics and they cared about their students’ understanding. One teacher talked about his caring for and respecting students in the following way. “I run a structured class but we have fun and they know I care. And if I get after them today, tomorrow we start fresh and I do it because I care.” (1-M-SEC).

Teachers feel that part of respecting students is getting to know them as individuals. The respect that the teachers felt and showed toward their students was outwardly observable. 4-F-DUAL told of parents and students alike that had made comments to the effect that the teacher’s respect for the students was appreciated and was one of the reasons they were pleased to have her as a teacher.

Cluster Two: Teachers Relating to Mathematics and Teaching

The teachers suggested that their attitudes about mathematics and

teaching mathematics had an impact on their students' learning. Two teacher characteristics in cluster two are "loves mathematics" and "likes teaching mathematics". While these are related, they are slightly different. One point observed was that all of the secondary teachers interviewed professed to "love" the subject area of mathematics. One secondary teacher described how she loves mathematics as follows: "I not only love my job as a teacher but I love teaching mathematics. I just think there is so much to mathematics that so many students don't even realize and if I can just show them just a little of that" (3-F-SEC). A dual certified teacher, currently teaching secondary mathematics, described why he likes teaching mathematics:

I really like teaching math because it's a tougher . . . subjects we have. It gives me the satisfaction when they can catch on to an idea or concept and I can pass that . . . and I not only know it, but they know it (6-M-DUAL).

The enthusiasm one secondary teacher feels today for teaching is evident in his actions, his demeanor, and in his words, as reflected in the following quote:

Once I started teaching it was to work with kids and as a farmer I thought I would be a 4-H leader and teach Sunday school do those youth things anyway and this gave me an opportunity to do it day in and day out in my job. It was great fun. I could have never guessed that I'm teaching my 24th year and feel like I'm just getting started. It's amazing to me that I have that feeling still (1-M-SEC).

Cluster Three: Teachers Creating the Learning Environment

From the interviews, several comments were made that reflected the teachers recognizing the role of the learning environment in teaching mathematics and their personality characteristics that supported the development of a positive learning environment. The teachers talked of setting a positive tone to their classroom because

it allowed for students' to freely ask questions, allowed students' to make mistakes, and the teachers felt it supported student learning.

One practice that was referred to by the teachers was the notion that it is important for the students to know what is expected of them. The idea is that it sets the tone for their classroom and students won't be caught off guard by not knowing that they needed to do to be successful. The teachers felt their clear expectations made students feel comfortable and not worried about surprise quizzes. They expanded on that notion to say that the classroom climate was controlled because of their clear expectations and that students learned best in that environment. Some to-the-point quotes illustrate the idea of clear expectations. "I am a very cut and dry . . . and everybody knows my expectations . . . (3-F-SEC)." 2-M-ELE states, "I try to make my expectations very clear and not back off on them."

The idea of fostering a climate in the classroom that is controlled, yet flows with necessary interruptions, is seen as important to students' learning. It is a challenge for many teachers to balance a need to be organized with recognizing that at times, flexibility is necessary in order for the best possible learning to occur. This quote may help illustrate my point, and it also talks about flexibility. "We (I believe) are daily jugglers . . . things thrown into our path that we don't anticipate on a daily basis and then you have to learn to bounce with the flow or as you are instructing and someone is not getting it, you have to think on the spot" (3-F-SEC). Flexibility in allowing students' questions was also important. Teacher recognized that the needs of students came first and it may be that he/she may not move through the lessons quickly because of taking time to respond to all of the questions.

The teachers all shared stories of how their students liked the structure and organization in their mathematics classroom. The teachers described, "being organized" as follows. "I'm very organized. Pretty structured. They know what they're going to get. They know what the tests are going to be like" (1-M-SEC). 4-F-DUAL explains, "I'm organized about their daily work and what they have handed in and what they haven't and they really like that."

The teachers also seemed to believe that it was important for them to nurture the development of organizational skills in their students. The teachers talked about how important it is to have note taking and homework in mathematics to be structured and readable in order for students to best learn the subject. One of the key ways in which teachers facilitated the development of organizational skills was through supporting students in learning how to take notes and organize their work. One teacher pointed out the need to teach organization skills explicitly when he said, "You have to let kids organize themselves. You try to teach organizational skills"(1-M-SEC). Teachers offered ideas on how they did this. For example, 4-F-DUAL requires her students to keep a binder that she grades periodically. 1-M-SEC said he taught his students to take notes by checking notebooks himself and having students swap notebooks to see other examples of note taking.

*Theme Two: Certain Teaching Methods Encourage Students to
Take Responsibility for Their Learning*

Theme two focuses on the interviewed teachers comment regarding the impact on the students' learning when teaching methods were used that encouraged students to take responsibility for their learning. A common thread through these teaching methods is that teachers facilitate their students to do their own thinking, take their

own notes, use manipulatives and make projects to learn mathematics concepts, and to solve mathematics problems on the blackboard versus listening to the teacher lecture.

Theme Two includes teaching methods that were mentioned in the responses to questions about how their teaching methods have changed. Teachers also included the information about this in their answers to other questions. Specific teaching methods are given in Table 5.

Table 4. Theme Two: Certain Teaching Methods Encourage Students to Take Responsibility for Their Learning.

<i>Cluster</i>	<i>Codes</i>
<i>Teaching Methods</i>	Fostering Critical Thinking Students Taking Notes Using Math Manipulatives Students Making Projects Teachers Lecturing Less

“Fostering critical thinking” is one of the teaching methods that refers to problem solving ability. The teachers felt that students should learn to solve problems on their own and the teachers felt they must step back and allow the students to do the thinking. Teachers acknowledged that some students struggled with problem solving, but the teachers offered hints and strategies to their students without giving them the answers. The teachers knew that giving answers and solving problems for students did not help their students learn. The students had to do the learning by themselves.

Some teachers felt very strongly about their students taking notes and they went into a lot of detail about how they foster that skill in their classroom. The following quote illustrates why one teacher sees note taking as important.

I try to teach them how to help themselves. One of the purposes of the binder is they have notes and examples to go back to and the paras are really great learning how to do things with me. So the first thing we say when a kid has a question. Have you looked at your notes? So now at this time of year they look in the notebook before they ask (4-F-DUAL).

“Mathematics manipulatives” are objects that are used by teachers to support hands-on learning for students to facilitate the understanding of various mathematics concepts. They are particularly helpful when working with elementary students who may not possess the abstract reasoning abilities of older students. The two elementary teachers and a dually certified teacher mentioned using manipulatives as a teaching tool, which one would expect given their training to teach elementary students.

Teachers discussed projects as a fun activity for both the teachers and their students as a means by which students could demonstrate their learning. One teacher spoke of students in her past classes feeling cheated and asking why they did not get to do projects when they were in her class. Another spoke of a springtime geometry project as one of his favorite parts of teaching and something that students loved to do. Projects are part of what one teacher sees as the reform method in mathematics that show students' knowledge. She shares, “I have a real appreciation for small-group instruction and projects and different ways that students can demonstrate their knowledge. More open-ended questions. You try to find that balance between the two: the reform method vs. the formal”(4-F-DUAL).

“Lecturing less” was given as the outgrowth of either the teachers' responses to mathematics reform in the last two decades or a natural progression in their teaching over the years. 1-M-SEC and 6-M-DUAL said after many years of experience teaching at the high school level they realized that their students had to

solve problems on their own at the blackboard or at their desks versus the teacher working out all the problems. The two teachers with the addition of 5-F-ELE said their students understood the mathematics better when they lectured less.

Theme Three: Role Models, Favorite Teachers, Family, and/or Coaches Influenced the Teachers' Decision to Make Mathematics Teaching Their Career Choice

Theme three emerged from responses to when and why did the teachers decide to become a teacher. Every teacher interviewed spoke of teachers they had once known that influenced them to consider the profession of teaching. The responses fell into two clusters under theme three. Table 6 gives the clusters of theme three along with the code phrases of the clusters.

Table 5. Theme Three: Role Models, Favorite Teachers, Family, and/or Coaches Influenced the Teachers' Decision to Make Mathematics Teaching Their Career Choice.

<i>Clusters</i>	<i>Codes</i>
<i>Influences on Career Choice</i>	Family who were teachers Favorite teachers Coaches
<i>Messages transmitted</i>	Love of Learning Education is Important Passionate about Teaching

Cluster One: Influences on Career Choice

The teachers all mentioned that important people in their lives influenced their career choice. Some teachers mentioned family members; others talked about favorite teacher; others spoke of coaches. Some of the teachers who knew early on that they wanted to teach watched their parents, who were teachers, prepare for each school year and knew they wanted to follow in their footsteps. Other teachers watched their

favorite elementary teachers attend all their school's sporting events or talked at length with their secondary teachers and thought they also could teach. Other teachers spoke of coaches who inspired them to play sports and showed interest in them academically as well.

Interestingly, when the teachers mentioned their family they always mentioned that the family member was or had been a teacher. Many of the teachers talked of being from generations of teachers or having siblings who were also teachers. Sometimes the teachers spoke of mathematics teachers who influenced them and other times they spoke of teachers in other subject areas.

Cluster Two: Messages Transmitted

The teachers' family and favorite teachers transmitted messages to their students that had a profound effect on them and influenced them to decide on teaching as a career choice. The teachers shared that family members, who were teachers, and favorite teachers transmitted their love of learning, the importance of education, and their passion for teaching. The messages about loving to learn were echoed by the teachers. They know learning is a life-long process and they felt learning was exciting and enjoyable. They saw education as important to their getting a teaching job and for succeeding in life in general. When they spoke of their favorite teachers they highlighted the passion those teachers had for teaching that they had also developed that passion for teaching.

Summary

In Chapter IV, the research process was described, the biographies of each of the six interviewed teachers were presented, and the patterns or themes that emerged

from the data were outlined. Three themes were presented:

1. Certain Personality Characteristics Contribute to Positive Learning Environments for Students.
2. Certain Teaching Methods Encourage Students to Take Responsibility for Learning.
3. Role Models, Favorite Teachers, Family, and/or Coaches Influenced the Teachers' Decision to Make Mathematics Teaching Their Career Choice.

Direct quotations from interviews were provided, wherever possible, to substantiate and expand on the given results. A summary of the results, the interpretation of results, and suggestions for further research will be presented in Chapter V.

CHAPTER V

SUMMARY, INTERPRETATION OF RESULTS, RECOMMENDATIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

Summary

The purpose of this study was to identify personality characteristics of successful mathematics teachers by interviewing those teachers and having them relate traits they perceived in themselves that helped them teach effectively. Six in-service mathematics teachers were interviewed, the following questions were asked of each teacher with follow up questions dependent upon the participants' responses.

1. When and why did you decide to become a teacher?
2. What personality characteristics do you possess that you feel help you to teach?
3. How would you describe elementary, middle school, and high school students?
4. What satisfaction do you get from teaching and do you see yourself teaching five years from now?

Included in this chapter are three major themes that emerged from the data from the study, nine assertions of the study, the interpretation of the results, recommendations, and suggestions for future study. Three themes emerged from the coded interviews: certain personality characteristics contribute to positive learning

environments for students; certain teaching methods encourage students to take responsibility for their learning; and role models, favorite teachers, family, and/or coaches played heavily on the teachers' decision to make mathematics teaching their career choice. Within each of these themes, assertions are presented that emerged from the data.

Theme number one supports four assertions: teachers felt it was important to have good relationships with students; showing respect for students and interest in their daily lives was important to the participants; teachers felt that when they, themselves, were interested in mathematics and were enthusiastic about teaching, the learning environment for the students improved; and teacher attributes help contribute to a positive, more efficient, learning environment for the students. Theme two supports two assertions: teachers want students to think and learn for themselves; and hands on teaching methods can enhance a child's learning experience. Theme three supports three assertions: family, who were teachers, often influenced participants to become teachers; favorite teachers often influenced participants to become teachers; and coaches often influenced participants to become teachers. Each of the themes and assertions are described in the following sections.

Theme One: Certain Personality Characteristics Contribute to Positive Learning Environments for Students

The teachers recognized that they had an impact on the learning of their students in many ways. During the interviews they addressed several personal characteristics that they felt positively impacted their teaching. The personal characteristics addressed by the teachers included description of how they relate to

their students in a positive way, how the teachers relate to their subject and teaching in general, and how the teachers create learning environments in their classrooms. Under the umbrella of theme one, four conclusive statements emerged and are discussed as follows.

*Assertion #1: Teachers Felt It Was Important to Have
Good Relationships With Students*

Teachers reported that having a sense of humor, telling jokes, and projecting themselves as human (to their students) were some of their personality characteristics. These attributes contributed to the teachers' ability to establish rapport with the student that they believed contributed to a positive learning environment.

*Assertion #2: Showing Respect for Students and Interest in Their Daily Lives
Was Important to the Participants*

The teachers commented on the importance of showing respect for the students and the role it played in the students reciprocating that respect. The sense was that the respect contributed to establishing rapport with the students and increased the students' comfort level in the classroom. As a result, anxiety was reduced which helped the students learn. In addition, the teachers felt that showing an interest in their students outside of the classroom, such as greeting them on the street or attending sporting events helped the students to feel important.

*Assertion #3: Teachers Felt That When They, Themselves, Were Interested in
Mathematics and Were Enthusiastic About Teaching, the Learning
Environment for the Students Improved*

Enthusiasm for teaching and mathematics was reflected in the language of the teachers when they described their love of the subject area of mathematics and love of teaching mathematics. Secondary mathematics teachers mentioned that they liked

teaching mathematics more often than elementary teachers. It is easy to imagine that if a teacher does not like mathematics or does not like to teach, subtle messages may be conveyed to the students, which could negatively impact their learning. It seems obvious that a teacher's attitude towards his/her subject and students could and probably does rub off on the students.

*Assertion #4: Teacher Attributes Help Contribute to a Positive,
More Efficient, Learning Environment for the Students*

Teachers reported that being organized, being flexible, and having clear expectations of their students were supportive of their teaching. In fact, teachers said that being organized helped them teach more effectively and return corrected papers to students in a timely manner. Being flexible helped teachers adapt to the individual needs of each student and having clear expectations meant that students were never surprised by unexpected events. Students always knew exactly what was expected of them making it easier to complete homework assignments and prepare for tests.

Theme Two: Certain Teaching Methods Encourage Students to
Take Responsibility for Their Learning

The interviewed teachers commented on the impact on the students' learning when teaching methods were used that encouraged students to take responsibility for their learning. A common thread through these teaching methods is that the teachers facilitated their students to do their own thinking, to take their own notes, to use manipulatives and make projects to learn mathematics concepts, and to solve mathematics problems on the blackboard versus listening to the teacher lecture. Under the umbrella of theme two, two conclusive statements emerged and are discussed as follows.

Assertion #5: Teachers Want Students to Think and Learn for Themselves

Fostering critical thinking by asking questions of students, lecturing less, and encouraging students to take notes in various ways were frequently mentioned in the interviews as teaching methods used by the participants. The teachers' goals for their students included learning to solve mathematics problems and the teachers wanted their students to do the thinking.

Assertion #6: Hands On Teaching Methods Can Enhance a Child's Learning Experience

Some of the teachers spoke of using mathematics manipulatives (concrete objects to provide visual and tactile learning), mathematics labs, and mathematics projects as teaching methods. The teachers spoke enthusiastically about how their students were excited about learning when the teachers used projects and mathematics manipulatives.

Theme Three: Role Models, Favorite Teachers, Family, and/or Coaches Influenced the Teachers' Decision to Make Mathematics Teaching Their Career Choice

Theme three emerged from responses to when and why did the teachers become a teacher. Every teacher interviewed spoke of teachers that influenced him or her to consider the profession of teaching. The teachers' family and favorite teachers transmitted messages about the value of teaching that had a profound effect the teacher interviewed. Under the umbrella of theme three, three conclusive statements emerged and are discussed as follows.

Assertion #7: Family Members Who Were Teachers Often Influenced Participants to Become Teachers

It was not uncommon for the participants to talk about family members sharing

their positive stories of teaching. The family members talked of the fun they had teaching, their love of learning, and that teaching was a worthwhile occupation. This influenced most of the teachers participating in this study to choose a teaching career.

Assertion #8: Favorite Teachers Often Influenced Participants to Become Teachers

Favorite teachers passed on their love of learning, their passion about teaching, and their belief that education is important. A majority of participants spoke of a favorite teacher as a person that led them, by example, to consider teaching as a profession.

Assertion #9: Coaches Often Influenced Participants to Become Teachers

Coaches passed on their interest in students' sports and academic performance. Coaches served as role models that students should be treated with respect. Some of the teachers talked of their coaches as the ones they wanted to follow by becoming teachers and coaches.

Interpretation of the Results

These results are discussed as they pertain to the questions posed to interviewees with a summarization of the results given after the question is listed.

Responses to Questions

Question #1: When and Why Did You Decide to Become a Teacher?

The results of this study indicate that six currently practicing teachers, four who taught secondary mathematics and two who taught at the elementary level, decided at different ages to go into teaching and they were influenced by family members and favorite teachers to do so.

Answers to question one ranged from “ever since they were little children” to “during college.” These results are similar to what one author identified as decision-making times in a person's life when the person is likely to decide on a career, especially a teaching career (Shutz, 2001).

The participants' answers as to why they decided to become a teacher invariably led them to talk of teachers in their family; parents who were teachers, siblings who were teachers, and/or other relatives who were teachers. Families influenced most of the teachers in the study to choose mathematics as a career by sharing their positive stories of teaching, their love of learning, their passion about teaching, and their belief that education is important. Schutz (2001) reports similar findings in his work and links family influence to students setting goals of becoming a teacher.

Many of the teachers interviewed mentioned a favorite teacher or teachers when describing why they chose teaching. They spoke fondly of the impact a favorite teacher had upon them. Some of the teachers included a coach as their favorite teacher. They saw themselves becoming coaches and teachers because of their coaches' example of relating to students. This finding is also supported by Schutz's 2001 study. Teachers influenced students in their decisions by providing encouragement, modeling, suggestions or exposure to teaching situations according to Schutz (2001).

Question #2: What Personality Characteristics Do You Possess That You Feel Help You to Teach?

The results of this study indicate that six currently practicing teachers, four

who taught secondary mathematics and two who taught at the elementary level, described their personality characteristics that added to their ability to relate to their students and contribute to a more efficient learning environment.

In response to this question, some teachers identified personality traits they believed supported their teaching of mathematics such as having a sense of humor, showing they are human by saying they make mistakes, and having respect for their students. The teachers referred to being interested in students' daily lives and showing respect for students. A few of the teachers mentioned that they were cognizant of students returning their respect. Many researchers have documented the fact that when students feel safe in a classroom and when students feel that their teacher respects them, the student learns best (Stronge, 2002).

The teachers also described themselves as being organized, flexible, and having clear expectations. Gabrielatos (2002) characterizes these traits as personality aspects that contribute to the effectiveness of teaching. Finally, enthusiasm for teaching, in general, and specifically for mathematics may be reflected when teachers talked about the "love of mathematics", how much they liked teaching mathematics, and how much fun they had teaching mathematics.

Question#3: How Would You Describe Elementary, Middle School, and High School Students?

The results of this study indicate that six currently practicing teachers, four who taught secondary mathematics and two who taught at the elementary level, had similar descriptions of students at different levels. The teachers in this study talked about elementary students being impressionable, quick to learn, and excited about

learning. Middle school students were characterized as worrying about peer pressure and still somewhat excited about learning. The secondary students were described, as more laid back and less excited about learning than the two younger levels.

Question #4: What Satisfaction Do You Get From Teaching and Do You See Yourself Teaching Five Years From Now?

The results of this study indicate that six currently practicing teachers, four of whom taught secondary mathematics and two of whom taught at the elementary level, received satisfaction from enjoyable interaction with students and helping their students to learn mathematics. All but one of the teachers said they hoped to be teaching in five years. The only exception was a teacher who said she was eligible to retire in a few years, but might consider coming back part-time. All the teachers said they enjoyed interacting with students and helping the students to learn mathematics. The majority of the teachers in the study loved mathematics, so sharing their love of mathematics with students and helping students understand mathematics was, in itself, satisfying to the teachers.

Recommendations

Recommendations for implementing the results of this study would be most appropriate for those who work in teacher preparation programs. Those who have access to potential students might best accomplish the recruitment of students who will become mathematics teachers. The results of this study could be used to identify similar characteristics in college students, especially students showing a potential interest in mathematics or teaching. Pre-service elementary teachers, students in upper level mathematics courses, and any other students showing an aptitude in

mathematics, science or teaching but as yet undecided in their career direction should be encouraged to consider a mathematics teaching career.

Suggestions for Further Research

The purpose of this study was to identify personality characteristics of six mathematics teachers by interviewing those teachers and having them relate traits they perceived in themselves that helped them teach effectively. To think that mathematics teachers all share identical personality characteristics and can be catalogued or summed up under a general description is both naïve and unsubstantiated by research. Mathematics teachers are all unique individuals; however, mathematics teachers have a common purpose that might reflect some common personality characteristics. It was not surprising that the majority of the six teachers in this study showed some common characteristics such as having a sense of humor; being well organized; holding clear expectations of their students; and most shared having a “love of mathematics.”

The information obtained in this study on personality characteristics of mathematics teachers may help to identify elementary education students minoring in mathematics as potential secondary mathematics majors. If a student appears to possess all needed criteria for becoming a successful mathematics teacher (as established in this study), he/she might be encouraged to consider teaching mathematics as a career.

However, the characteristics identified in this study may not be inclusive of all the characteristics of mathematics teachers and more study is needed to further explore the question. These characteristics may not be unique to mathematics teachers and in fact, two researchers, Minor et al. (2001) and Gabrielatos (2002), found some of the

same characteristics that were found in this study, while Minor studied all teachers and Gabrielatos studied specifically language teachers. The identification, in this study, of some of the same characteristics of student-centered, enthusiastic about teaching, and interpersonal skills is supported by the Minor and Gabrielatos' studies. The additional characteristics identified by participants in this study may or may not be unique to mathematics teachers because the characteristics could be the characteristics of all teachers and not specific in regard to the subject taught.

Further study will be needed to make sure the characteristics identified by six mathematics teachers include all such characteristics representing a larger population and to explore the possibility that the identified characteristics may also be found in teachers of other subject areas. Therefore, future research could solidify the importance of certain characteristics for being a mathematics teacher versus being a non-mathematics teacher. Information obtained from future studies could then be used to have college students identify similar characteristics in themselves. A target population could be students showing a potential interest in mathematics or teaching such as pre-service elementary teachers; students in upper level mathematics courses; and any other students showing an aptitude in mathematics, science or teaching but as yet undecided in their career direction. Helping students identify in themselves characteristics that are also present in practicing secondary mathematics teachers could be a powerful aid in recruiting more secondary mathematics teachers and thereby addressing the shortage of mathematics teachers in our nation.

Appendix A

Consent to Participate for Study's Interview

Hello, my name is Kathleen Champion. I am currently a doctoral graduate student in the Department of Teaching and Learning, College of Education and Human Development at UND, collecting information for my dissertation. I am interested in becoming a more informed and hopefully better educator and researcher of education. You are being asked to take part in a research study. **The purpose of this study is to explore the perceptions of practicing teachers. If you agree to take part in this research study you will be agreeing to participate in no more than three interviews lasting from 30-60 minutes each.**

Although you may not benefit from taking part in this study, your participation may lead to increased knowledge about yourself. Every precaution will be taken to ensure that there are no risks involved for your participation. I will develop a coding system to assign each participant a three-digit identification number. Once the interview audiotape and transcribed data from the audiotape are matched, the three-digit identification number will be used to replace the participant's name throughout the data analysis and subsequent research processes. **Any information obtained will be held in the strictest of confidence. Your participation is voluntary and you may withdraw at any time. Please note that your responses will be used for research purposes only and will be strictly confidential.** Only the researcher, her advisor and people who audit IRB procedures will have access to the data. **The data will be stored for three years in a locked box separate from another locked box containing only the consent forms. After three years the data in both boxes will be shredded beyond recognition, and the audiotapes will be burned.**

Are you willing to participate in this study?	YES _____ NO _____
Name: _____ (Please Print)	
Email Address: _____	
_____ Signature	_____ Date

Thank you very much for your help with this study. If at any time you are uncomfortable and wish to end your participation in this study, you may do so. You will receive a copy of this consent form. If you have any questions or are interested in the results of this study, please contact me at 1-800-437-4104 or by emailing k_champion@mail.masu.nodak.edu, or my advisor, Dr. Margaret Shaeffer at 777-3733. Or the UND Office of Research and Program Development at 777-4278.

Appendix B

Table 7. Frequencies of the codes leading to Theme One: Certain Personality Characteristics Contribute to Positive Learning Environments for Students

Freq.	All Teachers	Elem.	Dual	Sec.	Elem. Trained	Sec. Trained	Class A- female	Class B- male
Codes Character.	N=6	N=2	N=2	N=2	N=4	N=4	N=3	N=3
Sense of Humor	4/6	1/2	1/2	2/2	2/4	3/4	1/3	3/3
Organized	4/6	0/2	2/2	2/2	2/4	4/4	2/3	2/3
Clear Expectns	5/6	1/2	2/2	2/2	3/4	4/4	2/3	3/3
Loves Math	5/6	1/2	2/2	2/2	3/4	4/4	2/3	3/3
Kid driven	3/6	1/2	0/2	1/2	2/4	1/4	1/3	2/3
Knows is Human	3/6	1/2	1/2	1/2	2/4	2/4	2/3	1/3
Likes Teaching Math	3/6	0/2	1/2	2/2	1/4	3/4	1/3	2/3
Flexible	3/6	1/2	0/2	2/2	1/4	2/4	2/3	1/3
Respect Students	4/6	1/2	1/2	2/2	2/4	3/4	2/3	2/3
Having Fun	2/6	1/2	0/2	1/2	1/4	1/4	0/3	2/3

Appendix C

Table 8. Frequencies of the codes leading to Theme Two: Certain Teaching Methods Encourage Students to Take Responsibility for Their Learning

Freq.	All Teachrs	Elem	Dual	Sec.	Elem. Trained	Sec. Trained	Class A-female	Class B-male
Codes TchMet	N=6	N=2	N=2	N=2	N=4	N=4	N=3	N=3
Critical Thinkng	4/6	2/2	1/2	1/2	3/4	2/4	2/3	2/3
Taking Notes	2/6	0/2	1/2	1/2	1/4	2/4	1/3	1/3
Math Maniplt	2/6	1/2	1/2	0/2	2/4	1/4	1/3	1/3
Lecture Less	3/6	1/2	1/2	1/2	2/4	2/4	1/3	2/3

Appendix D

Table 9. Frequencies of the codes leading to Theme Three: Role Models, Favorite Teachers, Family, and/or Coaches Influenced the Teachers' Decision to Make Mathematics Teaching Their Career Choice.

Freq.	All Teachrs	Elem.	Dual	Sec.	Elem. Trained	Sec. Trained	Class A-female	Class B-male
Codes Inflnce	N=6	N=2	N=2	N=2	N=4	N=4	N=3	N=3
Family	4/6	2/2	1/2	1/2	3/4	2/4	2/3	2/3
Love of Learng	4/6	1/2	1/2	2/2	2/4	3/4	3/3	1/3
Tchrs	6/6	2/2	2/2	2/2	4/4	4/4	3/3	3/3
Educ is impt	3/6	1/2	1/2	1/2	2/4	2/4	2/3	1/3
Passnt	2/6	0/2	1/2	1/2	1/4	2/4	1/3	1/3

Appendix E

The Seven Parent Codes

The next step of data analysis was to formulate categories of the data. The Ethnograph software allows each code to be assigned a parent code. The assignment of parent codes to each code was to facilitate the classification of data into categories. As each description of a code was read it was assigned an appropriate parent code. Seven parent codes adequately categorized the more than four hundred original codes. For example, SENSEHUMOR was assigned the parent code of SELFDESC, which means self-description. The seven parent codes or categories of data in order of frequency are:

1. SELFDESC = self-description
2. RLMDLFAM = role model and/or family
3. TCHNGMET = teaching methods
4. COACHEXP = coaching experience
5. STUDDTES = descriptions of students
6. TCHNGLVL = grade level (courses) taught
7. WHYWNTCH = why participant wanted to be a teacher

Appendix F

Nine Child Projects

To facilitate the analysis of data, the Ethnograph software allows different files to be grouped together into child projects, assigned a name, and analyzed with individual frequency counts and comparisons. Child projects do not have the same meaning in regards to the parent codes mentioned above. Child projects are helpful in working with groups of interview files. Recall that each interview has its own file in the Ethnograph program. Each of the nine child projects that were constructed consisted of a minimum of two files and a maximum of four files. All child projects and their descriptions are listed below.

1. ELPRACTCH = two practicing elementary (fifth grade) teachers
2. SECPRATCH = two practicing secondary teachers
3. ELSECDUAL = two dual certified elem. & secondary teachers
4. FEMALETC = three female teachers
5. MALETC = three male teachers
6. ELTRAITC = four elementary trained teachers
7. SECTRAINT = four secondary trained teachers
8. CLSSATCHR = three teachers in Class A schools
9. CLSSBTCHR = three teachers in Class B schools

Table 10. Codes, Themes, Assertions.

CODES	THREE THEMES	ASSERTIONS
<i>Teachers Relating to Students:</i>	THEME ONE	Assertion #1 Teachers felt it was
Sense of humor	Certain	important to have good
Admits mistakes	personality	relationships with students
Kid driven	characteristics	Assertion #2 Showing respect for
Respect for students	contribute to	students and interest in their daily
<i>Teachers relating to mathematics</i>	positive	lives was important to the tchrs
<i>and teaching:</i>	learning	Assertion #3 Teachers felt that
Loves mathematics	environments	when they, themselves, were
Has fun teaching mathematics	for students	interested in math & were
<i>Teachers creating</i>		enthusiastic about teaching, the
<i>the learning environment:</i>		learning environment improved
Clear expectations		Assertion #4 Teacher attributes
Flexible		contribute to a positive, more
Organized		efficient, learning environment

Table 10. cont. Codes, Themes, Assertions

CODES	THREE THEMES	ASSERTIONS
<i>Teaching Methods:</i>	THEME TWO	Assertion #5
Fostering Critical Thinking	Certain teaching	Teachers want students
Students Taking Notes	methods encourage	to think and learn for themselves
Using Math Manipulatives	students to take	Assertion #6 Hands on teaching
Students Making Projects	responsibility	methods can enhance
Teachers Lecturing Less	for their learning	a child's learning experience
<i>Influences on Career Choice:</i>	THEME THREE	Assertion #7 Family, who were
Family who were teachers	Role models, favorite	teachers, often influenced
Favorite teachers, coaches	teachers, coaches	participants to become teachers
	and/or family	Assertion #8 Favorite teachers
<i>Messages transmitted:</i>	influenced teachers'	often influenced participants
Love of Learning	decision to make	to become teachers
Education is important	mathematics teaching	Assertion #9 Coaches influenced
Passionate about Teaching	their career	participants to become teachers

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