The concluding article in this section describes the ExxonMobil Foundation support and the federal grant funded support for Mathematics Specialists. Over nine million dollars has been awarded for three interrelated projects devoted to the development and offering of seamless Virginia programs to train Mathematics Specialists, and to research their ultimate effectiveness on students’ mathematics achievement.

FINANCIAL SUPPORT FOR MATHEMATICS SPECIALISTS’ INITIATIVES IN VIRGINIA

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Introduction

The work of university faculty and school system administrators and teachers to establish Mathematics Specialists in school systems across Virginia has been supported by both corporate and federal/state grants. Initially, support from ExxonMobil Foundation was vital to the initiative to work within selected school districts to define roles and test the impact of Mathematics Specialists. Many of the manuscripts in this journal issue report on efforts to date and on their perceived effect on student learning. This early work has laid the groundwork for the current Mathematics Specialists’ programs across Virginia. In Spring 2003, shortly following the release of the Virginia Mathematics and Science Coalition (VMSC) *Mathematics Task Force Report*, the Virginia Board of Education directed the Department of Education to begin the process of creating a Mathematics Specialist endorsement [1]. This action created a major opportunity and an equally major challenge for Virginia’s mathematics/mathematics education community. The opportunity existed for statewide utilization of Mathematics Specialists, resulting in significant gains in student achievement. The challenge existed because there were virtually no teachers in Virginia who were prepared to serve as Mathematics Specialists. In addition, there were few courses and no full programs available to prepare individuals to serve in these roles. Furthermore, although there was a great deal of anecdotal information that Mathematics Specialist programs significantly improved student learning, there was only limited scientific
research to support this conclusion and no mechanism in place to undertake this research. Placing Specialists in schools represents a significant commitment, and this commitment will not become widespread and sustained without supporting research.

To meet this challenge, over nine million dollars of grant funding has been competitively sought and obtained during the past year by principal investigators Reuben Farley, William Haver, Loren Pitt, and their colleagues. These awards were made in conjunction with VMSC, and in collaboration with Coalition partners. The current funding has enabled the project Principal Investigators (P.I.) and their university and school system colleagues to: 1) work collaboratively to establish seamless programs to prepare Mathematics Specialists; 2) simultaneously conduct controlled research studies on the effect of Specialists on student learning; and, 3) conduct studies of the statewide policy issues related to implementation of Specialists in the schools.

**Virginia Department of Education (VDOE) Mathematics and Science Partnership Program (MSP)**

**VDOE-MSP Goals and Outcomes** — The Virginia Mathematics Specialists Project is a Virginia Mathematics and Science Partnership (MSP) grant that received an initial award for $749,581 in 2004, and new supplemental awards of $295,000 in 2005. The initial partnership was led by the VMSC and included eight colleges and universities, and 26 school divisions. The overarching goal was to train the first cadre of Virginia’s Mathematics Specialists.

**VDOE-MSP Action Plan** — The VDOE grants directed by P.I. Loren Pitt have supported the initial development of five core mathematics courses and the first of three educational leadership courses. These courses are being offered across Virginia in both two-week residential settings and as numerous on-site university courses both in summer and academic year sessions. To date, summer residential institutes have been held at James Madison University and University of Virginia; the 2005 institutes are scheduled at the College of William and Mary and Emory and Henry University. Other courses have been offered at Longwood University, Norfolk State University, University of Mary Washington, Virginia Commonwealth University, and Virginia Tech. This program offers a “Fast Track” for prospective Mathematics Specialists who have master’s degrees to complete anticipated endorsement requirements which were recommended to the Virginia Board of Education in the Virginia Mathematics and Science Coalition Task Force on Mathematics Specialists [1].
The three lead universities, Norfolk State University (NSU), the University of Virginia (UVA), and Virginia Commonwealth University (VCU), agreed to work collaboratively and develop the core of a master’s degree program for K-8 Mathematics Specialists. The proposal defined this core as a sequence of five mathematics courses developed especially for Mathematics Specialists and one leadership course. The five mathematics courses are: 1) Numbers and Operations; 2) Rational Numbers and Proportional Reasoning; 3) Geometry and Measurement; 4) Functions and Algebra; and, 5) Probability and Statistics.

These courses are designed with the specific goal of addressing the needs of K-8 Mathematics Specialists. They are meant to provide a profound understanding of the basic mathematics that is taught in schools, as well as providing participants with an understanding of how children develop their understanding of this mathematics, and how to evaluate their students’ understanding in ways that can inform teaching.

The mathematics and leadership courses are being developed following a model that has been used successfully by the VMSC in professional development projects for a number of years. A development team is assembled consisting of five to ten individuals from higher education and the schools. The teams include teachers, mathematicians and mathematics educators, and mathematics supervisors. Working together, they identify the course goals and identify and/or develop appropriate materials. Detailed syllabi and instructor materials are then pieced together. In advance of teaching the courses, an instructor training session is held involving instructors from all the sites. During these sessions, the future instructors are guided through the materials to ensure that the course materials and the purpose of the various activities are understood by the instructors.

Eighty teachers from across Virginia will complete the sequence of six courses by September of 2005. The lead universities each committed to establishing a master’s degree program for K-8 Mathematics Specialists; this has been done and will be described later in this article.

The master’s degree programs are being offered in a cohort model and, in an effort to develop a common program model, four of these courses are being offered as statewide residential institutes. The grant pays partial tuition, books, living expenses, and stipends for the
mathematics courses. To receive support, participants must be nominated by their school divisions and commit to attending at least two of the residential institutes.

The two 2004 institutes, Numbers and Operations and Rational Numbers and Proportional Reasoning, were held at James Madison University and the University of Virginia, respectively. They were well attended and popular, and a majority of over 90% of the participants who did not already have master’s degrees has applied for admission to one of the new degree programs. The 2005 summer institutes will be in Probability and Statistics and Geometry and Measurement, and will be held at the College of William and Mary and Longwood University, respectively.

Following the success of the 2004 programs, the Virginia Department of Education awarded two supplemental awards to the Virginia Mathematics Specialists Project. These awards have two distinct purposes. First, the Project and the VMSC were asked to host a spotlight and dissemination conference aimed at central office school personnel. The aim of this grant is to highlight the potential of Mathematics Specialists as a tool for strengthening student learning of mathematics, and to inform schools of the programs for educating future Mathematics Specialists that are being developed in the state. A much larger portion of these grants was aimed at enlarging the Specialists Project and, in particular, moving the mathematics project into the rural far Southwest region of Virginia. As a result of this grant, we are planning residential institutes at Emory and Henry College in Summer 2005 and 2006. These institutes will recruit statewide, but recruiting will target the Southwest region.

National Science Foundation (NSF) Teacher Professional Continuum (TPC) Program

NSF-TPC Goals and Outcomes — The NSF-TPC project received a five-year grant of $4,444,898 for a collaborative effort led by Virginia Commonwealth University and the VMSC. Reuben Farley at VCU is the P.I. for this project.

The project focuses on two research studies. One study led by the Educational Commonwealth Policy Institute at VCU is researching the statewide policy issues associated with the implementation of a large scale Mathematics Specialists program across Virginia. This study, led by David Blount and Judy Singleton, is analyzing policy, legislative, regulatory, and funding issues regarding the establishment of the Virginia Mathematics Specialist Initiative.
The mathematics education research study, led by Patricia Campbell, a mathematics education researcher at the University of Maryland, has the goal of determining through well designed research the impact of a Mathematics Specialist program on teachers who are supported by Mathematics Specialists and on the mathematics achievement by these teachers’ students. Patricia Campbell is conducting research to determine:

- The impact of the Mathematics Specialists preparation program on the participants’ attitudes and beliefs;
- The impact of the Specialists on classroom teachers in their schools; and,
- The impact of Specialists on student learning, understanding, and performance on standardized tests.

NSF-TPC Action Plan: Mathematics Specialist Cohorts — The centerpiece of this project is research focused on two cohorts of twelve teachers who are preparing to serve as Mathematics Specialists (a total of 24 Specialists). Participating school systems Portsmouth, Virginia Beach, Richmond City, Stafford, and Spotsylvania have identified a total of twelve triples of schools with comparable student demographics and student performance on Virginia’s SOL tests. One school was randomly selected from each triple, and these twelve schools have been assigned a Mathematics Specialist beginning with the 2005-06 school year. Two years later, a second school will be randomly selected from each triple, and will be assigned Specialists beginning with the 2007-08 school year. Individuals are selected by the participating school systems to receive Specialist training and support, and then are assigned to serve as Mathematics Specialists in the randomly selected schools.

NSF-TPC Action Plan: Mathematics Specialist Preparation Program — The project is refining the six graduate mathematics and mathematics education courses that were first developed under the VDOE-MSP project, and developing two additional courses. The project will also provide the additional support needed by individuals selected to serve as Specialists.

Each course will be offered by NSU, VCU, and UVA. We believe that the research conducted will benefit from having the prospective Specialists enroll in courses taught by three different sets of instructors. This will be more typical of what will occur in an established program. A set of training sessions (faculty development seminars) will be developed and offered to the team of instructors in the project, both university and school personnel, who will be
teaching each section of the course/seminar. Enrollment will be limited in each section of the course to twenty individuals, including, of course, the four teachers from each region who are in the pilot cohort.

It is important that the instructional programs utilized in schools be research based. Likewise it is important that the instructional programs utilized to prepare Mathematics Specialists be research based. Very little research exists concerning the optimum preparation for Mathematics Specialists. The major thrust of the NSF-supported projects is to develop such a research base. The development and instructional teams will remain together throughout the project. They will refine the courses after their first offerings based upon their experiences, feedback from project evaluators, and the preliminary findings of the research team concerning measures of the mathematical content and pedagogical knowledge and beliefs of the Mathematics Specialists.

**NSF-TPC Action Plan: Statewide Master’s Degree** — We will support the training of Mathematics Specialists statewide and enhance the professional development for many other teachers through the development and offering of a Statewide Master’s Degree. Reuben Farley at VCU is directing this program. This training and the flexible degree concept under which it will be offered has received numerous requests from teachers and supervisors. Statewide Master’s Degrees have been initiated by VCU, NSU, and UVA. Institutions across the state anticipating joining VCU, NSU, and UVA in this initiative include James Madison University, George Mason University, Old Dominion University, and Virginia Tech. Each contributing partner will create a flexible master’s program featuring opportunities to earn credits from partner universities across the state in different tracks, such as: Master of Interdisciplinary Studies (Math and Science); Mathematics/Science Specialist; and a Master of Arts in Mathematics Teaching (blending mathematics, content pedagogy, and leadership). The Mathematics Specialist Track featuring the core set of seven graduate mathematics and mathematics education courses developed and/or refined and piloted as a part of this project are being offered by UVA, NSU, VCU and most recently, Longwood University and George Mason University.

A quality control board with graduate school representatives from all participating Institutions of Higher Education (IHE) will approve the content of master’s degree programs offered under this umbrella, as well as approve individual plans of study and award degrees. All of the resources within Virginia (including universities, museums, and science centers) will be
utilized, and individuals will be able to combine different types of credits including: on-site credit at local institutions; residential credit from various institutions offered through grant-funded Summer Institutes around the state; credits earned through various university centers statewide; transfer credits earned in-state or elsewhere; and/or, distance learning credits earned by completing on-line courses from various universities statewide.

NSF-TPC Action Plan: Research on the Effectiveness of Mathematics Specialists — The mathematics education study is being led by Patricia Campbell at the University of Maryland. It will evaluate the effectiveness of Mathematics Specialists through a treatment-control design as it investigates the potential relationship between four outcomes:

- Mathematical content and pedagogical knowledge, and the mathematical beliefs of the Mathematics Specialists;
- Leadership and support practices of the Mathematics Specialists;
- Nature of teachers’ classroom mathematics instruction as interpreted by the Mathematics Specialists, the degree of engagement of teachers with the Mathematics Specialists, and the mathematical beliefs of the teachers; and,
- Mathematics achievement of students in the schools served by the Mathematics Specialists.

The data sources for measuring these outcomes will include:

- Paper and pencil assessments of the mathematical content knowledge and mathematical pedagogical knowledge of Mathematics Specialists;
- Paper and pencil assessments of the mathematical beliefs of Mathematics Specialists and teachers;
- Virginia Standards of Learning (SOL) tests;
- Modification of the Project IMPACT mathematics interview assessment [2];
- Hours of attendance in mathematics professional development activities by teachers and Mathematics Specialists; and,
- Specialists’ activity and reflection logs as entered by the Specialists into a Palm Pilot™ data collection system.

The research will explore a number of core questions:

- Does professional development and practice change Specialists’ mathematical content knowledge, pedagogical knowledge, and beliefs?
• What types of Specialist behaviors and interactions with individual teachers impact student achievement and teacher change?
• Does the impact of the Specialist change over time?
• Do Specialists influence teachers’ mathematics beliefs and pedagogical approaches?

In order to measure potential change in Specialists’, teachers’, and students’ understanding, as well as the relationship between these variables over time, this project will use repeated measures within a stratified randomized design. As described, twelve triples of schools will be identified, with the schools within each triple having a similar prior tradition of mathematics achievement, serving a similar population of students demographically, and operating within the same school district. Within each triple, schools will be randomly assigned to one of three categories: Treatment 1 (Cohort 1 Mathematics Specialist placed in Fall 2005); Treatment 2 (Cohort 2 Mathematics Specialist placed in Fall 2007); and, Control (No Mathematics Specialist). This analysis will access students’ mathematics achievement scores over time, with a teacher having different classes of students across years and these classes having different collections of students across years. For all students in one classroom in one year, the analysis will treat their scores on the SOL as repeated measures of achievement that yield a teacher’s classroom score for that year. Then, these classroom scores from year to year are repeated measures of the effect of the teachers’ instruction, with the potential concurrent repeated effect of teachers’ engagement with the Mathematics Specialists and the expertise of the Mathematics Specialists over time. Recognizing the limited scope of achievement being measured in the SOL tests, this project will also randomly select students from each triple of schools and administer a grade-specific mathematics interview assessment to determine sampled students’ conceptual understanding and reasoning. While these interview data will not be entered in the quantitative analysis, they will address the validity of the project’s assessment of student achievement.

Because a teacher has both student achievement and mathematics beliefs scores for several years and because there is a control group, this analysis essentially can serve as a control for a teacher’s teaching “talent” as it evaluates the impact of the Mathematics Specialists and their offerings of professional development. This analysis will reflect any increase in teachers’ professional development through either workshops or engagement with Mathematics Specialists over time. Because the data also measures the mathematical content and pedagogical knowledge and beliefs of the Mathematics Specialists, as well as their level of activity and sophistication of
reflection, this analysis can examine the impact of expertise and longevity of the Mathematics Specialists on students and teachers. This technique is a multi-level model with cross-classification that incorporates within-classroom and within-teacher variance as well as school-level (Mathematics Specialist) variance.

Because schools and teachers are not randomly assigned populations of students for instruction, and because not all teachers have identical prior professional backgrounds, this analysis will collect student demographic data and teacher certification status data to serve as control variables.

**NSF-TPC Action Plan: Policy Research** — The policy research component is being directed by William Bosher and Daniel Norman through VCU’s Commonwealth Educational Policy Institute (CEPI). Working through the CEPI, David Blount and Judy Singleton will study policy-related issues associated with the implementation of Mathematics Specialists programs across Virginia. First, CEPI will assist project leadership with issues related to policy and regulatory development and implementation including access and communications between the local school districts, appropriate state education agencies, the state legislature, and the university project investigators, researchers and evaluators.

Second, CEPI will utilize a state-level longitudinal case study approach to collect and analyze all policy, legislative, regulatory, and funding issues related to the establishment of the Mathematics Specialists Initiative. Specifically, this study will include analytical components involving political support and expectation, establishment of state licensure, funding mechanisms, training expectations, costs and benefit analyses, and implementation issues.

Third, the longitudinal case study will focus on the parallel utilization history of the project schools and districts including local policy and program regulatory issues. Specifically in this area, CEPI will work collaboratively with the project researchers to design appropriate data collection for local school and district policy and implementation issues regarding personnel selection, recruitment, job description development, and Specialist/classroom teacher interaction. Impact of Specialists upon district instructional services, support systems, and professional development will be analyzed in the policy and regulatory context. Additionally, CEPI will work closely with project researchers to include policy analysis that may be required as a component of
the project’s overall research design as well as to plan within the overall design appropriate data collection methodologies for the statewide and local district case studies.

Policy reports on both the statewide initiative and the local school/district implementation issues will be issued annually during the project period. Each interim report will include specific findings and recommendations intended for practical problem solving in project implementation. It is anticipated that data analysis conducted by the team conducting research of the effectiveness of Mathematics Specialists will raise additional policy, regulatory, and funding choice issues that will need to be incorporated in the case studies. Similarly, policy research likely will uncover additional issues that need to be addressed concerning the effectiveness of Mathematics Specialists. The final report will include corroborative data from survey, interview and participant polling to support/refute preliminary policy, regulatory and implementation issue findings studied during the period covered by the project.

**National Science Foundation Mathematics and Science Partnership (MSP) Program**

**NSF-MSP Goals and Outcomes** — The NSF Mathematics Specialist Partnership Institute received a five-year grant of $3,726,915 to a partnership led by VCU and VMSC, with William Haver of VCU serving as P.I. The Institute will be offered to two cohorts of 25 outstanding K-5 teachers. Each teacher will: participate in a four-week Institute for three consecutive summers; complete a total of 33 graduate credits during the Institute sessions and the subsequent academic years; participate in a rich collection of Institute enrichment activities; and, earn a master’s degree and certification as a Mathematics Specialist. The first cohort has been selected and will begin their training in Summer 2005 in the VCU Summer Institute.

The VDOE-MSP Project focused on preparing teachers who already had earned master’s degrees in related areas. The Institute Partnership will certify the first fully prepared group of Mathematics Specialists who will have completed the full master’s degree program. As a group, the graduates of the Partnership Institute will provide leadership and serve as role models for their peers statewide as Mathematics Specialists become engaged across Virginia.

The goals of the proposed Institute Partnership program are outlined below.

- Prepare a group of fifty exemplary elementary school teachers to provide intellectual leadership as school-based Mathematics Specialists who combine: a profound understanding of the mathematics studied in the elementary grades; an enthusiasm for mathematics and its applications; the special knowledge needed for effective teaching of
mathematics; and, the leadership skills needed to serve as inspirations and resources for their peers and the mathematics education profession.

- Determine the extent to which a quality Institute experience leading to a master’s degree results in transforming the participating teachers from effective classroom teachers to disciplinary leaders who can infuse their schools and the broader profession with a commitment to taking the steps that enable all students to develop a deep understanding of mathematics and a capacity to be successful in advanced mathematics and science courses in subsequent years.

NSF-MSP Mathematics Specialist Cohorts — Two cohorts, each consisting of 25 accomplished elementary school teachers, will participate in a Summer Institute spanning three summers. Each participating teacher will:

- Participate in three sessions of the Summer Institute, each lasting four weeks with follow-up extending throughout the following academic year;
- Complete a total of five mathematics courses, one interdisciplinary mathematics and science course, four education courses, and a final internship/independent study project (nine of these courses will be started during the Summer Institute sessions with varying degrees of follow-up, and one will be offered entirely as a distance learning course);
- Participate in the wide spectrum of other Institute activities;
- Earn a master’s degree, using the above mentioned coursework, and complete Virginia requirements to receive the Mathematics Specialist License; and,
- Receive a stipend of $15,000.

Partner school systems have:

- Made a commitment that participating teachers would serve as full-time school-based Specialists after they have completed the program;
- Representatives on the Management team to assure that the Mathematics Specialist training meets the needs of the partner systems, and that school systems participate as full partners in developing, refining, and offering the program.

The first Institute cohort includes the indicated number of teachers from the following core school system partners: Norfolk City (4), Hampton City (1), Portsmouth City (2), Richmond
City (5), Hanover County (2), Fairfax County (7), Arlington County (3), Alexandria City (3), and Culpepper City (1).

**NSF-MSP Selection of Participants** — The participants are nominated by the partner school systems and then receive final approval for admission to the graduate degree program by the partner universities. The school systems have committed to providing participating teachers the time and the school support to serve as in-school Mathematics Specialists after the successful completion of the Institute experience. This is a major commitment; school systems have made firm plans to provide this time. The systems have been selected to include urban and rural systems with significant minority and non-English speaking student populations. All partners are committed to selecting a diverse set of participants in terms of gender, race, age, and students served.

**NSF-MSP Institute** — The core of the project will be the NSF Institute that will take place in three four-week sessions. For each cohort of teachers, the first Summer Institute session will be hosted by VCU, the second session by NSU and directed by Phillip McNeil, and the third by UVA under the direction of Loren Pitt. During each session, the teachers will: complete two mathematics courses (with follow-up during school year); begin a leadership/education course (a large portion of the course will take place during the year so that teachers can put in place what is discussed in their own classes and in those of other teachers within their schools); and, participate in seminars, conduct classroom visitations, and interact with visitors to the Institute. A major emphasis will also be placed on preparing principals and school system administrators to make use of Mathematics Specialists.

**NSF-MSP Coursework and Master’s Degree** — The Institutes will offer the five mathematics and two education courses developed under the VDOE-MSP and NSF-TPC projects. These courses will be refined based upon research findings and formative evaluation. In addition, two new education/leadership courses and an externship course will be developed by a team of teachers, mathematics and mathematics education college faculty, and school system mathematics supervisors. One of these courses will be a distance learning course.

Upon completion of the Institute Program, including the coursework described above, the master’s degrees will be awarded by NSU, UVA, or VCU and it is anticipated that the
participants will be fully licensed as Mathematics Specialists by the Virginia Department of Education.

**NSF-MSP Research Study** — The major research component is directed by James McMillan with the Metropolitan Educational Research Consortium. Aimee Ellington and Joy Whitenack at VCU will utilize case studies of Institute participants to study the effectiveness of the training program on participants preparing to become Mathematics Specialists. A naturalistic, qualitative case study design will be developed and implemented. This type of research allows the researcher to better understand the “why” and “how” of changes attributed to the introduction of an intervention. In this study, Mathematics Specialists’ professional activities are the focus of the research project. This qualitative study complements the quantitative research undertaken in the NSF-TPC project.

**NSF-MSP Research Study: Phase I** — The following research questions will be addressed in Phase I of the research:

- What is the nature of the professional relationships developed between the Mathematics Specialists and the college mathematics faculty who are leading the MSP Institutes and teaching the Institute courses?
- What do the Mathematics Specialists perceive is their role in facilitating instructional change?

For Phase I, all 25 Specialists-In-Training in the first cohort will be studied. In addition to interviews and observations, the researchers will make use of the instruments utilized by Patricia Campbell in the NSF/TPC-supported project described previously in this manuscript. These instruments gather pre- and post-data of the participants concerning content knowledge, pedagogical knowledge, and mathematical beliefs. As a part of this phase, the participants will be clustered representing different approaches to the role of Mathematics Specialists in the schools (second Phase I research question).

**NSF-MSP Research Study: Phase II** — The following research questions will be addressed in Phase II of the research:
Which professional development activities offered by the MSP Institutes impact the Mathematics Specialists’ effectiveness in the schools?

What is the nature of the professional relationships between the Mathematics Specialists and the school building administrators?

What factors and processes support the successful infusion of Mathematics Specialists? How do these factors and processes facilitate change in teachers’ instructional practices?

Overall, what are the most important ways the Mathematics Specialists impact their respective school buildings, in general, and individual teachers in particular?

A sample of four to five prospective Mathematics Specialists will be purposely selected to be the subjects of case studies. Two or three Specialists will be selected from each of the most promising clusters identified in Phase I.

Multiple sources will be used to document and account for the Mathematics Specialist professional activities. Most of the data will be collected using qualitative methods, although contributing quantitative data will also be used. Sources will include the Mathematics Specialists, MSP Institutes, Institute leaders, principals and teachers.

Although data collection will involve the use of multiple techniques, the qualitative data will be collected primarily through formal and informal interviews, and through observations. The researchers will develop a core set of questions that address the project goals, objectives, and procedures. In addition, the researchers will develop potential follow-up questions to ask. Because the purpose of ethnographic interviewing is that of purposeful sampling as well as checking and triangulating information, these questions will be sufficiently open-ended to allow the participants to explain, develop ideas, and to elaborate. Further, the researchers will triangulate the interview data with other data to develop a rich description of the social contexts in which the Mathematics Specialists participate. Hypotheses will be developed, refined and, in some cases, discarded during this process of reconstructing the contexts.

Interviews will be conducted with key personnel on an ongoing basis throughout each year of the project to fully understand the dynamics of introducing Mathematics Specialists and
the contexts of the schools. It is expected that there will be at least seven interviews in each of the schools each year. All formal interviews will audiotaped. When possible, the researchers will develop field notes of interview sessions (formal and informal) that will later be expanded and reviewed for accuracy. The interviewees will also have opportunities to review these informal documents to check for the extent to which the information is accurate, appropriate, etc.

Observations will also be conducted each year, with the number of observations increasing each year as greater infusion is expected. It is anticipated that at least four one-half day observations will be conducted in each school during the second year and at least seven observations will be made during subsequent years. Observers will record field notes taken during and immediately following time in the school.

Triangulation and negative case identification will be used to enhance the credibility and transferability of the findings. The development of interview and observation procedures will take place during the initial summer and fall of the project.

Both interview and observation data will be analyzed and synthesized to develop categories, case patterns, and themes that provide in-depth understanding of the Mathematics Specialists’ project activities. The project findings will be coordinated with the project evaluation and other research that documents changes in the Mathematics Specialists and student learning.

**Conclusion**

Support from VDOE-MSP, NSF-TPC and NSF-MSP will result in the development and refinement of a research-based graduate program to prepare Mathematics Specialists. Master’s degree-level programs will be offered by the University of Virginia, Norfolk State University, Virginia Commonwealth University, Longwood University, George Mason University and, most likely, additional universities. Each will include the identical, collaboratively developed, set of five mathematics and three education/leadership courses.

Support from the NSF was provided because of the research that will be conducted under these projects. By its very nature, the results of this research are unknown. However, we are optimistic that it will support the hypothesis that well-prepared, school-based Mathematics Specialists will lead to major gains in student learning.
As the primary goal of the VDOE-MSP project and the secondary goal of the NSF projects, the first group of Virginia’s Mathematics Specialists is being prepared. The VDOE-MSP project will prepare approximately 120 individuals, many of whom already possess master’s degrees and will meet the anticipated criteria for endorsement. The two NSF projects will prepare a total of approximately 170 Mathematics Specialists. These individuals will be primarily from the pioneering school systems that partnered in obtaining the research support and made the early commitment to Mathematics Specialists: Stafford, Spotsylvania, Alexandria, Arlington, Culpepper, Fairfax, Richmond, Hanover, Norfolk, Portsmouth, Hampton, and Virginia Beach. If evidence continues to support the need for and benefits of Mathematics Specialists, additional school systems in other regions of the Commonwealth outside of Virginia’s “Golden Crescent” region may decide to deploy Mathematics Specialists. In this case, additional support at the local, state, or national level will be required to make use of the programs that have been developed to prepare individuals to serve in this capacity.

As discussed throughout the paper, the project evaluators are making important formative contributions throughout the projects. Marie Sheckels of the University of Mary Washington is evaluating the VDOE-MSP Project and Horizon Research, Inc. (HRI) of Chapel Hill, NC, under the leadership of Iris Weiss, Melissa Smith, and Sean Smith, is conducting the evaluation of the NSF-MSP and NSF-TPC projects. In addition to the formative contributions, the summative evaluation, which is closely coordinated with project research studies, will validate the research protocol and the conclusions reached.

The funding invested in the Virginia Mathematics Specialists program both from corporate and federal agencies is an indication of Virginia’s national leadership in establishing the role of Mathematics Specialists in Virginia’s schools. The research and evaluation components of these projects will be instrumental in determining the future training and deployment of Mathematics Specialists in schools across the Commonwealth and the nation.
References
