

# MATHEMATICS TEACHER SPECIALISTS IN VIRGINIA: A HISTORY

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## Introduction

Responding to a widely held perception that many of Virginia's elementary teachers were inadequately prepared in mathematical content and content pedagogy, the Board of the Virginia Council of Teachers of Mathematics (VCTM) discussed in 1990 how the VCTM might address this issue. After considerable discussion, the Board concluded that placing Mathematics Lead Teachers in our elementary schools would be its most effective solution that might also realistically be achievable. The Board passed a resolution to this effect, and an official Position Statement in support of placing Mathematics Lead Teachers in elementary schools of the Commonwealth of Virginia was published in September, 1991 [1].

Shortly thereafter, the Virginia Mathematics Coalition (known as the Virginia Mathematics and Science Coalition [VMSC] since 1993) and the Virginia Council for Mathematics Supervision (VCMS) joined VCTM in this effort, and a movement began that has continued to the present time and which is quite remarkable for its accomplishments. Conceptually, a working consensus has developed over time that Mathematics Lead Teachers, who were regular classroom teachers with add-on duties, were sufficient and that to address the schools' needs would require the attention of Mathematics Teacher Specialists or Mathematics Coaches. These would be individuals without classroom assignments who could work at strengthening the mathematics instruction of all teachers. This consensus is not universal, but the strength of these views and the remarkable power that they have had in recent years is illustrated by the following facts:

- Today, Virginia is on the verge of adopting a K-8 Mathematics Specialist Teacher endorsement;
- In 2005, the Virginia House of Delegates and the Virginia Senate unanimously passed a joint resolution instructing the Virginia Board of Education to design a Mathematics Specialist endorsement;
- School divisions have begun placing the first generation of Specialists in their schools; and,
- Four universities have implemented master's degree programs designed to lead to the Mathematics Specialist endorsement.

Three years ago, none of these events were foreseen, and although much work remains to be done in documenting that Mathematics Specialists are one of the most effective and cost effective means to improve our students' learning of mathematics, we have made great progress on that front in the Commonwealth. Virginia has now moved to a point where issues of implementation are becoming critical. We are now trying to develop solid answers to such questions as:

- What is a Mathematics Specialist and what do Specialists do?
- What are the principle ingredients of content, content pedagogy, and leadership training Mathematics Specialists will need to be effective?
- How can we implement Mathematics Specialist training programs and quickly bring well-prepared Mathematics Specialists into the schools?
- What are the elements of school culture and administrative support that Mathematics Specialist programs need to be effective?

In this article, we present a brief history of these efforts. We hope that we have provided enough detail to give some insight into the special circumstances and key elements that have fostered our success. Perhaps the most remarkable aspect of the Virginia Mathematics Specialist story is the degree of collaboration that has developed between all the principal players. Our schools, our institutions of higher education, and the Virginia Department of Education have worked collaboratively on these issues for years, and answers that represent a broad consensus of opinion have emerged through this collaboration.

### **Mathematics Specialist History 1990–2000**

At the state level, the first notable success of the Mathematics Lead Teacher movement in Virginia occurred in 1992 with the inclusion of Mathematics and Science Lead Teachers as a central component of the Virginia State Systemic Initiative or V-QUEST proposal. The funding for this project lasted three years. It represented a critical first step that initiated several important processes.

- 1) A significant partnership was initiated between the Virginia Department of Education and other key stake holders which ultimately led to significant systemic change.
- 2) The project piloted Lead Teachers and provided the initial training to a cohort of teachers that subsequently became mathematics leaders in Virginia schools.

- 3) Although the degree of success varied greatly in these initial school programs, for the first time numerous teachers and school administrators witnessed the positive changes that could result from having high-quality, school-based teacher professional development and curriculum leadership. Among the school divisions that began with V-QUEST Lead Teacher programs may be found a majority of the divisions that have provided Virginia's Mathematics Specialist movement with its leadership and vision.
- 4) The project provided the VMSC and its higher education partners with a project that they believed in, and which has kept the Coalition in constant contact with the schools and the mathematics leadership in the schools.

With the completion of V-QUEST, the VMSC Board was concerned that statewide momentum be maintained with the Lead Teacher project, and voted in 1996 to begin a sustained initiative to develop the concept of Mathematics and Science Lead Teachers, as well as develop our understanding of the training and support that Lead Teachers would need to be effective. This became the Coalition's highest educational priority.

As a first step on behalf of the Coalition, Critchfield and Pitt informally evaluated several of the early Virginia Lead Teacher programs, and identified elements common to the most successful programs and teachers [2]. As expected, they found significant differences in performance separating the schools with quality programs from those without. These differences included both the preparation of the Lead Teachers and the professional development and support that they received in the schools. Support for the Lead Teacher concept grew and evolved slowly and the concept was strengthened to become that of a Teacher Specialist. In 1999, an informal VMSC working group (subsequently referred to as the VMSC Specialist Partnership) began working to develop comprehensive models for Specialist roles, training programs, and school administration roles that could support quality mathematics instruction in our schools.

Several local phenomena eventually proved to be significant at the statewide level. For example, the schools of education at both George Mason University (GMU) and Virginia Commonwealth University (VCU) began graduate leadership programs in mathematics education, and the graduates of these programs began impacting the schools in geographic regions adjacent to the universities. We mention one example. In Hopewell Public Schools, a small urban Title I division south of Richmond, a graduate of the VCU program was employed in 2000 as the school division's first full-time Mathematics Lead Teacher. A year later, that school

became fully accredited, and this process was repeated each year for the next two years with the division's other two elementary schools [3].

Two other local conditions that influenced the state efforts in important ways were provided by the ExxonMobil Elementary Mathematics Specialist projects in Hanover and Bedford counties. The Hanover project provided an important example for other school divisions to observe and emulate. The Bedford project proved important in Virginia as a result of Bedford's request for mathematics leadership and instruction for their Mathematics Lead Teachers from the University of Virginia (UVA). This was the catalyst that contributed to the establishment of the previously mentioned VMSC Specialist Partnership. The Bedford-UVA connection also provided the first formal contact between the Coalition and the ExxonMobil Foundation regarding Mathematics Specialists—a contact which quickly became a partnership that has greatly influenced events in Virginia.

#### **Mathematics Specialist History 2000-2004**

The recent developments in Virginia coincided with the publication of three national reports: *The Mathematical Education of Teachers*, 2001; *Adding It Up: Helping Children Learn Mathematics*, 2001; and, National Council of Teachers of Mathematics *Principles and Standards of School Mathematics*, 2000 [4-6]. These studies included calls for the placement of Mathematics Teacher Specialists in the elementary schools. In May 2001, with ExxonMobil support, a one-day conference was held for school administrators on standards-based mathematics instruction. Sixty school administrators and higher education faculty attended this meeting. At the same time, because of the emerging links with the network of ExxonMobil Mathematics Specialist projects, Virginians became aware that large school divisions with diverse populations in Albuquerque, New Mexico and Houston, Texas had Mathematics Specialists programs that were showing strong results; results that included enhanced achievement for special needs students.

The meetings and the national scene energized the Virginia movement with the effect that in May 2001, ExxonMobil funded the first of a sequence of statewide Virginia Forums on Mathematics Specialists. These have all been hosted by VMSC. The first one was held in Fredericksburg, and focused on statewide implementation of Specialist programs and was aimed at division mathematics coordinators and other central office school administrators. The meeting was attended by 78 individuals who included several central office personnel and who

subsequently became important advocates for Mathematics Specialists within their divisions. A statewide dialogue began that grew stronger when it was learned that certain Virginia school divisions, including Hopewell and Norfolk, had begun implementing Mathematics Specialist programs and that positive results were being observed.

In Summer 2002, three significant milestones were passed. With the support of an Eisenhower grant from the State Council for Higher Education in Virginia, an informal partnership of eight school divisions, the VMSC, and UVA organized to create a model Mathematics Specialist curriculum. This VMSC Specialist partnership offered its first Mathematics Specialists Leadership Institute. Thirty-one participants attended. A second Institute was planned for 2003, and several new school divisions joined the partnership.

In the same summer, the presidents of the VMSC, VCTM, and VCMS wrote a joint letter to Virginia's Superintendent of Instruction urging consideration of the needs and benefits of elementary and middle school Mathematics Teacher Specialist licenses. The superintendent's response to this letter made the presidents aware that further progress would require building a broad base of support for the Mathematics Specialist concept throughout the education community in Virginia. Therefore, VMSC established a fifteen-member Specialist Task Force, led by Vickie Inge of Stafford County Schools, to prepare a carefully detailed case for obtaining elementary and middle school Mathematics Teacher Specialist endorsements, and for implementing Specialist programs in the schools. The report was completed in Spring 2003 and was published on the Coalition's website (<http://www.vamsc.org/vms/index.html>). This report also appears in this issue [7].

Before the Task Force had completed its report, the Virginia Department of Education used a draft version of it to write regulations for a new Mathematics Specialist endorsement that were approved by the Board of Education in Spring 2003. Moreover, Virginia's commitment to Mathematics Specialists became more evident when, in Fall 2003, the Commonwealth chose to make Mathematics Specialists one of the two focus areas in Virginia's first Mathematics and Science Partnership (MSP) competition. The purpose in doing this was to prepare the first cohort of Mathematics Specialists in advance of final approval of the endorsement.

The approval process began in Summer 2003, but the Board's entire package of licensure recommendations was later withdrawn because of issues that arose over other parts of the recommendations that were unrelated to Mathematics Specialist endorsement. This setback

proved to be temporary and the endorsement approval process was back on track by mid-2004. In early 2005, the Virginia House of Delegates and the Virginia Senate unanimously passed a joint resolution instructing the Virginia Board of Education to design a Mathematics Specialist endorsement. Final approval is expected in 2006.

In response to the Virginia MSP initiative, the Coalition wrote and received a grant of nearly \$750,000 for The Virginia Mathematics Specialist Project to develop a common set of five mathematics courses for Mathematics Specialists and to initiate Mathematics Specialist master's degree programs at three universities: Norfolk State University (NSU), University of Virginia (UVA), and Virginia Commonwealth University (VCU). Four of the five courses exist, and were piloted and taught in 2004 and in Spring 2005. The fifth, *Probability and Statistics*, will be offered at three locations in Summer 2005.

Throughout 2004, the Coalition's Mathematics Specialist Project continued to grow. The National Science Foundation awarded Virginia Commonwealth University and the VMSC two major grants. The first, The Mathematics Specialist: Research Study and Pilot Program, is a \$4,444,898 grant supported by the Teacher Professional Continuum program to conduct a comprehensive research study on the impact of Mathematics Specialists on student learning and to offer courses for Mathematics Specialists at NSU, UVA, and VCU over the five-year term of the grant.

The second, Preparing Virginia's Mathematics Specialists, is a five-year, \$3,726,915 MSP grant sponsoring summer institutes to prepare fifty Mathematics Specialists. The individual grants and their combined activities across Virginia are discussed in the last article in this issue [8].

With the support of these three grants, teachers have enrolled in more than 280 mathematics classes for Specialists, and more than eighty have taken the first *Leadership in Mathematics Education* course. Approximately eighty teachers are currently in the process of enrolling in the master's degree programs. In Spring 2005, the Virginia Department of Education extended funding of the Virginia Mathematics Specialist Project for a second year with an additional \$295,000. This includes funds for a one-day, statewide "Spotlight on Mathematics Specialists" symposium to be held in May 2005, and a mandate to bring the project into Southwest Virginia, an area where it has not yet reached.

## Lessons Learned

This is an exceptionally exciting moment for mathematics education in Virginia. The sustained effort of the Virginia mathematics education community has produced a major change in the model for K-8 mathematics education. This community strongly believes in the effectiveness and importance of well-educated and appropriately supported Mathematics Specialists. We also believe that ongoing research will ultimately validate these beliefs.

How did it happen that the efforts of a few educators, administrators, and mathematicians could bring about changes of this magnitude and importance? This is a speculative question and no answer will be definitive, but an informed opinion can at least provide a list of factors that seem to have been important.

The VMSC and the Mathematics Specialist project have been broad based, highly collaborative, and long term. School administrators, teachers, mathematicians and mathematics educators, politicians, and administrators from the Virginia Department of Education have succeeded in working together effectively and noncompetitively for a very long time.

This sustained collaboration led to the evolution of an unusually informed and tight community. Different constituencies in the community grew to understand each other's issues, constraints, and strengths far better than they did at the beginning. Higher education, the schools, and the education establishment became supportive partners in ways that were not envisioned earlier, and which would have been impossible on a short time scale. These sustained efforts were also essential in obtaining the support from the ExxonMobil Foundation that has been extremely important to the project.

To illustrate this, I will describe a personal example of transformation and its impact. My career has been spent as a research mathematician at a research university. At one stage in this process, I was asked to assume a leadership role in developing an outline for the mathematical preparation of future K-8 Mathematics Teacher Leaders, and I was largely ignorant of both the profound depth of understanding that is required to teach basic mathematics and of how mathematics is learned. One of my partners, a third grade mathematics teacher, advised me that I would profit from attending the summer leadership institutes in *Developing Mathematical Ideas* that are held at Mt. Holyoke College [9].

I took her advice and the experience proved to be extremely valuable. This provided me with an entirely new set of insights in learning and teaching mathematics, and, incidentally, most of these insights came from working with elementary teachers who were very limited mathematically. The experience had numerous consequences. It allowed me to become a stronger advocate on issues concerning elementary mathematics. I also became more effective in developing coursework for teachers. Together with colleagues from the schools and others from higher education, this led to the development of the five mathematics courses for Specialists that was mentioned earlier. The courses relate directly to the teachers' classrooms and appear to be very popular. Because this work was done in the context of the Coalition, the courses have been adopted at other universities in the partnership with appropriate refinements and revisions. In turn, the impact of the courses and their popularity has helped to fuel the growth in interest in Mathematics Specialists across the state.

There are four essential lessons that I have learned from these experiences:

- Our effectiveness and impact was greatly magnified through collaboration;
- All constituencies in the education community brought essential knowledge and made essential contributions to the effort; and, the inclusive nature of the partnership contributed to making everyone a more valuable partner;
- Our partnerships grow stronger over time, but this will only be true when partnerships are built upon mutual respect and inclusiveness, and when the partnership's goals are unchanging and focused on real problems; and,
- A little luck and great partners are excellent assets.

It has been a true pleasure to be part of this project.

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