

The Use of State Policy to Support Teacher Leader Programs: The Case of the Virginia MSP

August 2010

Neil Schiavo
Barbara Miller

Education Development Center, Inc.

Prepared for the
Math and Science Partnership Knowledge Management and Dissemination Project
Horizon Research, Inc.
Education Development Center, Inc.
A Math and Science Partnership Research, Evaluation and Technical Assistance project
Funded by the National Science Foundation

Work on the Math and Science Partnership Knowledge Management and Dissemination Project is funded by the National Science Foundation (EHR- 0445398). These writings do not necessarily reflect the views of the National Science Foundation.

Christine Phillips¹ was engaged in a debate in response to the question “How many rational numbers can be found between 1/10 and 1/11?” Phillips, an elementary school teacher, and the other teachers in her graduate-level course had been challenged by the mathematician leading the class to prove their answers aloud to the class. It was a conversation about mathematics that Phillips could not have participated in three years ago, before she applied to the graduate degree program to prepare K-8 Mathematics Specialists offered through the Virginia MSP. Since she began the program, the state of Virginia had instituted a Mathematics Specialist license for school-based teacher leaders who were released from the classroom and charged with strengthening mathematics instruction within their schools. Phillips was eager to become a Specialist. Before joining the graduate program, Phillips had an interest in mathematics and was looking for leadership opportunities at the elementary school where she taught. She was already seen as a “math person” among the teachers in her school. However, her courses in the graduate program had shown her how much she had to learn to become a true leader in mathematics instruction in her school. As she provided her proof to her classmates, Phillips thought about how this discussion would help her in her work as a Mathematics Specialist. It was unlikely that she would discuss these concepts at this level with teachers in her school, but Phillips recognized that she needed a deep knowledge of mathematics to be an effective Mathematics Specialist and her graduate courses moved her towards that goal.

Introduction

The Virginia MSP² was launched in 2004 with funding from the National Science Foundation. The project was a partnership between three university partners, nine school districts, and the Virginia Mathematics and Science Coalition (VMSC), a state-wide collaborative focused on mathematics and science education made up of leaders from K-12 school districts, universities, government, and business. Leadership of the Virginia MSP consisted of mathematicians and mathematics education faculty from the participating universities, district mathematics supervisors, and members of the VMSC. The Principal Investigator of the Virginia MSP was Bill Haver, a mathematician from Virginia Commonwealth University.

The goals of the Virginia MSP were connected to the creation of a new state license for K-8 Mathematics Specialists in Virginia, as an effort to improve the quality of mathematics instruction across the state. Ultimately, the Virginia MSP sought to develop a program that could be replicated across the state to prepare teachers to become Mathematics Specialists. Towards that end, the MSP project had three explicit goals:

- Prepare a group of 54 exemplary elementary school teachers to provide intellectual leadership as school-based Mathematics Specialists.

¹ Pseudonyms are used in all vignettes, which are based on accounts of project leaders and participating teachers.

² The official title of the project is the NSF-MSP Institute: Preparing Virginia’s Mathematics Specialists. Throughout this case, the project is referred to as the Virginia MSP.

- Determine the extent to which a quality Institute experience results in transforming the participating teachers from effective classroom teachers to disciplinary leaders in their schools.
- Institutionalize Mathematics Specialist programs in Virginia through creating graduate degree programs preparing Mathematics Specialists as permanent fixtures at partner and other institutes of higher education.

This case focuses on the strategic use of state policy in the Virginia MSP to support the creation of sustainable graduate degree programs to prepare Mathematics Specialists. The case begins with the context for mathematics teacher leadership in the state, followed by a description of the strategies used by the Virginia MSP to achieve its goals. This provides the backdrop for discussion of the key issues, identified by the project leaders, which shaped the design of the graduate degree programs and its effectiveness in preparing Mathematics Specialists. The case concludes with a discussion of sustained impact of the teacher leadership programs implemented through the Virginia MSP.

Description of the Virginia Math and Science Partnership

The Virginia MSP was designed as a partnership between three universities and nine school districts³, with the involvement of the VMSC. The partners had distinct responsibilities, but shared in the development and implementation of a common vision for the preparation and practice of Mathematics Specialists.

University partners included mathematics and mathematics education faculty members from Virginia Commonwealth University, Norfolk State University, and University of Virginia. At its core was a small group of mathematicians who had shared longstanding friendships and professional associations that preceded the Virginia MSP. These relationships were central in initially establishing the partnership across universities and with school districts, as the mathematicians had worked with local school systems in earlier initiatives.

A central responsibility of the university partners was to collaborate on the design and instruction of graduate degree programs to prepare Mathematics Specialists. As part of the degree programs, each university was responsible for hosting a summer institute which rotated among the three partners each year. An important condition among the universities was the agreement to accept a larger number of transferred graduate credits than would ordinarily be permitted by the institution. This provision allowed participants to attend (and receive credit for) courses taken during the summer institutes that they attended at each of the partnering universities.

³ In Virginia, school systems are organized into divisions, which operate similar to the structure of school districts that are present in many other states. The main distinction from a school district is a school division's status as a sub-division of the local government. A school division receives budget approval from its associated city, town or county. In this case, for clarity, the term district has been substituted for division.

Nine districts were members of the Virginia MSP: Alexandria City, Arlington County, Culpeper County, Fairfax County, Hanover County, Norfolk City, Richmond City, Portsmouth City, and Stafford County. These districts were all located in the “urban crescent” of Virginia, in the northern and eastern portion of the state. Districts were purposely recruited that fit with the MSP vision for the Mathematics Specialists. Districts were selected that had large enough elementary schools to support the placement of a full-time, school-based Specialist. Also, districts with growing “English as a second-language” student populations and minority populations were selected to test the effectiveness of Specialists as a strategy for improving student learning among populations most at-risk. All participating districts had these characteristics, although the demographics of the student populations varied among the districts. Within the Virginia MSP leadership team, districts were represented by the district mathematics supervisor. The supervisors participated in the design and instruction of the graduate courses.

Each district worked in partnership with the universities in selecting teachers for the MSP programs. Districts and universities agreed to a set of common criteria as the basis for selection. These criteria included the demonstration of leadership potential, an interest in mathematics, and a minimum of three years experience of classroom instruction. Each district managed its own process for identifying and nominating candidates for the MSP. District mathematics supervisors had a key role in selecting candidates, with the input of school principals, but candidates needed final approval for admittance from the university to which the candidate was applying. In selecting the second cohort, the MSP instituted a new policy that candidates were required to take the quantitative portion of the Graduate Record Examination (GRE) or Miller Analogy Test and receive a minimum score to be eligible for the MSP graduate degree program. This new policy was in response to an analysis of the performance of the first cohort, which found that entrants with little background in mathematics struggled in the graduate courses.

A central responsibility of the district partners and a key condition for participation in the Virginia MSP was district commitment to place graduates of the degree programs into full-time Mathematics Specialist positions. These positions would be funded by the district. Participating school districts were not required to commit to specific roles for the Mathematics Specialists; the districts determined the details of how to use the Mathematics Specialists in their schools.

Context for Mathematics Teacher Leadership in Virginia

Prior to the launch of the Virginia MSP, the Virginia Mathematics and Science Coalition (VMSC) had investigated ways to improve elementary mathematics instruction across the state. In 2002, the VMSC commissioned a task force to investigate the effectiveness of various mathematics specialist-type positions in districts across Virginia. The task force, which included many future members of the leadership team of the Virginia MSP, published a report in 2005 that identified factors that limited the impact and sustainability of these positions. The task force found that many of the earlier programs had suffered from a lack of highly-qualified candidates or an understanding of what highly-qualified

mathematics specialists would know. Further, in cases where the VMSC report found examples of strong models of teacher leadership in mathematics, the impact of these programs was compromised because the programs could not be sustained.

The VMSC task force recommended the creation of a state certification for Mathematics Specialists to address the challenges that had faced earlier initiatives. The report asserted that state-wide licensure would validate and establish rigorous standards for the Mathematics Specialist position, ensure a steady pipeline of candidates, and bring more visibility and stability to the work of these teacher leaders. The VMSC report noted that programs that were solely left to the local school districts would always be considered tenuous in comparison to programs existing at the state level. In making the case for a state-sanctioned teacher leader position in mathematics, the task force drew a comparison to an established license for Virginia Reading Specialists.

Virginia state license provides professional recognition and legitimacy to reading programs and to Reading Specialists. Across Virginia, school districts can immediately identify teachers who are prepared as experts at teaching reading by their license. In this same way, we believe that a teacher in a school who carries the title of Mathematics Specialist will immediately be recognized by other teachers, administrators, and parents for their expertise in teaching and learning mathematics. (Virginia Mathematics and Science Coalition Task Force, 2005)

The state-wide Mathematics Specialists license received final approval in September 2007. The graduate degree programs of the Virginia MSP were designed to meet the requirements for licensure and establish a model for approved Mathematics Specialists graduate programs across the state.

MSP Strategies

The goals of the Virginia MSP were to prepare teachers to be Mathematics Specialists, assess whether the program produced disciplinary leaders in their schools, and institutionalize these graduate degree programs. Three primary strategies were planned for meeting these goals: (1) creating and teaching coursework for graduate degree programs at the partnering universities; (2) developing summer institutes as a centerpiece of the degree program; and (3) conducting research on the impact of the degree program on Mathematics Specialists knowledge and skills as well as practices in their schools.

Coursework for graduate degree programs

A focus of the Virginia MSP was the creation of graduate degree programs that were aligned to the K-8 Virginia Mathematics Specialists license. The Virginia Department of Education had proposed requirements for the Mathematics Specialist license, namely that candidates should have at least three years of classroom experience teaching mathematics and possess a degree from an approved Mathematics Specialists program, or complete the requisite graduate level coursework in another program, including at least 21 hours of

coursework in undergraduate or graduate-level mathematics (Virginia Department of Education, 2007). These requirements were the foundation for designing the graduate degree programs offered through the Virginia MSP.

The licensure requirements informed the number of courses in the Virginia MSP graduate programs and the subjects that were covered. Each university offered its own program that consisted of virtually identical core courses. The titles of the courses varied slightly, as faculty adapted existing courses when possible, rather than create new courses which required additional time to complete the university approval process. MSP funding was used to pay for university faculty members and district mathematics supervisors to come together to design and teach the graduate courses.

The mathematics courses in the graduate program at each university focused on an agreed upon set of topics: Geometry and Measurement, Number and Operations, Probability and Statistics, Rational Numbers, Algebra and Functions. Similarly, the three educational leadership courses in the program addressed agreed upon topics. The first course focused on mathematics pedagogy, the second on coaching techniques, and the third on lesson study and assessment. Teachers that were admitted into the Virginia MSP graduate programs had the cost of their tuition covered by the project. Participants also received an annual stipend from the Virginia MSP.

For project leaders, it was important that the graduate degree programs not only addressed the licensure requirements, but ensured a rigorous preparation for the Mathematics Specialist role. They believed that the rigor of the graduate programs was enhanced by bringing together members from each of the partnering organizations to develop and teach the courses. The courses were designed collaboratively by teams of mathematicians and mathematics education faculty from the university partners and school district mathematics supervisors from the nine school districts. Courses were typically taught by a three-person team that included a member of the faculty of mathematics and of education and a district mathematics supervisor. The Virginia MSP embraced this collaborative approach to ensure that the graduate courses attended to the mathematics, pedagogy, and leadership skills seen as necessary to be effective as a Mathematics Specialist.

Summer institutes

The centerpiece of the Virginia MSP graduate coursework was a residential summer institute. Participants in the programs attended the summer institute in three successive years. The majority of the coursework of the graduate degree programs was completed during the summer institutes. During each institute, participants completed two graduate courses in mathematics and began one education leadership course, which was completed through monthly meetings during the school year.

The summer institute was organized as an intensive, 20 day experience over five weeks, during which participants focused exclusively on engaging in their coursework and developing the skills to become Mathematics Specialists. The expense of attending and

conducting the summer institute was paid for with MSP funds. Participants lived together in university dormitories and attended courses from morning until late in the afternoon. Virginia MSP project leaders said that it was not uncommon, after a day of classes, to find participants discussing mathematics and their courses into the evening and night. Project leaders viewed the summer institutes as the primary opportunity to have access to the program participants, who worked during the school year as teachers.

Each year, the summer institute was held on the campus of a different university partner. By the time participants had completed the graduate degree program, they had attended a summer institute offered by each of the universities that were core partners in the Virginia MSP. Regardless of where it was held, the summer institutes had a similar structure and were attended by faculty and district leaders from across the partnership. Although the courses that were taught differed each year, the number of courses and the team-teaching approach was consistent during each summer institute.

Research on impact

The Virginia MSP organized empirical research that would support the goal of creating a model for graduate degree programs that could be expanded across the state. Studies were conducted to document the effects of participation in the graduate degree programs and the impact of Mathematics Specialists on mathematics instruction in their schools.

A set of case studies by researchers from Virginia Commonwealth University focused on the impact of the Virginia MSP graduate programs on the development of Mathematics Specialists (Whitenack & Ellington, 2007). The researchers selected a sample of participants in the Virginia MSP graduate degree programs and followed them as they completed the programs and worked as Mathematics Specialists. Data were collected through interviews and observations, and assessments of Mathematics Specialists' knowledge of mathematics and pedagogy. The findings describe the experiences of participants in their courses and document activities of Mathematics Specialists to provide support to teachers and students. Project leaders noted that these findings were intended to inform the replication of programs at other universities in Virginia.

A quantitative research study (Campbell & Malkus, in press) was organized in partnership with a companion NSF-funded project, led by researchers at the University of Maryland. The study of randomly selected treatment and control schools compared student achievement on Virginia state tests in mathematics in schools that employed Mathematics Specialists to schools that did not. Findings from the study, based on test scores of 28,000 students, determined that students in grades 3, 4 and 5 in schools with Mathematics Specialists significantly outperformed students in the control schools. Project leaders believed that the findings supported the claim that the presence of a qualified Mathematics Specialists contributed to improved student learning in mathematics. With sufficient evidence of this claim, project leaders hoped that these research findings will help fuel expanded interest and support of the Mathematics Specialists around the state.

Key Issues that Shaped the Design and Implementation of the Virginia MSP Mathematics Specialist Program

Project leaders of the Virginia MSP identified key issues that shaped the design and implementation of the work. These issues reflected conditions that influenced the project's structure and focus, as well as decisions made by project leaders that contributed to the project's success. Discussion of each of these issues highlights strategic thinking as well as reflections in hindsight by project leaders, and offers insights for other designers of teacher leader programs.

- The partnership of universities and school districts needed to hold a shared vision for the work of the Mathematics Specialists.
- The rigor of the graduate program was strengthened through a collaborative approach to developing and teaching the courses.
- Utilization of Mathematics Specialists was influenced by district policies and school expectations.
- State policy set expectations for the preparation of Mathematics Specialists, but not for their work in schools.

The partnership of universities and school districts needed to hold a shared vision for the work of the Mathematics Specialists.

The leadership of the Virginia MSP recognized that, in order to design effective graduate programs, it was essential for the various partners to hold a shared vision for the purpose of the Mathematics Specialists. To craft a shared vision, one of the initial actions of the MSP was to gather the mathematicians, mathematics education faculty, and district mathematics supervisors of the MSP leadership team to create a statement describing the purpose of the Mathematics Specialist position. The state licensure (which was going through the final approval process at the time) provided an outline of which courses needed to be offered in the graduate programs. Project leaders saw the definition of the Mathematics Specialists as a step that moved beyond the requirements spelled out for licensure, which connected the training of Specialists to the responsibilities of Specialists in schools.

Writing the definition of the Mathematics Specialist position was an iterative process which lasted four months. The leadership team met regularly during that period, drafting and revising the definition. In their meetings, the leadership team drew on the earlier work of the VMSC task force and attended to issues that were important to district and university stakeholders. The definition described the purpose of the Specialist position in terms of the conditions and challenges present in schools across the state, to provide an image of how the Mathematics Specialists could operate in schools anywhere in Virginia to improve mathematics instruction. It characterized the Specialist as a resource devoted to working directly with teachers and as someone who could collaborate with administrators around instructional issues in mathematics. The final product was used by members of the Virginia MSP to promote the Mathematics Specialists as a strategy to

improve mathematics instruction and appeared in brochures to recruit program participants for the second MSP cohort. It was also shared with universities and school districts outside the MSP.

The definition stated:

- The overarching purpose for Mathematics Specialists is to increase the mathematics achievement of all the students in their schools. To do so, they*
- *Collaborate with individual teachers through co-planning, co-teaching, and coaching;*
 - *Assist administrative and instructional staff in interpreting data and designing approaches to improve student achievement and instruction;*
 - *Ensure that the school curriculum is aligned with state and national standards and their school district's mathematics curriculum;*
 - *Promote teachers' delivery and understanding of the school curriculum through collaborative long-range and short-range planning;*
 - *Facilitate teachers' use of successful, research-based instructional strategies, including differentiated instruction for diverse learners such as those with limited English proficiency or disabilities;*
 - *Work with parent/guardians and community leaders to foster continuing home/school/community partnerships focused on students' learning of mathematics; and*
 - *Collaborate with administrators to provide leadership and vision for a school-wide mathematics program. (Mathematics Specialists program brochure, 2007)*

Project leaders reported that the definition of the Mathematics Specialist position created common ground in two important ways. First, it provided the university partners with a shared understanding of what the Mathematics Specialists needed to be able to do, so that the graduate programs offered through the partnership would be aligned. Second, the common definition gave school districts confidence that the preparation programs were focused toward a known and public understanding of Mathematics Specialists' work in schools.

The rigor of the graduate program was strengthened through a collaborative approach to developing and teaching the courses.

Project leaders of the Virginia MSP aimed to design a model for graduate degree programs that, when replicated elsewhere, would not only address the same course topics but also provide the same rigor that marked the MSP programs. The project leaders identified the process used to develop and teach the courses as an important aspect of the graduate degree program courses. All courses taught in the Virginia MSP programs had been developed collaboratively by mathematicians, mathematics education faculty members, and district leaders. Project leaders believed that access to these different kinds of expertise contributed to the effectiveness of the preparation of the Mathematics

Specialists, who needed to hold deep knowledge of mathematics, pedagogy, and leadership skills.

This team-based process was different from how graduate courses were typically developed and taught. The project leaders documented and promoted this approach so that it could be replicated in other universities in the state, highlighting the following features:

1. Courses should be developed cooperatively with other universities, and undergo a critique process from colleagues at other universities.
2. Courses should be developed across the university's schools of mathematics and education, and typically should also include an instructor from a school district.
3. The university must agree to the transferability of credit to other universities offering courses for the Mathematics Specialists program.

The process of collaborative development and vetting of courses was employed at all three universities involved in the Virginia MSP. It ensured that there was consistency in the Specialist programs across the partnership and that a candidate would experience courses of similar quality and focus, regardless of the institution. Because students would be engaged in coursework at different universities over the course of the three-year program, it was important to establish a common process that could ensure rigor and consistency across the partnership. A project leader of the Virginia MSP noted the importance of providing time to faculty and district leaders to engage in collaborative work and the importance of MSP funding to bring partners together, across institutions.

The Virginia MSP enjoyed advantages from its history that supported collaboration among members of the leadership team. Several of the mathematicians had collaborated in earlier K-12 mathematics initiatives and had worked previously with the district mathematics supervisors of the partnering school districts. Further, the VMSC provided a strong state level presence that had brought together members of the Virginia MSP leadership to work on earlier education projects that had state-wide influence. The project leaders of the Virginia MSP, thus, had some common ground prior to the MSP that benefited their work in developing the Mathematics Specialists coursework. Still, project leaders noted that tension could emerge as mathematicians and mathematics educators argued for competing priorities within the course content. One project leader explained that typically tension arose as mathematicians aimed to raise the level of mathematics within the courses, while educators sought to insert more attention to student thinking. Project leaders believed that these tensions were adequately resolved through the collaborative process.

The process used to promote rigorous coursework, across universities, was carried beyond the partners that comprised the Virginia MSP. The VMSC, while having no authority to approve degree programs, brought together commonly developed Mathematics Specialists degree programs under the Statewide Masters Degrees Program which allowed for at least 15 credits of transfer work among the partner institutions. By overseeing this cooperative, the VMSC was able to review the rigor of the coursework offered at each university to determine if it met the standards for the license. Serving in

leadership positions of the VMSC were members of the Virginia MSP leadership team, and they supported the use of the MSP course development process as the program expanded to additional universities across the state. The VMSC, for example, required that courses be developed collaboratively by mathematicians, education faculty and school staff, before granting approval to universities that wished to offer the Specialist degree through the cooperative Statewide Masters Degrees Program.

Utilization of Mathematics Specialists was influenced by Virginia district policies and school expectations.

Project leaders of the Virginia MSP noted that district mathematics supervisors were critical to the success of the project. The district mathematics supervisor occupied a unique and important bridging role between the university faculty and the preparation program and building principals and the Specialists' work in schools. Project leaders had purposely sought mathematics supervisors as representatives of the district partners. It was believed that an advocate for the MSP needed to be district-based and have a mathematics focus in order to actively support the MSP vision for the Mathematics Specialists. In addition, the mathematics supervisors were seen as a district role that tended to have greater stability than other district positions, which would provide continuity for the Mathematics Specialists program in the district.

District mathematics supervisors understood the long-term goals of the MSP program to establish the Mathematics Specialists as a lasting feature in Virginia schools. The district mathematics supervisors also understood the immediate pressures on schools to utilize Specialists to improve student performance in mathematics, as measured by annual state tests. As a result, supervisors were in a position to influence and support principals in their use of Mathematics Specialists and helped to balance the competing demands placed upon the Specialists.

The district mathematics supervisor often had to address the tension that could result from the Specialist role as envisioned by the Virginia MSP project leadership (which included the district mathematics supervisor) and the expectations for Specialists held by principals. Principals were the ultimate determiners of the work of the Mathematics Specialists in their schools. Some principals placed Specialists in roles where they would work with at-risk students directly, rather than working with classroom teachers, in an effort to improve the performance of those students as quickly as possible. This ran counter to the Virginia MSP vision for the Mathematics Specialist as a leader who could improve mathematics instruction across an entire school by working with classroom teachers.

Each district mathematics supervisor devised his or her own strategies for working with principals to maximize the impact of the Mathematics Specialists in schools. A common issue that supervisors addressed was the amount of time Specialists spent working with teachers versus working directly with students. A strategy used by one supervisor was to gather data to share with principals that showed exactly where and with whom the Specialists were working, and for what duration. These data framed discussions by this

supervisor with principals in her district about whether the use of Specialists was consistent with goals for how they could best impact instruction in the schools. Another strategy used by this supervisor was to outline for principals the knowledge and skills that Specialists brought to their work, to make a case for how they could be used most productively.

District mathematics supervisors also used the influence of their position to inform the work of Mathematics Specialists. Often, supervisors had direct supervision of Specialists. Or supervisors had input into principals' performance review, and could use that leverage to shape the role that Specialists played.

State policy set expectations for the preparation of Mathematics Specialists, but not for their work in schools.

Virginia MSP project leaders recognized that the state licensure requirements determined the training of the Mathematics Specialists, but that state policy did not dictate the work that Specialists would do in schools. Project leaders believed that it was important to develop an approved Mathematics Specialist program in order that these teacher leaders would have the necessary knowledge and skills, and the flexibility to apply what they knew to their work in schools. One project leader stated that, in order to prepare the Mathematics Specialists for success,

Flexibility is the key, given the various crises and needs that emerge each day... Flexibility is developed through a broad-based skill set, in which they know the math content well, so that there is some automaticity of math; they don't need to "look it up." And that they are politically savvy, know what hot button issues are in their school, so that they don't add fuel to the fire, by being aware of constituents needs and issues.

The work of each Mathematics Specialist was shaped by principals, but frequently had common responsibilities: working with classroom teachers to plan lessons, analyzing student learning, modeling instruction, and leading professional development for teachers. However, the extent to which each Specialist engaged in these activities varied, and Specialists often had additional responsibilities that were different from the Virginia MSP vision for their role, such as working directly with students or working in other subject areas.

This vignette offers a comparison of the work of two Mathematics Specialists. After completing their third summer institute, Christine Phillips and Ruby Thomas were hired into Mathematics Specialists positions in two elementary schools in the same Virginia district. Transitioning from a classroom teacher role, each believed that she had the skills and depth of knowledge needed to succeed in being a leader in mathematics instruction in her assigned school. Yet now, in their second year of work as Mathematics Specialists, the responsibilities of each looked very different from one another, as demonstrated in this account of a typical day for Phillips and Thomas in their respective schools.

Christine Phillips stood to the side of the table as the three members of the fourth-grade team at Hardy Elementary School chatted and reviewed the work of their students. The teachers had brought student work from a monthly assessment to the meeting and were each asked to grade the work of students from one of their colleagues' classrooms. Phillips saw grading the student work as an opportunity for the teachers to look beyond their own classrooms and into the classrooms of their colleagues. In this meeting, Phillips observed that the students of one fourth-grade teacher had not attempted to answer the final problem in the task. Phillips made a mental note to follow up to determine if the teacher simply overlooked this last problem or if the problem represented an area where this teacher could use additional help.

The principal at Phillips' school had assigned her the responsibility for analyzing student achievement data from the state mathematics test and working with teachers in grade-level meetings and one-on-one in classrooms. Beyond these responsibilities, Phillips typically determined what actions she took as a Mathematics Specialist. Her experience this year was in contrast to last year, in her first year as a Mathematics Specialist, when she also had responsibilities for work in science and in literacy. This year, she was glad to focus only on mathematics, in a role directly related to the preparation she had received through the MSP. The experience, though, made her aware that she was seen as a resource that could be used to address the particular challenges currently facing the school.

Ruby Thomas is the Mathematics Specialist at Bates Elementary School, in the same school district as Christine Phillips. The principal at Bates had assigned Thomas a different set of responsibilities than those of Phillips and placed her in the role of working directly with students most in need of additional instruction in mathematics. Thomas had less contact with classroom teachers and less control over which teachers she works with, compared to Phillips.

As a Mathematics Specialist, Ruby Thomas was charged with identifying students who need support in mathematics and then developing and providing that support. Thomas designed monthly grade-level assessments to be administered by teachers, then collected and analyzed the student data, disaggregating the results into sub-groups. Thomas then worked, in small groups, with those students who were identified through the assessment as needing extra help, and tracked their progress through a second assessment. For half of each day, Thomas also worked with teachers during their grade-level planning time, led professional development sessions, and coached new teachers. Thomas worked with experienced teachers on a voluntary basis.

Thomas wanted to support teachers in using more open-ended student assessments, but her opportunities to work directly with teachers would soon be reduced. As the time for state standardized tests approached, Thomas would turn all her energies to working with students in remediation in a pull-out program. Thomas hoped that next year her role would be altered to allow her to draw more directly from her preparation as a Mathematics Specialist. She believed that she could work with those students needing

extra help directly in their classrooms, so that she could model strategies in front of the teacher.

While Christine Phillips and Ruby Thomas shared the same preparation and each received a Mathematics Specialist certification, they did not engage in the same kind of work as Mathematics Specialists in their schools. State policy shaped the graduate degree programs, but it did not influence the nature of the work that the Specialists did in the schools. For this reason, the Virginia MSP invested resources in strategies that supported their vision for the work of the Mathematics Specialists in order to influence the work of graduates of the MSP degree programs. These strategies included the important bridging role of the district mathematics supervisor and research on the impact of Mathematics Specialists' work on student achievement.

The Sustainability of the Virginia MSP Mathematics Specialists Program

During five years of funding from NSF, the Virginia MSP made inroads towards its goals of creating graduate programs linked to the Mathematics Specialist license that could be replicated at universities across the state and successfully graduated two cohorts of Mathematics Specialists. The sustainability of the Virginia MSP has been demonstrated in the continuation of the graduate degree programs at the universities involved in the MSP, the start of similar graduate degree programs in additional Virginia universities, and the increased presence of Mathematics Specialists in K-8 education in Virginia schools.

This section of the case is a discussion of the sustainability of the graduate degree programs of the Virginia MSP. Sustainability is viewed through the lens of strategies of the MSP project leaders that were likely to contribute to continuation and growth in the Virginia MSP programs beyond the original MSP funding. This discussion expands on the strategies and key issues identified by the Virginia MSP project leaders as influential in the design and implementation of their programs.

Strategies that contributed to sustainability were identified through the use of a theoretical framework from the Handbook for Enhancing Strategic Leadership in the Math and Science Partnerships (Weiss et al., 2004). In the framework, four components were identified as critical to enacting and sustaining change through school reform efforts: 1) designing and implementing interventions, 2) garnering support from key stakeholders, 3) aligning policy and 4) developing capacity and infrastructure to scale up interventions.

Strategies that contributed to the sustainability of the Virginia MSP Mathematics Specialist program:

- The partnership of universities and districts allowed the MSP to pilot the Mathematics Specialists degree programs before expanding across the state.

- The inclusion of district mathematics supervisors from the beginning of the MSP built ongoing district support for the Mathematics Specialists.
- The graduate programs needed to provide participants with a deep and broad knowledge base, to enable them to be effective in a range of roles in schools.

The partnership of universities and districts allowed the MSP to pilot the Mathematics Specialists degree programs before expanding across the state.

One of the primary goals of the Virginia MSP was to create a graduate program that could be extended and offered at universities across the state. The structure of the Virginia MSP made it uniquely positioned as a state-wide model. The Virginia MSP developed a strategy for cross-university collaboration, which could be brought to universities that were not part of the MSP. This structure allowed the Virginia MSP to pilot the MSP programs before it attempted to bring the model to other universities and districts outside of the MSP.

Project leaders of the Virginia MSP designed the sequence of coursework so that each course was taught, at different times, by faculty members from each of the partnering universities. Furthermore, the program was designed so that the members of each cohort took courses at each of the three main university partners during the program. These steps allowed the project leaders to assess the portability of the courses and whether or not they could be successfully taught at other universities.

However, there were aspects of the Virginia MSP programs that would be hard to replicate elsewhere. The leadership team included mathematicians who were able to champion the program within their universities and address potential obstacles through their relationships with university administrators and other professors. In expanding into other universities, faculty with comparable stature and influence may be needed to advocate for the program in their schools. Further, MSP funding allowed the Virginia MSP to purchase time of instructors and participants. While new university partners will be able to benefit from some of the work of the MSP, the universities will need to find funding to pay for training of course instructors and the development of new courses, as needed.

Even before the completion of MSP funding, project leaders had been contacted by representatives of other Virginia universities that wanted to offer similar graduate degree programs in their own institutions. As they received these inquiries, project leaders of the Virginia MSP anticipated possible challenges for bringing the graduate program to schools in all parts of the state that would require some adaptations to the model developed in the MSP. The Virginia MSP included districts from the eastern, more urban, part of Virginia. Virginia also contains a number of rural and poorer school districts, generally found in the western, mountainous region of the state. The rural districts present issues that were not addressed by the Virginia MSP, such as limited access to university faculty and resources and smaller school populations to support Mathematics Specialists. With smaller schools in these rural districts, project leaders predicted adaptations may be necessary, such as splitting a Mathematics Specialist

position between several locations or otherwise structure the work of Specialists differently than had been documented in the MSP.

The inclusion of district mathematics supervisors from the beginning of the MSP built ongoing district support for the Mathematics Specialists.

The district mathematics supervisors helped Mathematics Specialists bridge the university and the school worlds. Supervisors were full participants in designing and teaching the graduate courses and defining the vision for Mathematics Specialists in the Virginia MSP as well as key players in defining the Specialist role in schools and supporting them with their work. In working closely with the district mathematics supervisors, the Virginia MSP acknowledged that it would not be able to engage all of the school administrators whose expectations would influence the work of the Mathematics Specialists. In particular, the Virginia MSP did not invest in strategies to directly engage school principals, and instead relied on the supervisors to influence principals through their role in the district office.

As graduates of the degree programs transitioned into Mathematics Specialists roles, the supervisors met with their district colleagues to develop ongoing support for the Specialists. Through meetings and changes in district policies, supervisors worked to establish shared expectations for the work of Mathematics Specialists among principals that were aligned with the definition created by the Virginia MSP.

With the district mathematics supervisors serving such key roles, it was important to the sustained success of the project that they were included in the MSP leadership team from the outset of the partnership. While the Virginia MSP had substantial roots in a network of university mathematicians, the district supervisors were granted a central role in shaping the project. Supervisors not only had a role in overseeing the work of Mathematics Specialists in the districts, but also had a hand in designing and leading instruction in the graduate degree courses. The active collaboration between district and university partners developed the ongoing support of the supervisors as advocates for the Virginia MSP vision of Mathematics Specialists beyond the MSP grant.

The graduate programs needed to provide participants with a deep and broad knowledge base, to enable them to be effective in a range of roles in schools.

The state licensed Mathematics Specialists were new positions in Virginia, and had neither a historical precedent nor an explicit state mandate that dictated their responsibilities in schools. Project leaders of the Virginia MSP attempted to fill this gap with their work on a shared definition, within the partnership, of the work of the Mathematics Specialists. However, they were also aware that Mathematics Specialists would ultimately be called upon to fulfill a range of roles, which would reflect the different needs and challenges of their schools.

As a result, project leaders aimed to prepare graduate degree program participants with a broad knowledge base so they would be ready for whatever they were asked to do. The

best way to prepare the participants for this variety of roles, it was decided, was to provide them with a deep knowledge base in mathematics, pedagogy, and leadership skills. If the Virginia MSP program was not intensive, then it was possible that graduates would receive the Mathematics Specialist certification but not have the depth of knowledge needed to succeed in the position.

The intensity of the preparation supported the sustainability of the Mathematics Specialist programs by positioning the Specialists to demonstrate effectiveness in a variety of scenarios. The Specialists were expected to have an impact in schools, no matter if the school exhibited weak or strong capacity for mathematics instruction. To be sustained as a model for a state-wide program, the Virginia MSP needed to prepare Specialists to be placed in schools across the state whose varied needs would dictate the roles of the Specialists.

Conclusion

The Virginia MSP focused on utilizing state policy (the licensure for the K-8 Mathematics Specialists) in the design of its preparation programs. The possibility of sustained impact of these programs was enhanced through the attention of project leaders to strategies that leveraged this new state policy, as well as awareness of its limitations. The Virginia MSP leadership team faced a challenge that surfaces for many education leaders charged with designing a preparation program for teacher leaders: creating a preparation program linked to the anticipated practice of the teacher leaders.

For the Virginia MSP, the state policy spelled out the requirements for receiving the Mathematics Specialist license. Project leaders took additional steps to go beyond these requirements, through their partnership with district mathematics supervisors, the creation of a definition of the Specialist position, and an emphasis on collaboration in the teaching of the graduate courses. These steps contributed to the sustainability of these programs to shape Mathematics Specialists across Virginia.

References

- Campbell, P. & Malkus, N. (in press). The impact of elementary Mathematics Specialists. *The Journal of Mathematics and Science: Collaborative Explorations*. Retrieved from http://www.vamsc.org/Impact/VCU_Jrnl_2010_pat_campbell.doc
- Virginia Commonwealth University. (2008). *Mathematics Specialists Master's Degree Program* [Brochure]. Richmond, VA: Virginia Commonwealth University.
- Virginia Department of Education. (2007). *Licensure regulations for school personnel*. (State Board of Education Publication No. 8VAC20-22-10). Richmond, VA: Virginia Department of Education. Retrieved from http://www.doe.virginia.gov/teaching/licensure/licensure_regs.pdf

Virginia Mathematics and Science Coalition Task Force. (2005). Mathematics Specialists task force report. *The Journal of Mathematics and Science: Collaborative Explorations*, 8, 5-22.

Weiss, I., Miller, B., Heck, D., & Cress, K. (2004) *Handbook for enhancing strategic leadership in the Math and Science Partnerships*. Chapel Hill, NC. Horizon Research, Inc. Retrieved from http://www.horizon-research.com/reports/2004/mspta_handbook.pdf

Whitenack, J. & Ellington, A. (2007). A Methodology to Explain Teachers' Emerging Roles as K-5 Mathematics Specialists. *Annual Meeting of the American Educational Research Association*. Chicago, IL. Retrieved from http://www.vamsc.org/Impact/Whitenack_Ellington_AERA_2007.pdf