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The prevalence and function of mathematics specialists across southern New Jersey

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THE PREVALENCE AND FUNCTION OF MATHEMATICS SPECIALISTS ACROSS SOUTHERN NEW JERSEY

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ABSTRACT

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2005-06

Dr. Louis Molinari

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The purpose of this descriptive study was to examine current practices regarding math specialists in the eight southern counties of New Jersey. Additionally, information on training opportunities offered by several universities was presented and compared to the certification requirements of other states. A written survey was mailed to a proportional stratified random sample (n=45), categorized by county and socioeconomic status. Both simple percentages and tests of significance (t-test and chi-squared) were used in analyzing the data. This study found there were no significant differences in the number of math specialists working in economically disadvantaged districts compared to other, more affluent districts. There were, however, significant differences in the desired qualifications/ characteristics of math specialists across socioeconomic classifications. The evolving nature and lack of standardization regarding math specialists was noted throughout, as was the absence of scientific research on the effectiveness of such individuals. The implications of the findings of this study are discussed.

BRIEF ABSTRACT

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This descriptive study examined current practices regarding math specialists in southern New Jersey. Training opportunities at several universities were presented and compared to certification requirements in other states. A written survey was mailed to a proportional stratified random sample (n=45), categorized by county and socioeconomic status. No significant difference was found in the number of math specialists working in economically disadvantaged districts compared to more affluent districts. Significant differences were found in the desired qualifications/characteristics of math specialists across socioeconomic classifications.

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CHAPTER ONE: THE PROBLEM

Concerned about the progress of American students, educational leaders have initiated training programs so that elementary teachers in this country can gain the specialized knowledge needed to be more effective in the classroom. Historically, elementary school teachers in the United States were expected to have a working knowledge on a plethora of subjects. Most undergraduate teacher preparation programs acknowledged the need for a wide spectrum of information and required pre-service candidates to enroll in a variety of courses in order to be adequately prepared for the demands of an elementary classroom. This tendency towards a broad range of subjects has resulted in course offerings with little depth. Arguing against this shallow course of study, the National Council of Teachers of Mathematics (NCTM) has become a well known advocate for teachers to have a deeper, more solid understanding of the domains they teach (NCTM 2000). Employing math specialists has become one option used to counteract such superficial study by self-contained generalist teachers.

Statement of the Problem

What are the practices of school districts in southern New Jersey with regards to Mathematics Specialists? Do colleges and universities offer graduate-level programs to current professionals who desire additional training? Even in the absence of a state directive, mandate, or funding, could it be that school districts have created positions for math specialists? Could it be that such jobs occur more often in one socioeconomic setting than others?

Purpose of the Study

It is the purpose of this study to survey administrators from school districts in southern New Jersey to determine the extent to which math specialists are used in classrooms. Existing programs will be compared to research literature, and attitudes toward the qualifications and duties of math specialists will be assessed.

Limitations of the Study

Because of the nature of this study, it is not widely generalizable. Other regions within the State of New Jersey may have very different situations—financially, culturally, environmentally—and so assumptions or extensions to other areas made based on these results may be flawed or incomplete. Certainly within South Jersey there are multiple factors which influence whether a district employs a math specialist, and readers must be careful not to extrude this data from the context in which it was gathered. This study was meant solely as descriptive survey and was intended to create a broad overview of current practices regarding math specialists in southern New Jersey. Further, the opinions gathered from respondents may be based on limited or biased knowledge of the topics addressed. Steps have been taken to ensure that the information gathered is as accurate as possible.

Scope

This study intends to develop and test hypotheses regarding the number of math specialists in southern New Jersey and the sort of districts utilizing this type of professional. It is also the intent of this study, however, to provide a broad sense of the climate in southern New Jersey regarding math specialists; this includes college offerings aimed a training math specialists.

Background

Several recent events have renewed the familiar depth-versus-breadth debate on quality instruction, particularly in mathematics. The release of updated standards for curriculum and instruction along with a mandate for highly-qualified teachers in every classroom fueled a growing demand for a challenging curriculum applicable—and adaptable—to the needs of a new generation of students.

The first event was the release of *Principals and Standards for School Mathematics*, published by NCTM in 2000. This document was an update of the groundbreaking 1989 *Curriculum and Evaluation Standards for School Mathematics.* The original *Standards* was written in response to calls for reform in mathematics education and was hailed as a "revolutionary document." (Senk & Thompson 2003). The 2000 document outlines a Vision, six Principles, and Standards encompassing all domains of mathematics. The standards are divided into grade-bands (K-2, 3-5, 6-8, and 9-12) with learning expectations delineated for each level. This "ambitious and comprehensive set of curriculum standards for all students" has come to be the model used by states in developing their own content standards (NCTM 2000, 7). It has become the premiere document in establishing high expectations in mathematics education.

A second important event fueling the improvement of mathematics education was there authorization of the Elementary and Secondary Education Act, touted as the No Child Left Behind (NCLB) Act of 2001. When President George W. Bush signed this into law on January 8, 2002, he was approving a plan to improve the overall education of children in the United States. As a result, students are tested annually, with results reported to parents and other community members; schools must demonstrate annual

yearly progress (AYP) with the ultimate goal of 100% of students demonstrating proficiency on math and reading assessments by the 2013-2014 school year. Further, classroom teachers must document that they are "highly qualified" in each content area they teach. The No Child Left Behind Act (NCLB) has forced educators to make changes and improvements to curriculums, facilities, and pedagogy in attempts to better service students (US DOE, 24 Nov. 2005).

Proponents of in-depth training in mathematics and pedagogy have developed programs and instructional positions to address the growing demand for teachers with strong mathematics backgrounds. Understanding that it is unrealistic for elementary generalists to master every subject they teach, leaders in the field of education have called for the creation of mathematics specialists positions, particularly for the elementary grades. Math specialists, as defined by Barbara Reys and Francis (Skip) Fennell, are teachers "with particular knowledge, interest, and expertise in mathematics content and pedagogy." Such positions are created in American schools often because of grant funding and may take on numerous titles, including resource teacher, coach, liaison, support teacher, or facilitator (2003).

While a number of these specialist positions in the United States are funded through grants, other countries around the world have developed programs to ensure a more wide spread use of this assignment to improve performance in mathematics for all students. Elementary teacher candidates in Sweden and South Korea, for example, must choose three areas of specialization for their university coursework, and from these, study one in-depth. As practicing professionals in these foreign countries, teachers work in teams or teach all elementary subjects, as in the traditional American model. Although

these foreign teachers may still be required to teach multiple disciplines, experts in every subject are present on each school staff. These experts have more training in the content and pedagogy of their expertise area than their peers and can serve as resources to colleagues (Reys & Fennell 2003).

Both the National Science Foundation (NSF) and the Exxon/Mobil Educational Foundation have supported numerous training programs to prepare math specialists for new positions. Project IMPACT and the Kentucky K-4 Math Specialists Project were two such ambitious undertakings in the early 1990's aimed at preparing a significant number of math specialists over the course of several years.

It seems that in addition to private organizations like ExxonMobil and the National Science Foundation, State Departments of Education are recognizing the need for math specialists as well. A 2001 report from the Maryland Mathematics Commission recommends the state develop a certificate for mathematics specialists (Reys & Fennell 2003; MSDE 2001). This past year, Governor Ruth Ann Minner included $1.3 million in Delaware's 2006 budget to place math specialists in 22 middle schools across the state (Delaware 2005). Ohio has also taken steps in the legislature to provide math specialists to that state's schools. But while the call for math specialists has been present for years, it seems only now that states are taking heed of the recommendation.

Virginia has taken the most concrete steps of any state, however, in establishing math specialists in their schools. Going one step farther than Maryland, who to date has only outlined recommendations, Virginia has actually developed a certificate required to fill the position of Math Specialist. Statewide, universities in Virginia have created graduate programs to train teachers interested in becoming certified as math specialists.

Beginning in 2004, the National Science Foundation provided a five-year grant to the Virginia Mathematics and Science Coalition (VMSC), designed to not only fund the preparation of teachers across the state, but also to study the effectiveness of the program. Scheduled to conclude in May, 2009, this will be a "comprehensive research program on the impact of Mathematics Specialists on student learning (VMSC 2005).

The results of this five-year study will have a remarkable impact on the future of math specialists across the United States. Favorable results will most likely encourage more states to adopt certification and training programs, yet unfavorable results may tempt officials to abandon current programs. A website detailing the VMSC study, entitled *Mathematics Specialist: Research Study and Pilot Program* states "If, indeed, Specialists can catalyze increas[ed] student learning and achievement in the ways that we believe possible, we...must act in a timely...manner" (RSSP 2005). This timely action would increase learning opportunities for countless mathematics students across the country. It appears that other states besides Virginia are looking to incorporate math specialists into classrooms on a wide scale, or have done so in the past. With this knowledge, what is New Jersey doing with regards to this trend in mathematics education? What role do the colleges play in this plan? This thesis will examine the current practices in southern New Jersey, independent of state requirements to implement a Math Specialist program

Significance of the Study

This study may contribute significantly to the knowledge and practices of administrators and others involved in mathematics education, particularly in southern New Jersey. Presently, there is no single document which quantifies how many math

specialists are employed in this region. Further, there is no standardization of job functions, so a sample of activities will also be recorded. Professionally, educators and administrators will be able to examine the opportunities for growth and educational improvement through the study of literature and current practice. As one piece in the puzzle of improving mathematics instruction, it is hoped that this research will bring about educational change and encourage the use of best practices in mathematics education, whether or not the use of mathematics specialists is effective.

Organization of the Study

Chapter One serves as an overview of the study. It presents information regarding the significance of the study and the need for this information within the educational community. This section of the thesis briefly describes the purpose and hypotheses of the study, as well as the methods used to gather information. It also defines terms used throughout the study.

Chapter Two reviews existing literature related to the topic. Reference is made to material initially presented in the first chapter, and a more in-depth examination of previous research, along with programs and pilot studies in other states, is offered in this section.

Chapter Three outlines in detail the methods and procedures used in the study. Here, the population is defined and sampling methods are determined. A description of the survey developed for this study, along with information regarding reliability and validity, will be presented. Finally, an outline of the data to be collected and how it is to be analyzed will be defined.

Chapter Four presents results of the survey. An analysis of the data collected

during the study will be given. The hypotheses will also be tested based on the data analysis and conclusions will be drawn.

Chapter Five summarizes the findings of the study. Comparisons of New Jersey data will be made with previously published research. Recommendations for both action and further study will be made in this final section.

Definition of Terms Used

Math specialist—also, *Math Coach, Math Facilitator, Math Resource Teacher, Math Liaison, Math Support Teacher*—teachers with particular knowledge, interest, and expertise in mathematics content and pedagogy who also facilitate professional growth among their colleagues with regards to mathematics instruction (Reys & Fennell, 2003; MSP 2005).

Generalist—teacher who instructs in multiple content areas, usually in a self-contained elementary classroom

Release time—period when a teacher is excused from regular classroom responsibilities to perform special tasks

District Factor Group (DFG)—system used by the New Jersey Department of Education to rank school districts according to socioeconomic status. DFG is calculated based on seven factors observed in each community: percent of population with no high school diploma, percent with some college, occupation, population density, income, unemployment, and poverty. (NJ DOE 2006). Districts with an A or B rating tend to be poor, urban or rural communities. CD and DE classifications are lower- and middle-class communities, often bordering on A or B districts. FG and GH communities are upper-middle class districts located in the suburbs. I and J districts are wealthy, affluent, upper-

class towns.

Likert Scale—method of response where participants are asked to indicate their level of agreement to each item in a list; traditionally a five-point scale is used, but for this study, a scale of three points was applied

NCTM—The National Council of Teachers of Mathematics, a national organization in the United States that provides leadership and professional development for mathematics educators at all levels.

AMTNJ—The Association of Mathematics Teachers of New Jersey, an affiliated group of NCTM, working within the state of New Jersey.

Statement of the Hypotheses

1. There will be no significant difference in the number of math specialists working in economically disadvantaged districts (DFG A and B) compared to other, more affluent districts (DFG CD-J).
2. Across socioeconomic classifications, there will be no significant difference in the desired qualifications of math specialists.

Methods of Study

In order to assess the current situation regarding mathematics specialists in southern New Jersey, a review of existing literature was conducted. This included previous projects aimed at developing the mathematical content knowledge of elementary teachers, the purpose for such specialization, and opinions from leaders in the field regarding the use of such well-trained practitioners. A review of other states' requirements for certification was also included in the study.

Based on current literature and research, hypotheses were developed relative to

the study. The population was defined and subjects were selected according to a stratified random sample. A survey was constructed specifically for this study. The survey gathered information regarding current positions in districts, general demographic information, as well as respondents' opinions on qualifications and duties of a math specialist, regardless of whether that district employed someone in such a position. The data collected during the study was analyzed across socioeconomic classifications as well as geographically by county. Conclusions were drawn and recommendations were made based on the results of this analysis. As a result, a sketch of the practices in southern New Jersey regarding math specialists was made.

CHAPTER TWO: REVIEW OF LITERATURE

While math specialists are beginning to work in southern New Jersey, the concept has gained increased national attention. These specialists can provide expertise in content knowledge that other generalists can not. Many Americans—both in the field of education and in the general public—would agree that it is important for "students [to] receive mathematics instruction from teachers who understand mathematics content, know how students learn mathematics, and are able to use instructional and assessment strategies that help students learn mathematics" (Reys & Fennell 2003). In other words, it is important that students learn from well-trained teachers. This notion is problematic at the elementary level, however, especially with regard to specific content knowledge. Teachers at this level work as generalists, teaching many subjects in self-contained classrooms. How can such generalists be expected to have rigorous, quality training in multiple content areas? Stephen Willoughby likens the situation to doctors and lawyers, who receive generalized training, but then specialize in particular fields. This specialization diminishes the need for working knowledge of an overwhelming body of information (1987). Since educators at the elementary level do not often specialize in content-specific classrooms, many are not "adequately prepared" for the academic demands established by the new curriculum standards (Miller 1992).

Background

Historically, educators felt that a single teacher, who could provide structure and consistency to young learners, best served elementary school children. The focus at this age was on the social and psychological development of the child; little emphasis was

placed on the rigor of academic instruction (NJ Coalition 1996; Willoughby 1987). The standards movement, with a call for increasingly demanding concepts to be taught at younger and younger ages, does not seem to support this notion of social development. Further, there are a large number of elementary school teachers who were trained and are now practicing in the traditional belief of child growth.

The opinion that generalist elementary teachers are unprepared for the rigorous content of a standards-based curriculum has caused many officials in education to reexamine the current practices of schools in the United States. The movement to train and hire mathematics specialists is gaining strength, especially considering the increasing emphasis on accountability. As early as 1976, Dr. James Heddens of Kent State University wrote of the need for what he called Mathematics Clinicians, defined as "professionally trained mathematics specialists." Continuing that theme nearly thirty years later, then-President of the National Council of Teachers of Mathematics (NCTM) Johnny Lott wrote in an online chat "the specialist notion may not be the sole answer, but it should help with the problem of having teachers who are afraid of math or unsure of their knowledge of math. . . . There are many indicators that....tell us that specialists are needed" (2003).

Defining and Developing Math Specialists

While the duties and responsibilities of a math specialist can vary greatly from school to school and district to district, the basic description of the position holds constant no matter where one looks. Virginia is currently training the first cadre of mathematics specialists in that state and makes use of this definition:

> Mathematics Specialists are teacher leaders with strong preparation and background in mathematics content, instructional strategies, and school leadership. Based in elementary and middle schools, mathematics specialists are excellent teachers who are released from full time classroom responsibilities so that they can support the professional growth of their colleagues, promoting enhanced mathematics instruction and student learning throughout their schools. They are responsible for strengthening classroom teachers' understanding of mathematics content, and helping teachers develop more effective mathematics teaching practices that allow all students to reach high standards as well as sharing research addressing how students learn mathematics. (MSP 2005)

In 1976, when Heddens outlined the need for math clinicians, he expected that these specialists would be skilled in identifying and treating mathematical problems students were experiencing in the classroom (1976). Today's specialists, however, are responsible for more than just diagnosing students' problems. Such professionals collaborate with colleagues, design instructional approaches, align curriculum to the standards, and assist with instruction. They apply research findings to classroom practices, provide leadership, and work with parents and community members to enhance the math program and student learning. Math specialists provide enrichment opportunities for gifted learners and answer administrators' questions regarding programs and curriculum. They may also be asked to work closely with newer teachers and make or order materials. (MSP 2005; Dossey 1984; Rowan & Campbell 1995). The two viewpoints seem in sharp contrast to each other. Perhaps a combination of Hedden's

student-remediation model and the modern curriculum-trainer model would produce the ideal situation.

When the movement toward math specialists in elementary classrooms began to gain strength in the early 1990's, it appeared that this approach would allow the new NCTM Standards to be quickly disseminated to teachers across the country. Selected specialists received training in the new method of teaching called for by a standards-based curriculum, and in turn, trained others in their district or region. The current view of math specialists seems to focus more on mathematics content, an efficient way to bring the mandated highly-qualified, content specialists into American classrooms. This shift in attitude is understandable since practicing teachers have had nearly two decades worth of experience with standards-based education and novice teachers now are trained in their coursework. Regardless of a district's socioeconomic status, however, the turn-key style of instruction remains popular in many programs across the country.

Models for Implementation

Reys & Fennell (2003) identify two distinct models for implementation of math specialists positions, both of which are seemingly variations of the turn-key style of instruction detailed above. These models are referred to as *Lead Teacher* and *Specialized-Teaching Assignment*. Variations of these models have been noted in programs across the country.

In the first model, *Lead Teacher,* math specialists are released from classroom responsibilities and the focus shifts to supporting classroom teachers. Specialists may aid in planning and professional development, or gather resources. Often, they may demonstrate instructional techniques or substitute for classroom teachers who wish to

observe colleagues' lessons. A disadvantage to this model is that more staff is required to effectively carry out the plan; extra staffing can be difficult to acquire in tough financial times (Reys & Fennell 2003). Further, this model removes an experienced, highly trained teacher from regular contact with students and requires funding of an additional classroom position; administrators must evaluate whether the benefits of such a situation outweigh the costs (Mangin 2005).

In the second model, *Specialized-Teaching-Assignment,* all teachers have instructional responsibilities for reading and language arts. Teachers then choose one subject to specialize in—either math, science, or social studies. This allows teachers the ability to concentrate on only two subjects rather than the plethora normally demanded in traditional elementary classrooms. The result is more focused professional development opportunities and higher quality lessons since teachers can attend to a smaller range of material. From an administrative perspective, this model is more cost effective because it can be accomplished with existing personnel (Reys & Fennell 2003). Miller refers to teachers in this situation as "semispecialists" who work together in diads (two teachers) or triads (three teachers)—teams of professionals who all teach reading and language arts, but specialize in only one other content area (1992).

Much of the available research and literature seems to favor the lead teacher model, suggesting a preference for specialists who are released from classroom responsibilities. Stephen Currie, a teacher at Poughkeepsie Day School in New York, described his work as a mathematics specialist under the lead teacher model.

> I observe kids, teach classes on a fairly regular basis, run small group lessons,...do some pull-out work with kids who are struggling... I also do

> a lot of consulting with teachers about kids and curriculum...[and] I take the lead in assessment. ... Originally I think the job was going to have more to do with individual kids and pull out work...but it quickly appeared that the greater need was curriculum." (personal communication, November 21, 2005)

No matter the model a school follows or the duties of individuals, the goal in each of these programs is to change the way mathematics is taught so children gain a better understanding of the material presented to them. (Rowan & Campbell 1995; Houston 2005; Witte 1994).

Qualifications and Characteristics

So how is it that a classroom teacher comes to be known as a Math Specialist? The literature suggests that initially, extensive background in mathematics is not necessary; more important is their interest in mathematics and the teaching of mathematics. Experience in the classroom can then be supplemented with training and coursework in mathematics content and pedagogy (Willoughby 1987). Reys & Fennel also cite the ability to work with parents and community members, the ability to lead, and acceptance by peers as key components in the selection of math specialists (2003). Rowan and Campbell agree that acceptance is important, proposing that for a math specialist, the more recent the classroom experience, the more likely it is that other classroom teachers will accept the specialist's role (1995).

Once candidates for the math specialist position are identified, the training is analogous to that of reading specialists. Often fifteen to thirty or more credits of coursework in mathematics, pedagogy, and leadership are required. Constructivist theory

is often included in such training, and candidates are required to develop a broad understanding of not just what students are presently learning, but what prior experience these students have in mathematics and the demands future activities will present (Rowan & Campbell 1995; Reys & Fennel 2003). Such a broad training and solid foundation is applicable to working with populations at every socioeconomic level and prepares specialist candidates to teach students with a variety of needs.

Programs for Training and Implementation

Recognizing the need for change in mathematics education, several organizations have made substantial contributions and long-term commitments to establishing programs in schools. The National Science Foundation and Exxon Mobil Educational Foundation are two prominent contributors to initiatives aimed at improving the mathematics education of children. State governments—notably Kentucky, Texas, Vermont, Ohio, and Virginia, all of whom have rather diverse populations—have also committed to improvement in math education.

The Kentucky K-4 Mathematics Specialist Program was among the earliest plans to bring math experts to elementary students. Beginning in mid-1990, this program hoped to train enough teachers to establish a network of elementary math specialists across the state who could serve approximately one in five schools. In the spring of 1991, thirty teachers piloted the training seminar and regional teams developed more specific training modules which would be used in the wide-scale program. That fall, each regional team trained candidates—240 in all—in fifteen three-hour seminars. The candidates attended one night a week and could elect to receive graduate credit for their efforts.

During these seminars, modules covered specific math content, as well as topics such as integration of problem solving, use of manipulatives, implementation of group work, calculators, and computers, and alternate forms of assessment. Participants also discussed how to prepare and present workshops to their peers to further spread this information. Requirements of the seminars included reflective journal entries, field testing activities in classrooms, and completing challenging math problems and reading assignments. By the end of the program, nearly 400 teachers had been trained specifically in this program, with countless others benefiting from the interaction with a math specialist. As a result of this program "elementary school teachers have a substantial representation in the mathematics education community as well as in statewide activities in mathematics education" (Bush 1994). Some funding was provided by the ExxonMobil Foundation and through Eisenhower grants, but unfortunately the program ended in 1996 when funding was exhausted (W.S. Bush, personal communication, November 21, 2005).

Another program funded by the ExxonMobil Foundation was the Houston A+ Challenge in the Houston Independent School District (ISD). This multi-year program started in 2000 with five trained math specialists working in eight elementary schools throughout the district. The following year, the number of specialists doubled, and in the third year, students in fifteen K-5 schools were serviced by math specialists. (Houston 2005).

While the Kentucky program reflects the early approach to math specialists, one of speedy dissemination of new information and techniques, the Houston initiative represents the more current practice of highly-qualified content specialists. In fact, the

Houston initiative moves toward the ideal blend of Hedden's clinician and the modern curriculum-trainer models discussed earlier. In Houston, math specialists work with teachers and administrators to develop opportunities and programs based on research. But they are also in classrooms, co-teaching and working directly with children (Houston 2005).

ExxonMobil has funded math specialist programs in nearly 120 school districts; their commitment to changing the face of mathematics education can be felt across the United States. States such as Vermont have developed programs similar to those supported by the private foundations.

The Vermont Mathematics Initiative, started in 1999, demanded a significant commitment of time from its participants. A cohort of 35-40 teachers received instruction over two weeks in the summer then met for three weekends each semester. At the conclusion of three years, participants earned a Master's degree. The program was free to both public and private elementary teachers, with the $4000 tuition split by the state and participating districts. Teachers in this program were challenged not only by the content they would eventually share with students, but also by the content they were asked to personally master. A change in philosophy was also evident. One participant commented "I didn't say the same thing louder and slower…I understood what the kids needed to know" (Galley 2004).

Elsewhere in the United States, efforts to improve mathematics education are present but have not received the same notoriety as the Kentucky, Houston, or Vermont programs. An example of such efforts can be seen in the Project IMPACT program, operating in Maryland just outside of Washington, D.C. Project IMPACT was geared to

instructional reform in an urban setting; the goal was to deliver high quality professional development. Math specialists were embedded in each elementary school to initially conduct the training and then provide follow-up programs in subsequent years (Rowan & Campbell). Training began with teachers in the lower grades and a new group of educators was prepared each year as students progressed through school, so that after several years, all teachers were better prepared to teach standards-based mathematics.

Perhaps the most ambitious attempt at developing math specialists is underway in Virginia. There, the Department of Education established licensure requirements for those wishing to work as math specialists in K-8 schools. Beginning in Summer 2004, specialists would be required to have at least three years experience teaching mathematics, a master's degree and a minimum of 21 credit hours of coursework in math, pedagogy, knowledge, and leadership. Those who hold a master's degree in another field could take additional coursework to obtain the specialist certification; others could enter a program offered by one of several universities statewide specifically designed for a degree as a Math Specialist (Licensure 2004).

The Virginia Department of Education has secured funding to support a "fast-track" program, enabling eighty candidates to meet the coursework requirements for the math specialist license between May 2004 and September 2005. In addition to condensed, intensive coursework, reduced tuition is offered to candidates in approved programs. The goal is "to quickly prepare as many teachers as possible for licensure" (Licensure 2004). As with many programs, specialists in Virginia will help teachers initiate new instructional approaches and incorporate technology and assessment into their practice (VCU 2005). According to Dr. William Haver, a professor of mathematics

at Virginia Commonwealth University, "a math specialist can work with classroom teachers to develop strategies that are appropriate for each student" (VCU 2005).

While the efforts to train a plethora of math specialists are commendable, is the specialists' work with teachers and students having an impact on learning? There is anecdotal information that specialists are able to improve student performance in mathematics, but there is little scientific research available (VCU 2005). A National Science Foundation grant is funding the first scientific study on the effectiveness of math specialists on student learning and teacher change. Also in this five-year study, scheduled to conclude in 2009, is an analysis of policy issues surrounding the realization of such a massive undertaking as the Virginia math specialist licensure program (RSPP 2005). The National Council of Teachers of Mathematics suggests that the results of the Mathematics Specialist in K-5 Schools: Research and Policy Pilot Study in Virginia "may shape state policy" (Sanchez & Ice 2005).

Summary

There are a multitude of factors which influence districts' decisions to employ math specialists. In addition to considering cost, space availability, student and teacher needs, and state and national education mandates, the NSF study will give concrete, research-based information regarding the effectiveness of such programs. Such scientifically gathered information will perhaps be a deciding factor in the implementation of a math specialist program for many districts.

With the call from the federal government to "leave no child behind," math specialists may prove to be the answer in increasing math performance and raising test scores in underprivileged and disadvantaged schools. Until conclusive evidence is

obtained from the Virginia Pilot study, however, some districts are desperate to improve and have initiated the role of math specialist on their own. While several different models have been used in states around the country in a variety of settings, no real results have been reported.

CHAPTER THREE: DESIGN OF THE STUDY

The purpose of this study is to discover the practices of school districts in southern New Jersey with regard to the use of math specialists. It will also compare the desired qualifications for math specialists across socioeconomic groupings. Additionally, this study examines and compares the offerings of New Jersey universities with what research suggests is appropriate for the training of math specialists. The following discourse will address the specific design of the study, including:

- sampling methods
- a description of the survey instrument, with information on reliability and validity
- how the instrument relates to the null hypothesis
- the procedures used to conduct the study
- methods used to analyze the data
- issues related to the protection of human subjects.

Setting

This study was conducted in the southern third of New Jersey. The populations of each of the eight counties vary widely in size, ethnicity, income, and post-secondary schooling. Settings range from urban to suburban to rural, with schools and communities of all sizes and configurations. What follows is a more detailed examination of each county with information obtained in 2000 from the United States Census Bureau at http://quickfacts.census.gov/qfd/states/. A comparison and summary of all eight counties is given in Table I.

Table I

Comparison of 2000 Census Information for Eight Southern Counties in New Jersey

	State	County							
	New Jersey	Atlantic	Burlington	Camden	Cape May	Cumberland	Gloucester	Ocean	Salem
Population	8,414,350	252,552	423,394	508,932	102,326	146,438	254,673	510,916	64,285
Persons under 18 years old (%)	24.8%	25.3%	25.2%	26.8%	22.3%	25.4%	26.4%	23.3%	25.6%
White (%)	72.6%	68.4%	78.4%	70.9%	91.6%	65.9%	87.1%	93.0%	81.2%
Black or African American (%)	13.6%	17.6%	15.1%	18.1%	5.1%	20.2%	9.1%	3.0%	14.8%
Asian (%)	5.7%	5.1%	2.7%	3.7%	0.6%	1.0%	1.5%	1.3%	0.6%
Hispanic or Latino (%)	13.3%	12.2%	4.2%	9.7%	3.3%	19.0%	2.6%	5.0%	3.9%
Living in same house 1995 & 2000, (% age 5+)	59.8%	57.6%	60.0%	63.0%	61.1%	60.9%	65.4%	60.4%	67.2%
Language other than English spoken at home (% age 5+)	25.5%	20.3%	10.3%	15.8%	6.6%	20.4%	6.5%	10.9%	6.3%
High school graduates, % of persons age 25+	82.1%	78.2%	87.2%	80.3%	81.9%	68.5%	84.3%	83.0%	79.4%
Bachelor's degree, % of persons age 25+	29.8%	18.7%	28.4%	24.0%	22.0%	11.7%	22.0%	19.5%	15.2%
Median household income, 1999	$55,146	$43,933	$58,608	$48,097	$41, 591	$39,150	$54, 273	$46, 443	$45,573
Persons below poverty (%), 1999	8.5%	10.5%	4.7%	10.4%	8.6%	15.0%	6.2%	7.0%	9.5%
Land area (square miles)	7,417	561	805	222	255	489	325	636	338
Persons per square mile	1,134.4	450.1	526.2	2,289.4	401.0	299.3	784.3	803.0	190.3

Atlantic Located in the southwestern portion of the state, along the shores of the Atlantic Ocean, Atlantic County, New Jersey is home to over 252,000 residents. The county spans 561 square miles and reports 450 persons per square mile (virtually one-third of the state average). Approximately 25% of the county is under the age of 18, with nearly 57% residing in the same house during the years 1995-2000. Atlantic is one of the more racially diverse counties in southern New Jersey, with an identified 68% White, 17% African American, 5% Asian, and 12% Hispanic. One-fifth of the county speaks a language other than English in the home.

With regards to education, approximately 78% of Atlantic county's residents age 25 and older are high school graduates, and nearly 19% of the population has earned a Bachelor's degree. Twenty-four school districts service the county. In 1999, the median household income was reported at just under $44,000, with 10.5% of Atlantic county residents living in poverty. Atlantic City, along with other shore communities, is a major tourist attraction for this county.

Burlington Covering 805 square miles, Burlington County, New Jersey is the largest in this study. Spanning the middle of the state from west to east, Burlington county is home to over 423,000 residents, 25% of whom are under eighteen years old. The county recognizes forty school districts and reports 87% of the population are high school graduates. 28% are identified as having earned a Bachelor's degree. About one in every ten residents speaks a language other than English in the home.

In 1999, the median income for Burlington county households was $58, 608 and only 4.7% lived in poverty. 60% were living in the same house in 2000 as they were in

1995. Ethnically, Whites comprise about 78% of the population, African Americans 15%, Asians 2.7%, and Hispanics 4.2%. The figures for Asians and Hispanics are noticeably lower than the state average. Burlington county is home to several military installations, including Fort Dix and McGuire Air Force Base.

Camden Situated on the banks of the Delaware River, just south of Burlington County, Camden County, occupies the smallest land area of all those included in the study (222 square miles), yet has the second largest population at nearly 509,000 residents. This equates to a staggering 2,289 persons per square mile, double the state average. Of the half million residents in Camden county, 26.8% are under the age of eighteen. These children are serviced by 39 public school districts. 80% of the population has graduated from high school and nearly one fourth have earned a bachelor's degree.

Roughly 16% of the population speaks a language other than English in the home. The racial composition of the county is 71% White, 18% African American, 4% Asian, and 10% Hispanic. 63% of the populace were living in the same house in 2000 as they were in 1995. The median income (1999) was just over $48,000 with one in ten living in poverty. Recent efforts at revitalizing the Camden (City) Waterfront include the construction of a concert venue, aquarium, and regional light rail line.

Cape May The southern-most region of the state, Cape May County, is the second smallest in this study, consisting of just 255 square miles. Over 102,000 people call this area home. The population of Cape May county, however, is not as ethnically diverse as others. About 92% are White, 5% African American, and 3% Hispanic; less

than one percent are of Asian backgrounds. Because of the limited diversity in this county, only about 6% speak a language other than English in the home.

Seventeen school districts service Cape May, where just over 22% of the population is under the age of eighteen. About 82% of the populace have earned a high school diploma, with 22% earning Bachelor's degrees. The median household income in 1999 was $41, 591 and 8.6%--just one-tenth above the state average—lived in poverty. 61% of the population resided in the same house from 1995-2000. Cape May boasts many seasonal shore communities, including the Wildwoods and historic Cape May; the Cape May-Lewes Ferry is also a popular attraction, shuttling between New Jersey and Delaware.

Cumberland Perhaps the most distinctive county in the study, Cumberland County, New Jersey is home to more than 146,000 people, a quarter of whom are under the age of eighteen. The county is situated on a total of 489 square miles. Fifteen school districts—including Vineland and Bridgeton—educate students here. About 69% of residents are high school graduates, with only about 12% earning a Bachelor's degree. (Both of these figures are well below the state averages of 82% and 30% respectively.)

The 1999 median household income in Cumberland County was slightly over $39,000, with 15% of the population living in poverty. Nearly 61% of residents maintained the same house from 1995 to 2000. Over 20% of residents speak a language other than English in the home, which is not surprising given the ethnic makeup of the county. Whites account for only about 66% of the population—the lowest county in this study; African Americans comprise about 9% of the population, and Asians, just 1%. The largest percentage of Hispanics in this study can be found in Cumberland County,

with 19% of the population identified in this category. The geography of Cumberland County is just as diverse as its ethnicity, ranging from large urban centers like Vineland and Bridgeton, to small, rural communities like Shiloh.

Gloucester Located just south of Camden County, on the banks of the Delaware River and across from Philadelphia, Pennsylvania, is Gloucester County, New Jersey. Gloucester County is home to nearly a quarter of a million people, living on 325 square miles of land. The 1999 median household income was about $54,000, the second highest in this study; connected to this statistic is only a 6.2% poverty rate, the second lowest. 22% of Gloucester county residents have earned a Bachelor's degree, with 84% completing high school. Over 65% maintained the same house from 1995 to 2000, trailing only Salem County in the southern part of the state.

Residents under the age of eighteen account for about 26% of the population. These children are served by twenty-seven school districts. Less than 7% speak a language besides English at home. The racial makeup of Gloucester County is not radically diverse, with 87% White, 9% African American, 1.5% Asian, and 2.6% Hispanic. Historically, this area was mainly agricultural, but has seen a recent boom in development.

Ocean The northwestern-most county in the study, Ocean County, New Jersey spans an area of 636 square miles and claims over a half million residents (the most in this study). Of the almost 511,000 residents, 93% are White, 3% African American, 1.3% Asian, and 5% Hispanic. About 11% speak a language other than English in the home, and about 60% did not move between 1995 and 2000.

Twenty-nine school districts in Ocean County service 23% of the population age eighteen and under. 83% of the residents completed high school and nearly 20% went on to receive a Bachelor's degree. The median household income in 1999 was over $46,000 and about 7% lived in poverty. Ocean County is home to many seasonal shore communities, including Long Beach Island.

Salem Finally, Salem County, New Jersey is the southeastern-most county examined here. Directly across the Delaware River from the state of Delaware and at the top of the Delaware Bay, Salem County is the smallest in the study, with a population of only about 64,000 people. Covering just 338 square miles, Salem is the least densely populated of the eight southern counties, with just 190 persons per square mile. The 1999 median income was $45,573 with about one in ten living in poverty. Just under 80% graduated from high school, and 15% earned a bachelor's degree. Salem county is the least transient of the eight southern counties, with 67% of residents maintaining the same residence from 1995 to 2000.

Most Salem county residents speak English in the home, with only 6.3% speaking a foreign language. 25.6% of the populace is under the age of eighteen; these children are serviced by thirteen school districts. Ethnic diversity in Salem County consists of 81% White, 15% African American, less than 1% Asian, and nearly 4% Hispanic. This largely rural, farming region has avoided some of the development boom seen in neighboring Gloucester County; efforts to redevelop the waterfront have not yet passed the planning stages.

Design of the Study

This study is descriptive in nature, that is, collecting information about what is currently occurring in the districts identified in the population. District administrators—to include Superintendents, curriculum planners, and math supervisors—in the counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean, and Salem were asked to respond to a written survey regarding math specialists. Public school districts in the eight southern counties were selected using a proportional stratified random sample across county and district factor group (DGF), used for socioeconomic classifications. This ensured that proper representation of all southern counties and all socioeconomic levels was achieved.

Proportional stratified random samples require subgroups identified by a variable related to the research; in this case, 32 subgroups were created based on location (county) and socioeconomic status (DFG). Stratified sampling tends to be more representative of the population than a sample taken at random from the population as a whole; it also reduces error and allows for a smaller sample size. It ensures that an adequate number of subjects are selected from each of the subgroups. By using a proportional sample, this allowed each group to be represented in the sample as the same rate it is represented in the total population. This was an important part of the research: the study examined not only how many math specialists existed in southern New Jersey, but if there were difference between socioeconomic groups. Since not all groups were the same size (for example, there are far fewer I and J districts than CD and DE districts) it was appropriate to use proportional representation in the sample.

Further, a paper survey was implemented as a measure of convenience. Many of the respondents are busy administrators who received nothing in return for their participation in the study. To contact them via phone, email, or in person, may have created a strain on their time and influenced their responses. Counterpoint to this argument, however, is that those who did choose to respond to the paper survey did so voluntarily. Exclusive use of volunteers as respondents in a survey adds bias to the results, for the results may not be as representative of the population as expected; there may be a particular trait of those who do respond that causes their results to differ from the norm of the whole population. Balancing the potentially biased results of a paper-only survey with the stronger results from a proportional stratified random sample, however, provides a level of integrity to the findings of this study.

Sample

The population for this study was comprised of the 204 public school districts in the eight southern counties of New Jersey who serve students in grades K-12. Information regarding school districts—including District Factor Group (DFG), mailing address, and Chief School Administrator (CSA)—was obtained from the New Jersey Department of Education website. Districts were sorted by county and then DFG, forming "categories" by region and socioeconomic status. Table II shows the number of districts in each county and Table III gives the total number of districts in each socioeconomic category for all of South Jersey. It was determined that 20% of districts in each category would be contacted to participate in the study. This amount of 20% was selected to provide a reasonable sample size yet contain the cost of conducting such a study. For categories where 20% mathematically produced a decimal, the number was

Table II

Number of Public School Districts by County

County	# of Districts
Atlantic	24
Burlington	40
Camden	39
Cape May	17
Cumberland	15
Gloucester	27
Ocean	29
Salem	13
Total	204

Table III

Number of Districts in Each Socioeconomic Category

	A & B	CD & DE	FG & GH	I & J
# of Districts	72	87	34	11

rounded up to the next whole. This process assured that each category was fairly represented in the overall sampling frame and would produce a reasonable cross-section of South Jersey. (See Table VI in Chapter 4.) Districts were then assigned numbers and randomly selected to participate. Once this process was complete, the survey instrument was mailed to the Chief School Administrator (CSA) of all randomly selected districts with instructions for completing the survey. A postage-paid return envelope was also included to promote a higher return.

Of the 204 eligible districts, surveys were mailed to 45. This is slightly higher than the desired 20% (equal to 41 districts) because of the rounding method described above to ensure proper representation. In order to be eligible to participate in the study, districts needed to have a CSA and a mailing address. (Districts with Boards of Education only were not eligible to complete the survey, although they were counted when determining the number needed to satisfy 20%.) Often, the CSA was a Superintendent, but for smaller districts, a Principal was selected to receive the survey. Vocational-Technical districts, Special Services districts, and private schools were not considered in any part of the study. Districts serving portions of the K-12 spectrum (for example K-8 only or 9-12 only districts) were counted as equals even though they service distinctly different populations.

Description of the Instrument Used

A written survey was developed specifically for this study. A cover sheet was included with instructions on selecting the appropriate administrator to complete the survey; preferable was the Superintendent or CSA, however, anyone involved in the hiring and interview process was an acceptable respondent. The cover sheet has been

entered as Appendix A, while the survey can be found in Figure 1 and Appendix B.

Section 1 of the instrument included space for the respondent to indicate their position within the district as well as the county where the district is located. A definition of math specialist was provided and respondents were directly asked if their district currently employs one or more math specialists. Those answering negatively were directed to Section 3, while those responding positively were asked further questions on general information necessary to analyze the data, including the number of specialists and the number of schools each services, the grade level(s) serviced by the specialist, and how such a position is funded. Specific identification of the district was avoided.

Section 2 of the survey gathered information only from districts which currently employ a math specialist(s) (even if a different job title is used). Since a major goal of this study was to describe the current practices in the region, this part of the survey included descriptions of common tasks performed by math specialists as drawn from literature. Respondents were asked to identify and mark the duties such a professional performs in their district.

The third section of the survey asked all respondents to evaluate specific qualifications of math specialists as very important, somewhat important, or not important. Those who currently employ a math specialist were asked to respond based on their past experiences in interviewing and hiring for this position; respondents from districts which do not currently employ a math specialist were instructed to evaluate the qualifications as though interviewing for such a position. The comprehensive list of qualifications included in this section was compiled directly from research and review of literature.

Figure 1. Survey Instrument

_____ County

_____ Respondent's Job Title or Position

Please use the following definition while completing this survey:

A **math specialist** is a teacher with particular knowledge, interest, and expertise in mathematics content and pedagogy who is released from full time classroom responsibilities to assist in the professional growth of colleagues with regards to mathematics instruction. Math specialists may also be titled *math coach, math facilitator, math resource teacher, math liaison, math support teacher.*

Section 1

1.) Does your district currently employ one or more math specialists?

_____ Yes _____ No (If no, skip to Section 3)

2.) How many math specialists does your district employ? _____

3.) How many schools does each math specialist service? _____

4.) What grade levels are serviced by the math specialist(s)? _____

5.) How was this math specialist position funded? _____

Section 2 -- Mark each activity carried out by the math specialist(s) in your district. Check all that apply.

_____ Diagnose and remediate struggling math students

_____ Work collaboratively with colleagues

_____ Design instructional approaches

_____ Align curriculum to the Core Curriculum Content Standards

_____ Conduct demonstration lessons

_____ Co-teach lessons

_____ Observe colleagues

_____ Substitute for teachers who wish to observe peers

_____ Lead planning meetings (i.e. grade level or team meetings)

_____ Seek out and share research findings with colleagues

_____ Provide leadership and vision

_____ Work with parents and community members

_____ Provide enrichment opportunities for advanced students

_____ Work closely with new teachers

_____ Make or order materials

_____ Conduct professional development workshops

_____ Other _____

_____ Other _____

(OVER)

Section 3 -- Please mark only **one response for each** item below.

How important was each of these qualifications in the selection and hiring of the math specialist(s) in your district? *If your district does not employ a math specialist, consider each item as though you were in the process of interviewing candidates for such a position.*

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT
1. College degree in mathematics			
2. College degree in education			
3. College degree in mathematics education			
4. Minimum 3 years teaching experience			
5. Minimum 3 years teaching math			
6. Recent classroom experience			
7. Coursework in mathematics content			
8. Coursework in Educational Leadership			
9. Coursework in Pedagogy			
10. Experience in diagnosing and treating math deficiencies			
11. Certification/licensure as Math Specialist			
12. Experience conducting workshops			
13. Experience working with adult learners			
14. Enthusiasm for teaching mathematics			
15. Training in assessment strategies			
16. Interest in mathematics			
17. Ability to work with parents and community members			
18. Acceptance by peers			
19. Knowledge of Constructivist theory			
20. Broad understanding of math curriculum PreK-12+			
21. Proficiency with technology			

In order to establish the validity of the instrument, the survey was presented to five experts in their respective fields. These included 1) an Educational Specialist and researcher, 2) a University Professor of Mathematics Education, 3) a University Professor and leading researcher in Mathematics Education, 4) an Educational Researcher, and 5) a middle school Mathematics Teacher and Department Chair. These trained authorities examined the survey and commented regarding the validity of the instrument. Their comments and suggestions were taken into consideration before commencing the study. This information is presented in Table IV in Chapter 4.

In order to establish that the instrument was reliable, the survey was also presented to five different professionals holding similar positions as those who would actually take part in the study. Included in the reliability test were 1) a middle school Principal, 2) a graduate student enrolled in an Educational Leadership Doctoral program, 3) a graduate student enrolled in a Master's program in School Administration, 4) a former Assistant Principal and current classroom teacher, and 5) a Mathematics Curriculum Supervisor. The five respondents completed the survey with their own district as an example. One week later, they were again asked to complete an identical survey. A comparison of the first and second results was made using a dependent t-test to determine the reliability of the instrument. The results of the reliability test have been entered as Table V in Chapter 4. While some of the districts may have been part of the population examined in the study, the data collected in the reliability surveys was independent of study data. Also care was taken to ensure that the reliability participants would not be the respondents if their districts were randomly selected to participate in the sample.

A complete summary of data collected from the random sample of districts, along with analysis and interpretation of the data can be found in Chapter 4.

Relationship of the Instrument Used to the Null Hypothesis

This study attempted to gather information dealing with practices in southern New Jersey school districts regarding math specialists. The survey instrument collected such data, along with valuations of qualifications and job functions commonly required of math specialists. One specific hypothesis stated that there would be no significant difference in the number of math specialists working in economically disadvantaged districts (DFG A & B) compared with more wealthy districts (DFG CD-J). Analysis of the demographic information and other responses to the survey yields information regarding the hypothesis.

A second hypothesis was that across socioeconomic classifications, there would be no significant difference in the desired qualifications of math specialists. Part of the survey used in this study asks respondents to valuate qualifications for math specialists. Regardless of whether a district currently employs a math specialist, the value placed upon certain characteristics and qualifications may be inconsistent from district to district based on the needs of the populations served in each area. For districts that do not currently employ math specialists, it can be inferred that the respondent would be involved in the interviewing and hiring process should such a position be created. Therefore, qualifications rated highly on the survey would likely be critical components for a math specialist in that district. No matter whether a district currently employs a math specialist or not, the qualifications or sought-after qualifications identified in the survey could be compared to the findings of researchers.

Methods Used to Analyze Data

In Section 1 of the survey, respondents were asked if their district currently employs a math specialist. The responses were reported as simple percentages. In order to test for statistical significance for Hypothesis 1, a dependent *t*-test was conducted. A pair of scores was entered for each county: the number of districts in DFG A & B who responded "yes" they currently have a math specialist, and the number of districts in all other DFG (CD-J) who responded "yes." A degree of certainty of .05 was used to determine significance.

Section 2 asked respondents to indicate for which tasks math specialists in their district were responsible. This information is reported as simple percentages. No test of significance was needed since this data is descriptive and not directly related to a hypothesis.

In the third section of the survey, all respondents were asked to use a Likert scale to value twenty-one qualifications often required when hiring math specialists. Each item was scored based on the given response. "Very Important" earned a 3, "Somewhat Important" earned a 2, and "Not Important" earned a 1; no response was scored as 0. The scores for all twenty-one qualifications were totaled for each respondent. Significance was determined with a chi-squared test using the total score for each district, separated by DFG. Again, the .05 level of certainty was used.

Protection of Human Subjects

The physical health and safety of research participants are of critical importance in any study. Steps were taken to ensure the privacy of respondents without sacrificing accuracy of the data. Minimal identification of districts was required for demographic

purposes only. This research study was subject to the Institutional Review Board at Rowan University and was approved.

Summary of Research

This chapter outlined the research design utilized in this study. Descriptions of the population, sampling method, data collection instrument, and methods of analysis were provided as they related to both the hypotheses and the overall goal of this study: to research and report on the practices of districts in Southern New Jersey with regards to math specialists.

CHAPTER FOUR: ANALYSIS OF THE DATA

The purpose of this study was to describe current practices in the eight southern counties of New Jersey with regards to Math Specialists. Related literature guided the development of a survey. This survey was designed to assess the number of math specialists working in South Jersey. Further, this study gathered opinions of administrators regarding the qualifications/characteristics of math specialists. The results from socioeconomic subgroups were then compared. What follows is the results and analysis of the data collected.

Description of the Instrument

A survey was developed specifically for this study and is included in Appendix B. Respondents were asked to indicate their county and job title and given a definition of math specialist. Section 1 asked if the district currently employed a math specialist. Those responding "no" were directed to Section 3 of the survey. Those responding "yes" were asked more detailed questions, such as:

a) How many math specialists does your district employ?

b) How many schools does each math specialist service?

c) What grade levels are serviced by the math specialist(s)?

d) How was this math specialist position funded?

Section 2 of the survey was designed to gather information about the job functions carried out by math specialists currently employed by school districts in

Southern New Jersey. Respondents were asked to mark all activities that applied. If an activity was checked, it was given a score of one; if an activity was not checked, it was given a score of zero. The scores were tallied and reported in percent form.

The final part of the survey, Section 3, contained twenty-one qualifications/ characteristics which may be required of candidates to be employed as math specialists. This list of qualifications/characteristics was derived directly from literature along with currently existing math specialist training programs in other regions of the United States. Respondents to the survey were asked to mark each item as "very important," "somewhat important," or "not important." Each answer was scored on a Likert scale ranging from 3 to 1, with no response scoring 0. The scores for all twenty-one qualifications/ characteristics were tallied to produce a total score for each district. These total scores were then separated according to county and district factor group. It was then possible to compare districts across socioeconomic status using a chi-squared test of significance.

Before the survey was sent to districts as part of the study, it was analyzed for both validity and reliability. Validity is the concept that the instrument actually measures what it is intended to measure. As described in Chapter 3, the survey was presented to five experts for study and comment. The responses from each expert are quantified in Table IV. A total of 34 comments were made by these experts. Their recommendations were considered and any necessary were changes made before distributing the survey to school districts. In general, the experts' comments indicated that this survey would, in fact, gather the information it was designed to collect.

Additionally, before the survey was sent out to participants, reliability was calculated. Reliability is the concept that the instrument will produce the same score from

Table IV

Number of Comments from Each of Five Experts Regarding the Validity of the Survey Instrument

Expert	Number of comments
1	6
2	8
3	6
4	5
5	9
Total	34

one sitting to the next, with a given amount of time between administrations and assuming no further learning or treatment has occurred. In order to calculate the reliability of the instrument used in the study, the survey was sent to five professionals holding similar positions to those who would respond in the actual study. (See Chapter 3 for more detailed descriptions of these professionals.) The survey was administered to the participants and then re-administered one week later. Scores were assigned in the same manner as for the actual study; for the purposes of establishing reliability, however, a total score from both Sections 2 and 3 was obtained, whereas these sections were kept separate in the actual study. A non-independent *t*-test was used to compare scores for each participant from the first and second administrations. The total scores resulting from the reliability testing are displayed in Table V.

The scores obtained in the reliability testing were then subjected to a statistical test. The non-independent *t*-test produced a t-value of 0.00; given a confidence level of

Table V

Total Scores for Five Respondents on First- and Second-Administration Trials Used for Reliability Testing

Respondents	First Administration	Second Administration
A	65	65
B	52	55
C	55	53
D	58	58
E	60	60

0.05, the statistic is 2.776. The *t*-value is within the statistic and does not indicate a significant difference. Based on this information, the instrument is reliable.

Sampling and Return Rate

There are a total of 204 school districts in the eight identified counties of southern New Jersey, which form the population of this study. These districts were separated into categories by District Factor Group (DFG) and county. (District Factor Grouping is a system used by the New Jersey Department of Education to rank school districts according to socioeconomic status.) Twenty percent of each of the thirty-two categories were randomly selected to participate in the study.

In order to properly select participants, within each category, districts were assigned a number. Numbers were then randomly selected for participation in the study. Contact information for selected districts was obtained from the New Jersey Department of Education website and surveys were mailed to the Chief School Administrator of each randomly selected district. A pre-addressed, postage-paid envelope was also included

with the mailing for convenience and to encourage response. Approximately three weeks was allowed for completion of the survey. Table VI provides a detailed breakdown of both the number of surveys sent and the number of surveys returned for each county and district factor group category.

Table VI

Number of Districts Contacted to Participate in the Study and Number of Surveys Returned, Separated by County and District Factor Group

	A & B		CD & DE		FG & GH		I & J	
County	# Sent	#Returned	# Sent	#Returned	# Sent	#Returned	# Sent	#Returned
Atlantic	1	1	3	1	1	0	0	0
Burlington	1	0	3	2	3	3	1	1
Camden	3	3	4	2	1	0	1	0
Cape May	2	1	1	1	1	1	0	0
Cumberland	2	2	1	0	0	0	0	0
Gloucester	2	1	2	1	1	1	1	0
Ocean	3	1	2	0	1	0	1	1
Salem	1	1	1	0	1	1	0	0
Totals	15	11*	17	8*	9	6	4	2

* This total includes one survey returned in this DFG that had no county indicated.

Overall, forty-five surveys were mailed to school districts for a sampling rate of 22%. A total of twenty-seven surveys were completed and returned; this represents 13% of the total population. Furthermore, with 27 of 45 surveys returned, this study boasts a return rate of 60%. While the relatively small sample size may be of concern to some readers, the satisfactory rate of return should give more credence to the accuracy of the data obtained with the survey. Additionally, as outlined in Chapter 3, using the

proportional stratified random sampling method allows for a smaller sample size and reduces error while allowing for a representative sample of the population.

Analysis of the Data

One of the goals of this study was to determine if there was a difference in the number of math specialists working in economically disadvantaged districts compared to other more affluent districts. This information was collected through a simple "yes or no" question in Section 1 of the survey. The results for the economically disadvantaged districts (DFG A & B) were compiled against results from all other combined economic classifications (DFG CD-J), and are displayed in Table VII.

Table VII

Number of Districts Responding That a Math Specialist is Currently Employed, Separated by County and District Factor Group.

County	DFG A & B	DFG CD-J
Atlantic	1	0
Burlington	0	0
Camden	3	0
Cape May	0	1
Cumberland	0	0
Gloucester	1	0
Ocean	0	1
Salem	0	0
Total	5	2

At this point, it is important to note some irregularities in the survey responses. Only four respondents directly indicated that "yes" their district currently employed a math specialist; two other respondents completed Section 2 even though they indicated their district did not currently employ a math specialist. Furthermore, one district has contracted an independent consultant to perform the duties otherwise carried out by a math specialist. These three responses were unanticipated. For the ease of reporting, these irregular responses were calculated as though "yes" had been marked in Section 1, since all other information was consistent with a "yes" answer. Therefore, seven responses were tallied in Sections 1 and 2 instead of only four. These seven districts will henceforth be considered to have math specialists currently employed.

Of the seven districts employing math specialists, five are from the lower socioeconomic categories (DFG A & B), and only two are from all other categories combined (DFG CD-J). Camden County has the highest recorded concentration of math specialists in any of the counties surveyed with three, all from lower socioeconomic groups.

A non independent *t*-test was used to determine if a significant difference exists between the two study units. Eight pairs of scores were input, with each county having a number for low socioeconomic (A & B) and all other socioeconomic classifications (CD-J). The resulting t-value was -1.10. At a confidence level of 0.05, the statistic is 2.365 and the calculated t-value is well within this range. Although differences in the number of math specialists do exist between the two categories, these differences are not statistically significant. It can be concluded that math specialists are employed in all socioeconomic classifications to the same relative degree, supporting the first hypothesis of this study.

In order to gain a broader sense of the environments which have fostered math specialist programs, the question was posed in Section 1, "How was this math specialist position funded?" Five of the respondents noted some form of local funding (district budget) provided the necessary resources to hire one or more math specialists. Other responses included Title I funds and "second question," a distinct ballot question decided by voters on School Election day. For many of the districts who answered this portion of the survey, the idea of a math specialist was powerful enough to realize a place in the annual school budget. Unfortunately, in this era of flat-funding from the State, districts often do not have the luxury of adding positions when they are forced to make difficult decisions in order to maintain present staff. While the desire or need for math specialists may be strong, finances are often the deciding factor.

For those districts answering affirmatively in Section 1, Section 2 provided an opportunity for respondents to share job functions carried out by the math specialist(s) in their district. Sixteen common tasks derived from literature were presented, along with space to list other tasks not included on the list. The responses are presented as simple percentages. Specifically, if a particular activity is displayed as 58%, that means that 58% of the respondents indicated this activity was a task performed by the math specialist in their district. The results for each of the sixteen tasks are displayed in Table VIII.

Of the seven districts responding to the survey, the three most commonly indicated tasks—at 86%—were:

1) "Diagnose and remediate struggling math students"

2) "Work collaboratively with colleagues"

3) "Conduct demonstration lessons"

Table VIII

Percentage of Math Specialists who Perform Given Tasks in their Daily Work as Reported by Participants in this Study

Task	Number of Responses	Percentage*
Diagnose and remediate struggling math students	6	86%
Work collaboratively with colleagues	6	86%
Design instructional approaches	4	57%
Aligned curriculum to the Core Curriculum Content Standards	5	71%
Conduct demonstration lessons	6	86%
Co-teach lessons	4	57%
Observe colleagues	3	43%
Substitute for teachers who wish to observe peers	2	29%
Lead planning meetings (i.e. grade level or team meetings)	5	71%
Seek out and share research findings with colleagues	5	71%
Provide leadership and vision	3	43%
Work with parents and community members	5	71%
Provide enrichment opportunities for advanced students	4	57%
Work closely with new teachers	4	57%
Make or order materials	4	57%
Conduct professional development workshops	2	29%
Additional tasks not included above**	4	57%

* Percentages were calculated based on seven responses in Section 2 and rounded to the nearest whole.
** Respondents identified other tasks performed by math specialists which were not included on the survey's list.

The next most common responses, noted approximately 71% of the time, were:

1) "Align curriculum to the Core Curriculum Content Standards"

2) "Lead planning meetings (i.e. grade level or team meetings)"

3) "Seek out and share research findings with colleagues"

4) "Work with parents and community members"

Specialists who perform such tasks as those listed above, convey a sense of instructional leadership to their peers: they are master teachers, experts in their subject matter, and willing to share their knowledge with colleagues. These attributes lend well to the notion of math specialists as leaders and resource professionals within their schools.

In addition to the sixteen common tasks proposed on the survey, respondents elaborated when tasks performed by the math specialist were not included on the list. Four responses were received in this category. Specifically, respondents wrote:

1) "Conduct parent math workshops"

2) "Coordinate Online Assessments aligned with NJCCCS and provide data to give instruction and re-teaching as needed"

3) "Loves children"

4) "Asks good questions"

It is interesting to witness uncommon functions of a specialist. Since the list of tasks was derived from literature, it is assumed that these are common activities of a math specialist. For districts to elaborate on other tasks not included in the list hints at the difficulty one faces in defining the role of a math specialist; it seems that districts are not

only able, but are forced to custom tailor their math specialist program to meet their own unique needs.

The two tasks selected least often in Section 2–at just under 29%—were "substitute for teachers who wish to observe peers" and "conduct professional development workshops." This pair of activities, along with the rest of the list, was derived from literature. The low figure presented in this study does not seem to match the information from prior research. Perhaps this discrepancy can be attributed to a change in the needs of educators. When the concept of math specialists was initially developed, it was during a time of change: standards, technology, manipulatives, and hands-on learning were relatively new concepts for most practicing teachers. These specialists were instrumental in bringing such new techniques into the classroom; this was often accomplished through peer observation (requiring class coverage) and professional development workshops. Because the needs of teachers have changed, it seems, so too have the function of math specialists.

For the third section of the survey, respondents were asked to rate qualifications/ characteristics needed to become a math specialist. Scores ranging from three to one were assigned for each response. Using this Likert scale, where 3 was scored for "very important," 2 was scored for "somewhat important," 1 was scored for "not important," and 0 was scored when no response was given, it was possible to determine the total score. Total scores remained separated by DFG in order to evaluate this final part of the study. Table IX gives the total scores of each responding district for Section 3. This data was subjected to a two-dimensional chi-squared test of significance. At the 0.05

Table IX

Total Likert-Scale Score in Section 3 for each Responding District, Separated by Socioeconomic Categories

DFG A & B	58	50	57	57	55	58	54	53	48	0	56
DFG CD & DE	55	48	0	52	49	58	63	56			
DFG FG & GH	51	58	51	49	58	59					
DFG I & J	59	50									

probability level, the statistic is 18.31. The calculated chi-squared is 51.14, which exceeds the referenced statistic. Therefore, there is a significant difference in the desired qualifications/ characteristics of math specialists across socioeconomic classifications, and the null hypothesis must be rejected.

What does this mean, then, if there is a significant difference across socioeconomic categories? Section 3 presented a unique situation in that it asked a question that not all respondents were able to answer from first hand experience. It is, then, both an assertion of personal values and a judgment based on the needs of the district. Assuming that the administrator who completed the survey shares similar goals, values, and beliefs as the district on whole, the effect of personal opinion should be mitigated since such opinion would reflect the district's views as well. The differences revealed in Section 3 are attributable, then, to the specific needs of individual districts. Certain schools may encourage a specialist to work closely with students as a means of raising test scores, even as other schools may require specialists to provide professional development to a more veteran staff. From one district to the next, there is no standardization.

The lack of standardization may be interpreted as flexibility in implementation. While such flexibility in meeting unique needs may be beneficial to most districts, for other populations, an unintended advantage may be put in place. If students in various regions are afforded different interactions with these highly-trained professionals, can one conclude that education is not equal? The question of fairness looms: if a specialist can improve mathematics achievement, all students should have access to this assistance, no matter their socioeconomic environment.

It would be useful for district administrators, as well as college personnel and others supporting math specialist programs, to know which qualifications/characteristics were valued consistently high and consistently low as they develop training programs and requirements for certification and licensure. Section 3 aimed to gather such information. Table X presents composite scores from all respondents regardless of DFG or county for each Likert value in percent form. Additional information is given for each DFG band, in order that similarities and differences may be recognized among the socioeconomic levels; Table XI presents data for DFG A & B; Table XII for DFG CD & DE; Table XIII for DFG FG & GH; and Table XIV for DFG I & J. (Note that all percentages have been rounded to the nearest whole.)

When looking at the composite data for all respondents, the most important qualification/characteristic appears to be enthusiasm for teaching mathematics, with nearly 90% classifying this trait as "very important." Other highly ranked qualifications/characteristics include a minimum of three years teaching math, coursework in mathematics content, experience in diagnosing and treating math deficiencies, interest in mathematics, and a broad understanding of math curriculum

Table X

All responses to qualification/characteristic questions from all District Factor Groups regardless of socioeconomic status, based on 27 responses

Qualification/characteristic	Very Important	Somewhat Important	Not Important	No Response
College degree in mathematics	73%	22%	0%	7%
College degree in education	67%	22%	0%	11%
College degree in mathematics education	63%	26%	4%	7%
Minimum 3 years teaching experience	67%	26%	0%	7%
Minimum 3 years teaching math	85%	7%	0%	7%
Recent classroom experience	63%	30%	0%	7%
Coursework in mathematics content	81%	11%	0%	7%
Coursework in Educational Leadership	7%	67%	19%	7%
Coursework in Pedagogy	48%	41%	4%	7%
Experience in diagnosing and treating math deficiencies	81%	7%	4%	7%
Certification/ licensure as Math Specialist	33%	41%	19%	7%
Experience conducting workshops	37%	48%	7%	7%
Experience working with adult learners	26%	56%	11%	7%
Enthusiasm for teaching mathematics	89%	4%	0%	7%
Training in assessment strategies	67%	22%	4%	7%
Interest in mathematics	85%	7%	0%	7%
Ability to work with parents and community members	52%	37%	4%	7%
Acceptance by peers	56%	33%	4%	7%
Knowledge of Constructivist theory	37%	56%	0%	7%
Broad understanding of math curriculum PreK-12+	81%	11%	0%	7%
Proficiency with technology	44%	44%	4%	7%

Table XI

Responses from low socioeconomic districts to qualification/characteristic questions (District Factor Groups A & B), based on 11 responses

Qualification/characteristic	Very Important	Somewhat Important	Not Important	No Response
College degree in mathematics	82%	9%	0%	9%
College degree in education	64%	27%	0%	9%
College degree in mathematics education	64%	27%	0%	9%
Minimum 3 years teaching experience	55%	36%	0%	9%
Minimum 3 years teaching math	82%	9%	0%	9%
Recent classroom experience	55%	36%	0%	9%
Coursework in mathematics content	82%	9%	0%	9%
Coursework in Educational Leadership	0%	73%	18%	9%
Coursework in Pedagogy	45%	45%	0%	9%
Experience in diagnosing and treating math deficiencies	82%	0%	9%	9%
Certification/ licensure as Math Specialist	36%	45%	9%	9%
Experience conducting workshops	27%	64%	0%	9%
Experience working with adult learners	27%	45%	18%	9%
Enthusiasm for teaching mathematics	91%	0%	0%	9%
Training in assessment strategies	73%	18%	0%	9%
Interest in mathematics	91%	0%	0%	9%
Ability to work with parents and community members	55%	36%	0%	9%
Acceptance by peers	36%	55%	0%	9%
Knowledge of Constructivist theory	36%	55%	0%	9%
Broad understanding of math curriculum PreK-12+	91%	0%	0%	9%
Proficiency with technology	27%	55%	9%	9%

Table XII

Responses from lower-middle socioeconomic districts to qualification/characteristic questions (District Factor Groups CD & DE), based on 8 responses

Qualification/characteristic	Very Important	Somewhat Important	Not Important	No Response
College degree in mathematics	63%	25%	0%	13%
College degree in education	75%	0%	0%	25%
College degree in mathematics education	75%	13%	0%	13%
Minimum 3 years teaching experience	50%	38%	0%	13%
Minimum 3 years teaching math	75%	13%	0%	13%
Recent classroom experience	63%	25%	0%	13%
Coursework in mathematics content	75%	13%	0%	13%
Coursework in Educational Leadership	13%	63%	13%	13%
Coursework in Pedagogy	50%	38%	0%	13%
Experience in diagnosing and treating math deficiencies	88%	0%	0%	13%
Certification/ licensure as Math Specialist	25%	50%	13%	13%
Experience conducting workshops	38%	38%	13%	13%
Experience working with adult learners	25%	63%	0%	13%
Enthusiasm for teaching mathematics	75%	13%	0%	13%
Training in assessment strategies	50%	25%	13%	13%
Interest in mathematics	75%	13%	0%	13%
Ability to work with parents and community members	50%	25%	13%	13%
Acceptance by peers	63%	25%	0%	13%
Knowledge of Constructivist theory	13%	75%	0%	13%
Broad understanding of math curriculum PreK-12+	88%	0%	0%	13%
Proficiency with technology	50%	38%	0%	13%

Table XIII

Responses from upper-middle socioeconomic districts to qualification/characteristic questions (District Factor Groups FG & GH), based on 6 responses

Qualification/characteristic	Very Important	Somewhat Important	Not Important	No Response
College degree in mathematics	67%	33%	0%	0%
College degree in education	50%	50%	0%	0%
College degree in mathematics education	50%	50%	0%	0%
Minimum 3 years teaching experience	100%	0%	0%	0%
Minimum 3 years teaching math	100%	0%	0%	0%
Recent classroom experience	67%	33%	0%	0%
Coursework in mathematics content	83%	17%	0%	0%
Coursework in Educational Leadership	17%	67%	17%	0%
Coursework in Pedagogy	67%	33%	0%	0%
Experience in diagnosing and treating math deficiencies	67%	33%	0%	0%
Certification/ licensure as Math Specialist	33%	33%	33%	0%
Experience conducting workshops	67%	17%	17%	0%
Experience working with adult learners	33%	50%	17%	0%
Enthusiasm for teaching mathematics	100%	0%	0%	0%
Training in assessment strategies	83%	17%	0%	0%
Interest in mathematics	83%	17%	0%	0%
Ability to work with parents and community members	33%	67%	0%	0%
Acceptance by peers	67%	17%	17%	0%
Knowledge of Constructivist theory	67%	33%	0%	0%
Broad understanding of math curriculum PreK-12+	50%	50%	0%	0%
Proficiency with technology	50%	50%	0%	0%

Table XIV

Responses from high socioeconomic districts to qualification/characteristic questions (District Factor Groups I & J), based on 2 responses

Qualification/characteristic	Very Important	Somewhat Important	Not Important	No Response
College degree in mathematics	50%	50%	0%	0%
College degree in education	100%	0%	0%	0%
College degree in mathematics education	50%	0%	50%	0%
Minimum 3 years teaching experience	100%	0%	0%	0%
Minimum 3 years teaching math	100%	0%	0%	0%
Recent classroom experience	100%	0%	0%	0%
Coursework in mathematics content	100%	0%	0%	0%
Coursework in Educational Leadership	0%	50%	50%	0%
Coursework in Pedagogy	0%	50%	50%	0%
Experience in diagnosing and treating math deficiencies	100%	0%	0%	0%
Certification/ licensure as Math Specialist	50%	0%	50%	0%
Experience conducting workshops	0%	100%	0%	0%
Experience working with adult learners	0%	100%	0%	0%
Enthusiasm for teaching mathematics	100%	0%	0%	0%
Training in assessment strategies	50%	50%	0%	0%
Interest in mathematics	100%	0%	0%	0%
Ability to work with parents and community members	100%	0%	0%	0%
Acceptance by peers	100%	0%	0%	0%
Knowledge of Constructivist theory	50%	50%	0%	0%
Broad understanding of math curriculum PreK-12+	100%	0%	0%	0%
Proficiency with technology	100%	0%	0%	0%

PreK-12+. It appears that administrators desire math specialists to be enthusiastic and well-trained; additional qualifications only support a candidate's credentials.

Surprisingly, course work in Educational Leadership appears to be the least important factor in hiring math specialists, since only 7% of respondents rated this very important and almost one-fifth considered it not important at all. Perhaps the title "Educational Leadership" would appear misleading to those outside the educational field. Many lay persons would argue that someone in such a role as a math specialist should have training or coursework in leadership; those in the educational field, however, understand that "Educational Leadership" encompasses the many aspects of administration, not all of which are appropriate for a professional still working in the classroom. Further qualifications receiving little backing include a candidate's experience working with adult learners and knowledge of Constructivist theory. Once again, the trend of changing need causing a change in function is seen. Qualifications/ characteristics like experience working with adult learners were necessary in the early stages of math specialists' existence, but as more teachers are trained in topics such as Constructivist theory and the like, it is less necessary for math specialists to have an exceptionally strong background in such domains.

Acceptance or Rejection of the Hypotheses of the Study

The hypotheses in this study stated that there would be no differences among socioeconomic groups with regards to math specialists. Information was collected from randomly selected districts in the eighth southern counties of New Jersey with regard to math specialists in order to test these hypotheses.

The first specific hypothesis states: There will be no significant difference in the number of math specialists working in economically disadvantaged districts (DFG A & B) compared to other, more affluent districts (DFG CD-J).

The first hypothesis was accepted after examination of the results of the *t*-test. While some differences do exist between low socioeconomic and higher socioeconomic districts with regard to math specialists, the differences are not statistically significant ($t = -1.10$, $df = 7, p < .05$). It is true that more math specialists appear to be working in lower socioeconomic districts; however this reported information may be due to the simple fact that lower socioeconomic districts account for over one-third of all districts in South Jersey. This category also had a higher rate of survey return.

The second specific hypothesis states: Across socioeconomic classifications, there will be no significant difference in the desired qualifications/characteristics of math specialists.

Hypothesis 2 was rejected, however, after analysis of the results of the chi-squared test for significance. While it appears that only minimal differences occur in the total scores of each respondent, these differences are statistically significant ($\chi^2 = 51.14$, $df = 10, p < .05$), leading the reader to believe that there are in fact differences in the desired job qualifications/ characteristics for math specialists across socioeconomic classifications. This occurrence is discussed further in Chapter 5, where recommendations are given to address the situation.

Other data obtained from the surveys was reported as background information, useful in developing an overall picture of the situations occurring in districts across South

Jersey. Many of these results are given in simple percentages to illustrate to the reader where common responses occurred.

Opportunities for Training

As introduced in Chapter 1, the goal of this study was to provide a sense of the climate in southern New Jersey regarding math specialists, to include opportunities for interested professionals to receive necessary training to perform such duties. After gathering information on the desired qualifications/characteristics of math specialists, an examination of training opportunities available to practicing teachers was made. Specifically, graduate course and program offerings were sought at four colleges and universities in the central and southern part of the state. The College of New Jersey (TCNJ), Rowan University, The Richard Stockton College of New Jersey, and Rutgers University-Camden were selected because of their proximity to the eight counties targeted in the study. Offerings at the post-baccalaureate level were chosen since other states, including Virginia, require a minimum of three years classroom experience before candidates are able to apply for math specialist licensure; thus all candidates would have previously completed undergraduate study in order to have secured proper teaching credentials and be eligible for such certification.

Information obtained from several institutions which have programs to certify mathematics specialists was synthesized in order to find similarities among the programs. Requirements from Virginia Commonwealth University (VCU), George Mason University in Virginia, Northeastern Illinois University (NEIU) in Chicago, and recommendations from the Virginia Mathematics & Science Center were compiled and are displayed in Table XV (VCU K-8 2005; NEIU 2005; Licensure 2004; GMU 2006).

Table XV

A comparison of requirements for four existing math specialist certification programs: Virginia Commonwealth University, George Mason University, Northeastern Illinois University, and the Virginia Mathematics and Science Center

Virginia Commonwealth University (VCU)	George Mason University	Northeastern Illinois University (NEIU)	Mathematics And Science Center
• Math 691, Numbers And Operations • Math 691, Geometry And Measurement • Math 691, Probability And Statistics • Math 691, Algebra And Functions • Math 691, Rational Numbers And Proportional Reasoning	• MATH 600, Number Systems And Number Theory For K-8 Teachers • MATH 600, Geometry And Measurement For K-8 Teachers • MATH 600, Probability And Statistics For K-8 Teachers • MATH 600, Algebra And Functions For K-8 Teachers • MATH 600, Rational Numbers And Proportional Reasoning For K-8 Teachers	• 6-15 Credit Hours Of College Mathematics • MATH 408, Mathematics Structure For Elementary School Teachers • MATH 409, Mathematical Functions For Elementary School Teachers • MATH 435, Mathematics Structure II • MATH 438, Elementary Probability And Statistics For Teachers • MATH 439, Computers In Education	• Numbers And Operations • Functions And Algebra • Probability And Statistics • Rational Numbers And Proportional Reasoning • Geometry And MeasurementThe
• TEDU 651, Education/Leadership I • TEDU 651, Education/Leadership II • TEDU 651, Education/Leadership III • Education Elective	• EDCI 666, Research In Mathematics Teaching • EDCI 645, Curriculum Development In Mathematics Education • EDCI 646, Mathematics Education Leadership For School Change • EDLE 618, Supervision And Evaluation Of Instruction	5 Electives: • MATH 401, Number Theory For The Elementary School Teacher • MATH 402, Modern Algebra For The Elementary School Teacher • MATH 403, Modern Geometry For The Elementary School Teacher • MATH 410, Modern Analysis For The Elementary School Teacher • MATH 457, Recent Trends In Mathematics • MATH 495, Project In Mathematics Comprehensive Exam	• Research • Psychology • Diagnosis And Intervention • Leadership In Mathematics Education I • Leadership In Mathematics Education II
• Math/Sci/Educ Elective • Math/Sci/Educ Elective • TEDU 680, Externship Seminar • TEDU 700, Externship	• EDLE 791, Internship In Education Leadership • EDLE 616, Curriculum Development And Evaluation		• Field Experience

Common to all four of these programs was coursework in five basic strands: number and operation, geometry and measurement, probability and statistics, algebra and functions, and rational numbers and proportional reasoning. Also required was study in educational leadership, curriculum development, and a project, internship, or field experience. Based on these existing programs, such were the traits sought when examining programs offered at New Jersey colleges.

The initial investigations were conducted using the websites of these four colleges. Neither Rutgers – Camden or TCNJ offered programs or a sequence of courses which align with those recommended in Table XV. Stockton offers a Master of Arts in Education with a Concentration in Math. In addition to general education courses required for the Master's degree, a series of five mathematics content courses aimed at middle school instruction are required. This sequence, judging by the course titles and descriptions, parallels the courses suggested for certification programs in other states.

Rowan University offers three related programs which are similar to the programs offered in other states: a Master of Arts in Elementary School Teaching with a Concentration in Math, a Certificate of Graduate Study in Elementary School Mathematics, and a Certificate Of Graduate Study in Middle School Mathematics Education. In personal communication with program advisor, Dr. Louis Molinari, it was noted that a Post Baccalaureate Achievement Certificate in Elementary School Mathematics was initiated in the 1970's and Rowan (at that time known as Glassboro State College) was the first in the state of New Jersey to offer such program. It was developed during a time, Dr. Molinari explained, when mathematics and science were focus issues in American education, so there was a real demand for this type of program.

It was designed with a cognitive approach to learning mathematics, and may have used a different approach than many programs today (February 8, 2006). The Certificate program centers on core math concepts, and the Masters in Elementary School Teaching with a math concentration builds on this program by including general education requirements. While there is certainly an emphasis on improving mathematics education, the course requirements are somewhat different than those recommended by other states for certification as a math specialist. See Chart I for course titles required in these sequences.

Chart I

Course Requirements For Certificate of Graduate Study In Elementary School Mathematics And Master Of Arts In Elementary School Teaching, Concentration In Mathematics at Rowan University.

0802.550 Analysis Of Classroom Teacher Behavior In The Elementary School
0802.540 Contemporary Curriculum Processes/ Elementary Mathematics
0802.552 Piaget And Elementary Mathematics Education
*0802.556 Principles Of Identification And Treatment Of Mathematics Deficiencies
*0802.517 Elementary Mathematics Clinic
*0802.558 Principles Of The Math-Lab/Learning Center Approach In Elementary School Math
0802.560 Research Seminar In Elementary Mathematics Education
(*Select Two)
Those seeking the Master of Arts degree are required to complete additional coursework in Psychology, Foundations of Education, and Electives.

The third program offered at Rowan University, the Certificate of Graduate Study in Middle School Mathematics Education, began in Fall 2005. The required courses for this program are similar to those required of the elementary school mathematics certificates. See Chart II for a list of required courses.

Chart II

Course Requirements For Certificate of Graduate Study In Middle School Mathematics Education at Rowan University

1703.600 Topics in Elementary Mathematics
1701.528 Math Modeling/Algebraic Reasoning
1701.523 Selected Topics in Mathematics (2 courses are required in different topics, such a Geometrical Reasoning and Data Analysis/Discrete Math)
0833.502 School Math Processes/Principles
0802.552 Piaget and Elementary Math Ed.

Program advisor Dr. Janet Caldwell noted that there are currently about 45 teachers in the program. Further she noted that New Jersey's HOUSE rules for highly qualified status under the No Child Left Behind Act grandfathered already certified professionals and has made this program less appealing that it may have been under other conditions (Personal Communication, April 5, 2006).

Rowan University offers one additional program not publicized on the website. Unlike the three programs previously described, this series closely matches recommendations from other states and utilizes similar methods as those developed in the

early phases of the math specialist movement. The South Jersey Mathematics Partnership (SJMP) is designed around five modules which can be completed in about a year and a half. Cohorts of participants—80 to 100+ total by the Summer of 2007—work together to enhance content knowledge, instruction, assessment, and use of technology. Program director Dr. Eric Milou explained that any teacher in grades 5-8 from a partner district who is not math certified may apply to the program. The SJMP is not an official University program, but rather a grant funded by the US Department of Education (Personal Communication, April 18, 2006). It was designed to parallel the Certificate of Graduate Study, which is an official University program and open to anyone.

Summary

In this chapter, the results of the study were presented. Utilizing the design previously described in Chapter 3, data regarding sampling and return rates, reliability and validity, as well as the responses of participants were analyzed. Tests of statistical significance were carried out to determine whether the null hypotheses should be accepted or rejected. Additional information gathered from participants was presented here in Chapter 4, although it did not directly relate to the hypotheses. A comparison of programs offered at colleges and universities in the southern portion of New Jersey to math specialist certification requirements in other states was also offered. The final chapter of this thesis will further analyze this data as well as make recommendations for future study and action.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

Having identified the idea of math specialists working as content area experts in elementary schools as an intriguing area worthy of inquiry and after compiling scholarly research, information on existing programs, and opinions of experts in the field, a research study was developed and implemented across the school districts of South Jersey. All of these efforts, along with a report and analysis of the data collected during this research study, have been described previously in this thesis. This final chapter presents conclusions based on the findings of the investigation as well as makes recommendations for action and future study.

Summary of the Problem

As a result of No Child Left Behind, a renewed emphasis has been placed on mathematics education. Self-contained classroom teachers at the elementary level are finding they do not have the background in mathematics content demanded by the rigorous standards many states are adopting in order to comply with No Child Left Behind. The use of math specialists–whether acting in a certified, official capacity or in an unofficial role–has become an increasingly popular method to assist elementary classroom teachers in attaining sophisticated mathematics content, and to ensure that all children are receiving high quality instruction in this area. Some states have taken steps at developing certification requirements for the licensure of math specialists; as of the writing of this paper, New Jersey however has not taken any official action. Because

there is no state mandate or protocol or definition for "math specialist," it is difficult to know to what extent this option is being used in New Jersey. Thus, this descriptive research study attempted to gather information regarding the number of practicing math specialists, their job functions, and the opinions of administrators concerning necessary qualifications/characteristics for such a position. Determining if differences existed between various socioeconomic categories was also a goal of this inquiry. Finally, while examining the scope of math specialists in southern New Jersey, it seems only fair that an assessment of training opportunities at colleges and universities be included in this paper.

Summary of the Method of Investigation

As with any research project, a thorough analysis of previous findings on the topic was completed. Materials used in this analysis included journal articles, books, web sites, standards, and personal communications with experts. Furthermore, programs developed for use in other states by both private corporations and education officials were examined. Within this informed frame of knowledge, and relying on the recommendations of published literature, a survey was developed to be used in the study.

The survey asked for simple demographic information such as whether a district currently employs a math specialist, the specific duties and tasks performed by this professional, and the opinions of administrators regarding the importance of certain qualifications/characteristics. The validity of the survey was established by presenting it to five experts in the field. Their comments were taken into consideration prior to distribution of the survey. Additionally, the reliability of this instrument was calculated by administering the survey to five other professionals in similar capacities to those who

would participate in the study. After a second administration of the survey approximately one week later, the results were examined for differences of statistical significance.

All school districts in the population—comprised of the eight southern counties of New Jersey—were separated into categories based on socioeconomic status as determined by District Factor Group (DFG) ratings used by the state. A proportional stratified random sample was used to ensure proper representation of each category in the study: 20% of each category was randomly selected for participation and mailed a survey. Results of the survey were compiled and subjected to both t-tests and chi-squared test of significance in order to accept or reject the null hypotheses proposed. Additional data and supporting information was also presented.

Conclusions and Implications

This study found that there were no significant differences in the number of math specialist working in lower socioeconomic districts as compared with higher, more affluent districts. This study also found that there were, in fact, significant differences in desired job qualifications/characteristics across socioeconomic categories. As stated in Chapter 4, enthusiasm and a background in mathematics appear to be the most common characteristics administrators look for in candidates seeking math specialist positions, while coursework in Educational Leadership, knowledge of Constructivist theory, and experience working with adult learners were the least essential qualifications. The results of this study suggest that as the needs of classroom teachers have changed, so too has the role and function of the math specialist.

The findings of this thesis signal that there is a lack of both standardization and urgent desire for math specialists in New Jersey. Attempts to simply define the term

"math specialist" lead to great discussion and debate. Many districts have a professional who performs the same duties as a math specialist yet carries a different title. With no guidelines from the state pertaining to training or certification, districts custom design such positions to best meet the needs of the community. While such individualization and customization can be beneficial to the students who receive instruction from a specialist, such a practice may lead to unequal educational experiences for different populations. The findings of this study suggest that there are indeed significant differences across socioeconomic lines with reference to desired qualifications/ characteristics. Some districts may expect this math expert to work mainly with exceptional students to increase student performance; other districts may require tasks more akin to a supervisor or administrator. Without standardization, students in each of these aforementioned districts will have dissimilar experiences with a math specialist, and perhaps, unfortunately, unequal instruction.

In addition to lack of standardization, there seems to exist currently a lack of overwhelming desire for these specialized teachers. The trend of math specialists has yet to find the momentum mathematicians and educational experts had hoped it would enjoy—just one-fourth of the districts surveyed had a math specialist position. Certain districts many be fortunate to already have well-trained and highly-qualified math teachers among their staff, which reduces the need for math specialists. Other districts may not place as much emphasis on mathematics as on other content areas, and so a specialist seems in excess. Yet another group may envision the possibilities provided by the specialist model, but not have the means to launch new positions. The composition and goals of any given district will determine the inception and use of a math specialist: if

a district has the desire, yet money is limited and positions are being cut, there is no place for a new "specialist." Those districts who make it a top priority to hire such professionals will manage to incorporate these goals into annual budgets, no matter the tough financial situation. Unfortunately, this urgency and determination is rarely witnessed.

In addition to lack of standardization, impetus, and funding, it appears that the novelty of this specialty provides uncertainty of results. In this age of accountability, administrators willing to try innovative approaches to education are in the minority, especially with the hefty price tag of a teacher's salary attached. Because limited research exists on math specialists—and what is available is mostly anecdotal—many administrators may be wary of emphasizing the role and use of specialists. Until the conclusion of the Research and Policy Pilot Study in Virginia in 2009, district officials might turn instead to better tested concepts like smaller class size. The results of the Pilot Study will provide the first scientific research regarding the effectiveness of math specialists in the elementary classroom. In the absence of conclusive evidence on the positive impact of specialists, school officials may decide that the time, effort, and money spent to implement a successful program may be for naught and better justified elsewhere in the instructional program.

Readers must be mindful of the scope of this study and the extent to which findings can be generalized. All districts in the state of New Jersey are subject to the same certification regulations and public school law. Therefore, one can speculate that the unstandardized conditions in the eight southern counties are also occurring in the other thirteen counties to the north. Given diverse demographic composition in various

other parts of the state, however, individual district needs may be unlike the needs of districts in the southern region of the state. Therefore the findings of this study concerning job function and qualifications/characteristics may not necessarily hold constant. Certainly, in areas outside New Jersey where different certification regulations are in place, findings may be substantially unlike those presented here.

Implications for Change

In the absence of conclusive scientific research on the effectiveness of math specialists, decisions must be made on the anecdotal evidence which currently exists, since results of the Virginia Pilot Study are not expected until 2009. It is instinctual that placing a well-trained and highly motivated mathematics teacher in a co-teaching situation with another strong generalist teacher would only serve to improve learning for students in that environment. At worst, the current level of performance is maintained; at best, sizeable improvement is demonstrated by these students. Bringing all math teachers to the level of content specialists may produce even greater results. Following the trend of employing math specialists could revolutionize the way mathematics is both taught and learned in New Jersey classrooms. Intuitively, this movement could be the radical change necessary to increase the United State's performance and ranking on international assessments in mathematics. Realistically, however, such a change in mathematics education will likely serve to simply maintain our current performance levels.

Recommendations for Action

Citing the conclusions drawn in this chapter, there are five seemingly intertwined recommendations which will result from this study. Certainly, change does not occur

quickly; the predicted benefits of math specialists, however, should be cause enough to encourage speed in the call to action.

To begin, there needs to be standardization in the field of math specialists. Possible sources would be the state Department of Education; a panel of college faculty, practicing teachers, and invested professional organizations, including the National Council of Teachers of Mathematics (NCTM) and the Association of Mathematics Teachers of New Jersey (AMTNJ); or a combination of these sources. Such standardization should at minimum encompass the following:

1) terminology, including title and function
2) training and certification requirements
3) expected duties and responsibilities

Following this theme, this researcher recommends the development of a certificate, necessary to be hired as a math specialist. Such a certificate can be modeled after that of the Reading Specialist certification in New Jersey, which has been available for decades and is widely know to educators across the state.

Secondly, conclusive evidence and scientifically gathered data must be attained. Waiting until the 2009 results from Virginia may be denying students access to beneficial support provided by a math specialist. Hesitant administrators may be wary about implementing undocumented options. Thus smaller, short-term studies which would provide at least preliminary results are needed. Further, positive results of such a study, if properly promoted, would undoubtedly increase demand for qualified math specialists.

At this time, there is no mandate for math specialists (a third area in need of action). Rather, there are a few forward-thinking districts, with some extra finances, who

are willing to take a chance. In order to spread awareness and enthusiasm for such a program, "math specialist" must become the buzzword of the day. There must be an eager want to institute math specialists in every school. Only then will other factors relating to this situation fall into line—training opportunities, funding, and ultimately, certification and standardization.

Essential to so many aspects of public education, the fourth area recommended for action is funding. District spending is controlled by a taxpayer-approved annual budget, which must fund everything from supplies and transportation to building maintenance and salaries. When a district is faced with replacing a school's roof or creating a new teaching position, often the physical structure must take precedence. Recent legislative efforts to control property taxes in the state of New Jersey—including S-1701, which limits funds districts can hold in reserve—have curtailed options available to administrators who wish to fund new programs. In addition to property tax reform, legislators must examine school funding to ensure that all reasonable options are available to all districts, regardless of socioeconomic status.

Finally, an increase in program offerings by New Jersey colleges and universities must be made to ensure that teachers who are interested in this line of work have access to the necessary training. Even for those who have no desire to ever be known as a "specialist," additional content courses will strengthen their teaching practices. Perhaps an educator does not wish to take the full sequence of courses, but seeks additional information on a specific portion of the curriculum. High quality courses and workshops must be available at times conducive to a teacher's schedule and locations across the state.

Recommendations for Future Study

The following are recommendations for future study:

1) A replication of this study at a point in the future with a comparison of results. Such a longitudinal study might suggest change in climate and should reflect advances in research and knowledge regarding math specialists.
2) An extension of the study to include present conditions in other counties in New Jersey or neighboring states. A comparison of the regions may be beneficial in developing a more complete description of the current practices.
3) A Pilot Study, similar to that currently underway in Virginia. Scientifically obtained data is needed in this field of mathematics education in order to guide the direction of the movement. A correlational or causal-comparative study on the effect of math specialists on standardized test scores would be remarkable.
4) A comparison of case studies featuring detailed interviews of educators, students, administrators, and community members could be made between districts who have math specialists and those who do not.
5) A qualitative extension of this study to determine what specific functions and qualifications/characteristics are sought by particular types of districts. Modifications to Section 3 of the survey could be made to weigh credentials and determine which are most important in particular situations.
6) Surveys of unique populations could be conducted and compared. College faculty, administration, classroom teachers, and math specialists each have a unique perspective on the position of specialist: what they currently do and what

they could ideally do. Seeking honest responses from each of these four groups may enlighten gaps in training or practice.

REFERENCES

Bush, W. S. (1994). The Kentucky K-4 Mathematics Specialist Program. In *Professional Development for Teachers of Mathematics* (pp.246-54). Reston, VA: National Council of Teachers of Mathematics.

Dossey, J. A. (1984). One Point of View: Elementary School Mathematics Specialists: Where Are They? *Arithmetic Teacher*, 32(3), 3, 50.

Galley, M. (2004, April 7). Shoring up math and science in the elementary grades: Teachers get heavy doses of advanced mathematics. *Education Week*, 23, 1-14.

George Mason University (n.d.) Math Specialist Leader, Master's Degree in Education. Retrieved April 9, 2006 from http://gse.gmu.edu/centers/cscvm/MathSpecialistLeader06.pdf

Heddens, J.W. (1976). *Mathematics Education Specialization Program: Mathematics Clinicians.* Kent State University. (ERIC Document Reproduction Service No. ED119997)

Houston A+. (n.d.). K-5 Mathematics Initiative: Learning that Counts. Retrieved October 3, 2005 from http://www.houstonaplus.org/k-5math.html

Mangin, M. M. (2005). *Designing Instructional Teacher Leadership Positions: Lessons Learned from Five School Districts.* Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada. Retrieved December 4, 2005 from http://www.cepa.gse.rutgers.edu/AERA%202005/Mangin.Design.AERA05.final.pdf

Maryland State Department of Education (MSDE). (2001). *Keys to math success: A report from the Maryland Mathematics Commission.* Baltimore, MD: Author.

Mathematics Specialist: Research Study and Pilot Program (RSPP). (2005, July 15). Retrieved November 26, 2005 from http://www.math.vcu.edu/TPC-MS/

Mathematics & Science Center. (2004, August 16). K-8 Mathematics Specialists Licensure. Retrieved October 5, 2005 from http://mathsciencecenter.info

Math Science Partnerships' Learning Network (MSP). (2005, January 21). Definition of Mathematics Specialists. Retrieved October 3, 2005 from http://vamath.mspnet.org/index.cfm/10661

Miller, L.D. (1992). Preparing elementary mathematics-science teaching specialists. *Arithmetic Teacher*, 40, 228-31.

National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics.* Reston, VA: Author.

National Council of Teachers of Mathematics. (2003, August 28). Online chat with Johnny Lott: Elementary math specialists. Retrieved October 3, 2005 from http://www.nctm.org/news/chat_082803.htm [Transcript].

NJ Department of Education District Factor Groups (DFG) for School Districts. (n.d.). District Factor Grouping System. Retrieved February 8, 2006 from http://www.state.nj.us/njded/finance/sf/dfgdesc.shtml

New Jersey Mathematics Coalition. (1996). New Jersey Mathematics Curriculum Framework: Chapter 20 – Planning for Change. Retrieved December 3, 2005 from http://dimacs.rutgers.edu/nj_math_coalition/framework/ch20/ch20.html

Northeastern Illinois University (n.d.) MA-Mathematics for Elementary School Teachers. Retrieved October 3, 2005 from http://www.neiu.edu/~pwgwanya/ma-math.htm

Reys, B. J., & Fennell, F. (2003). Who should lead mathematics instruction at the elementary school level? A case for mathematics specialists. *Teaching Children Mathematics*, 9(5), 277-82. Retrieved October 3, 2005, from the HWWilsonWeb database.

Rowan, T.E. & Campbell, P.F. (1995, April). *School-based mathematics specialists: Providing on-site support for instructional reform in urban mathematics classrooms. The Project IMPACT model.* Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. ED395762)

Sanchez, W.B. & Ice, N.F. (2005, January/February). Assessment results play a role in instruction and policy decision. *News Bulletin.* Reston, VA: NCTM. Retrieved November 11, 2005 from http://www.nctm.org/news/assessment/2005_01nb.html.

Senk, S.L. & Thompson, D.R., eds. (2003). Standards-Based School Mathematics Curricula: What are They? What do Students Learn? Retrieved November 24, 2005 from http://www.amte.net/resources/S-Based_School_Math.htm

State of Delaware. (2005, January 27). Full-day K, teachers, math specialists, scholarship, cancer, livable Delaware among budget highlights. Retrieved October 3, 2005 from http://www.state.de.us/governor/news/2005/01january/012705%20-%20fy06%20budget%20proposal.shtml#TopOfPage

United States Department of Education. (n.d.). Fact sheet on No Child Left Behind. Retrieved November 24, 2005, from http://www.ed.gov/nclb/overview/intro/factsheet.html

Virginia Commonwealth University (2005, August 5). VCU researchers lead $8 million in National Science Foundation studies to improve elementary school math teaching and learning. Retrieved October 3, 2005 from http://www.vcu.edu/uns/Releases/2005/aug/080405a.html

Virginia Commonwealth University (n.d.) VCU K-8 Mathematics Specialist Program, Mathematics and Science Leadership Track, Master of Interdisciplinary Studies Degree. Retrieved October 3, 2005 from http://www.math.vcu.edu/TPC-MS/Track.html

Virginia Mathematics and Science Coalition (VMSC). (n.d.). Virginia Mathematics Specialists. Retrieved October 3, 2005 from http://www.vamsc.org/vms/body.html

Willoughby, S.S. (1987). Specialists for elementary school. *Educational Leadership*, 45, 91-2.

Witte, B. (1994, September). NCTM/Exxon Education Foundation K-3 Math Specialist Project. *Teaching Children Mathematics*, 1, 40-41.

APPENDIX A: SURVEY COVER SHEET

February 17, 2006

1361 Spiegle Ave
Westville, NJ 08093

Dear

As a graduate student at Rowan University, I am writing my thesis on Math Specialists. I am investigating how often these positions occur in school districts across South Jersey, what types of tasks such professionals perform, and what qualifications administrators seek when interviewing potential candidates for a Math Specialist position.

Your district has been randomly selected to receive a survey which will help in gathering data regarding Math Specialists. Would you please take a few minutes to respond to the enclosed questionnaire? The survey was designed to be completed by an administrator (or their designee), such as a Superintendent, Math Supervisor, or Curriculum Planner/Supervisor. If one of these administrators is not available, Principals, Lead Teachers, or other administrators involved in the interviewing and hiring process may complete the survey. Given the design of the study, however, it would be out of place for a teacher—including a math specialist—to answer the questions.

I recognize that your time is valuable. This survey should only take a few minutes to complete; I have enclosed a preaddressed postage-paid envelope for your convenience. Please assist me in my research by completing and returning the enclosed survey **no later than March 10, 2006**.

Thank you in advance for your cooperation and support.

Respectfully,

Susan Eith

Enclosure (1)

For a copy of the results (available after May 15, 2006), contact me:
Susan Eith
1361 Spiegle Avenue
Westville, NJ 08093
sme605@hotmail.com

APPENDIX B: SURVEY INSTRUMENT

_____ County

_____ Respondent's Job Title or Position

Please use the following definition while completing this survey:

A **math specialist** is a teacher with particular knowledge, interest, and expertise in mathematics content and pedagogy who is released from full time classroom responsibilities to assist in the professional growth of colleagues with regards to mathematics instruction. Math specialists may also be titled *math coach, math facilitator, math resource teacher, math liaison, math support teacher.*

Section 1

6.) Does your district currently employ one or more math specialists?

_____ Yes _____ No (If no, skip to Section 3)

7.) How many math specialists does your district employ? _____

8.) How many schools does each math specialist service? _____

9.) What grade levels are serviced by the math specialist(s)? _____

10.) How was this math specialist position funded? _____

Section 2 -- Mark each activity carried out by the math specialist(s) in your district.
Check all that apply.

_____ Diagnose and remediate struggling math students

_____ Work collaboratively with colleagues

_____ Design instructional approaches

_____ Align curriculum to the Core Curriculum Content Standards

_____ Conduct demonstration lessons

_____ Co-teach lessons

_____ Observe colleagues

_____ Substitute for teachers who wish to observe peers

_____ Lead planning meetings (i.e. grade level or team meetings)

_____ Seek out and share research findings with colleagues

_____ Provide leadership and vision

_____ Work with parents and community members

_____ Provide enrichment opportunities for advanced students

_____ Work closely with new teachers

_____ Make or order materials

_____ Conduct professional development workshops

_____ Other _____

_____ Other _____

(OVER)

Section 3 -- Please mark only **one response for each** item below.

How important was each of these qualifications in the selection and hiring of the math specialist(s) in your district? *If your district does not employ a math specialist, consider each item as though you were in the process of interviewing candidates for such a position.*

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT
1. College degree in mathematics			
2. College degree in education			
3. College degree in mathematics education			
4. Minimum 3 years teaching experience			
5. Minimum 3 years teaching math			
6. Recent classroom experience			
7. Coursework in mathematics content			
8. Coursework in Educational Leadership			
9. Coursework in Pedagogy			
10. Experience in diagnosing and treating math deficiencies			
11. Certification/licensure as Math Specialist			
12. Experience conducting workshops			
13. Experience working with adult learners			
14. Enthusiasm for teaching mathematics			
15. Training in assessment strategies			
16. Interest in mathematics			
17. Ability to work with parents and community members			
18. Acceptance by peers			
19. Knowledge of Constructivist theory			
20. Broad understanding of math curriculum PreK-12+			
21. Proficiency with technology			