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COLLABORATIVE EXPLORATIONS

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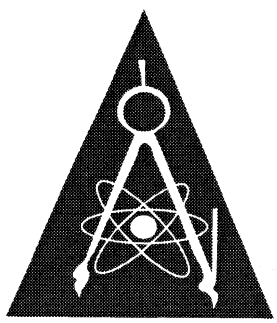
SPECIAL ISSUE
Mathematics Specialists



Virginia Mathematics and Science Coalition

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COLLABORATIVE EXPLORATIONS

SPECIAL ISSUE
Mathematics Specialists

Coordinating Editor
for this Special Issue

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Coordinating Editor's Remarks

A number of national reports focused on improving student learning in mathematics, coupled with strengthening teachers' understanding of mathematical concepts, have called for the placement of Mathematics Specialists in elementary schools, K-6. These reports (*The Mathematical Education of Teachers*, 2001; *Adding It Up: Helping Children Learn Mathematics*, 2001; National Council of Teachers of Mathematics (NCTM) *Principles and Standards of School Mathematics*, 2000; *Keys to Math Success: A Report from the Maryland Mathematics Commission*, 2001) have converged around a common idea [1-4].

Each report advocates that a Mathematics Specialist or a Mathematics Teacher Leader be placed in elementary schools to be a resource in professional development, teaching, curriculum development, assessment, and parent and community education to improve the teaching, learning, and assessment process. The NCTM *Principles and Standards of School Mathematics* states: "There is an urgent and growing need for mathematics teacher leaders—specialists positioned between classroom teachers and administrators who can assist with the improvement of mathematics education." [3]

The work of a Mathematics Specialist, Mathematics Coach, or Teacher Leader Specialist, whatever the role is called, can be distributed within a number of different models. A Specialist can provide professional development within the context of actual classroom situations through long- or short-term co-teaching arrangements. Likewise, a Specialist can work with teachers through the context of grade-level planning and debriefing sessions built around a lesson study model. A Specialist can lead a parent series focused on key concepts in elementary mathematics. Also, s/he can design professional development sessions for the faculty and administrators focused on the implementation of a new curriculum. There are multiple opportunities to bring professional development in elementary mathematics directly into the school and classroom.

Well-qualified Teacher Leaders in a Specialist role can have a significant influence on strengthening the mathematical, pedagogical, and assessment knowledge of classroom teachers who are frequently under prepared to deliver a rigorous mathematics program to a classroom of diverse learners. While the role of a Reading Specialist has been a part of elementary schools for many years, interestingly a Specialist in mathematics has taken longer to develop.

With support from ExxonMobil Foundation, the Virginia Council of Teachers of Mathematics, and the Virginia Council for Mathematics Supervision, the Virginia Mathematics and Science Coalition is devoting this issue of *The Journal for Mathematics and Science:*

Collaborative Explorations to the Mathematics Specialist role and issues of implementation of Specialist programs. The articles contained here will address the following topics.

- Why a Specialist? What in the present condition of elementary mathematics education makes the Specialist role particularly timely? What does research tell us about the Specialist role, about its effectiveness as a school-based strategy?

- What are examples from the field (schools and districts) where the Specialist role (or Coach or Lead Teacher) has been integrated into a district's mathematics program? What does this work look like? What has worked? What are the lessons learned? What particular skill sets do Specialists bring to their work?

- What do we know about the content and pedagogical preparation for a Specialist's role? How can the work of teaching mathematics be redistributed to bring authority to the Specialist's role? How does this model help to integrate a different kind of professional development into the work of schools?

- What can we learn from Specialists in other disciplines? Can professional development in reading help inform the Mathematics Specialist role?

- What roles can be played by institutions of higher education and state departments of education in preparing Specialists? What is being done? What do those models look like?

An important secondary purpose of this issue is to tell the history of the Mathematics Specialist movement in Virginia and in selected school districts. This history illustrates the remarkable impact that the sustained efforts of a small group of advocates for Mathematics Specialists have had in the schools and in Virginia's educational system. The advocates for Mathematics Specialists have been joined by powerful voices in the Virginia Department of Education and the Board of Education. An important part of this story is the role that has been played by continued support from the ExxonMobil Foundation for our *Mathematics Specialist* efforts in Virginia. This ExxonMobil support was significant in the Coalition and its partners receiving substantial funding for their Mathematics Specialist projects from the National Science Foundation and the Virginia Department of Education. This is leading Virginia into an exciting new era in mathematics education.

References

[1] *The Mathematical Education of Teachers*, Conference Board of the Mathematical Sciences, The American Mathematical Society, Providence, RI, 2001.

[2] J. Kilpatrick, J. Swafford, and B. Findell (eds.), *Adding It Up: Helping Children Learn Mathematics*, National Academy Press, Washington, DC, 2002.

[3] *Principles and Standards for School Mathematics*, National Council of Teachers of Mathematics, Reston, VA, 2000.

[4] *Keys to Math Success: A Report from the Maryland Mathematics Commission*, Maryland State Department of Education, Baltimore, MD, 2001.

PART I: PREFACE

In 2002, the Virginia Mathematics and Science Coalition (VMSC) Board directed that a task force be established to prepare a case and write a report to present to Local Education Agencies (LEA), the Virginia Department of Education (VDOE), the Virginia Board of Education, and policy makers as to how a Teacher Specialist might improve student learning. Consideration was to be given to Mathematics Specialists at both the elementary and middle school levels. This report was to discuss job descriptions, competencies, preparation, and licensure.

Here, we include the report, the executive summary, and a definition that was developed by the National Science Foundation–supported Mathematics Specialists School and University Partners after the report was completed. We also include a history of the Mathematics Specialists movement as an introduction to the articles in this issue.

MATHEMATICS SPECIALISTS DEFINITION

MATHEMATICS SPECIALISTS SCHOOL
AND UNIVERSITY PARTNERS

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

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;

PART II: MATHEMATICS SPECIALISTS IN SCHOOLS

This section presents brief histories of six Virginia school divisions and one division from Arizona that have worked with Mathematics Lead Teachers and Mathematics Specialists over a period of several years, and all of which have now taken steps toward implementing full-time Specialists in their elementary schools. These divisions range from Hopewell, a small Title 1 metropolitan school division outside Richmond with three elementary schools, to the large urban division of Norfolk with 35 elementary schools. A few rural school divisions in Virginia have begun using Mathematics Specialists, but to our knowledge all are in the initial stages of this process, and there are no truly rural divisions included here.

The stories for each of these divisions are different, and we believe that much can be learned from the details of their individual stories. In each case, there have been some unique circumstances that were critical in moving the Mathematics Specialists forward in the division, and these special circumstances often hold the key to understanding what happened. There are also common themes in these stories; for example, there was a long history that resulted in a knowledgeable group of future Specialists and advocates. The nature of these advocates varies in the examples, but their existence proved to be crucial. These groups of individuals appear to have exercised a profound influence on their school cultures, and their knowledgeable advocacy created environments where the potential impact of Mathematics Specialists was understood, and where new approaches to funding were entertained.

It also appears that the activists in these school divisions supported each other. Progress toward implementing Mathematics Specialists in one school division often was answered by similar steps in other divisions. Networking opportunities that were available through the ExxonMobil-funded Mathematics Specialist projects fueled the larger movement. ExxonMobil also funded the Virginia Forums which have focused on Specialists' influence in Alexandria and other divisions. In addition, the progress toward a Mathematics Specialist endorsement that is associated with the Virginia Mathematics and Science Coalition Mathematics Specialists Task Force seemed to energize these efforts across Virginia.

PART III: PROFESSIONAL DEVELOPMENT

This section describes the design of professional development programs for Mathematics Specialists. Articles by national experts address the issues relating to what Mathematics Specialists need to know and how to train them to acquire the content, pedagogical, and leadership skills necessary for their roles in the schools.

DESIGNING PROFESSIONAL DEVELOPMENT ACTIVITIES FOR MATHEMATICS SPECIALISTS

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Introduction

In response to calls for the improvement of mathematics instruction on national, state, and local levels, many school systems have begun to develop programs in which a key player is a mathematics specialist, mathematics teacher leader, or mathematics coach. While each system defines the work of these educators in slightly different ways, these terms generally indicate an educator who has been given the responsibility for supporting other teachers as they seek to improve their mathematics instruction. For the purpose of this paper, we will use the term Mathematics Specialist to refer to these educators. The work of Mathematics Specialists may include conducting professional development activities, working with teachers in their classrooms, interpreting local curriculum goals in the light of national standards and published curriculum, and communicating with parents and the general public about the purposes and accomplishments of the school's mathematics program.

Mathematics Specialists and Professional Development

Given this description of the work of Mathematics Specialists, questions arise. What do Mathematics Specialists need to learn to take on these responsibilities? What kinds of learning opportunities should be provided on an ongoing basis as they do their work? What areas of interest should be studied?

PART IV: FINANCIAL SUPPORT

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