

SCHOOL DIVISION LEADERS KEEN ON IN-SCHOOL MATHEMATICS EXPERTS

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Introduction

The twelve school division policy leaders interviewed as part of the National Science Foundation (NSF) Teacher Professional Continuum (TPC) grant were well aware that their students' mathematics achievement was unsatisfactory in a number of areas. They also realized that significant improvement in their classroom teachers' knowledge of mathematics content, as well as in their instructional delivery capabilities, was critical to realizing higher student performance.

The policy leaders saw potential for such improvement in signing on as partner divisions with the NSF-TPC grant which has as its overall goal determining the effectiveness of a school-based Mathematics Specialists program. In a series of interviews conducted after grant-sponsored Mathematics Specialists had been deployed in selected elementary schools for two years, the policy leaders affirmed their decisions. For their participating schools, they consistently reported stronger mathematics achievement, improved classroom teacher confidence, and noticeable school satisfaction.

Background

The NSF-TPC grant, now in its fourth year, is structured to prepare and support two cohorts of twelve teachers each as elementary school Mathematics Specialists for two years each in partner division schools. Together, the NSF and the five partner divisions fund the two-year placements for each cohort of Specialists.

The Cohort I Specialists began their school assignments with the 2005-2006 school year and continued for the 2006-2007 school year, after which time according to the grant provisions, NSF funding for this first cohort ceased. Notably, the Virginia General Assembly replaced half of the NSF funding for the 2007-2008 school year with the proviso that the partner divisions replace the remainder—which all five divisions did. That state legislators and local school boards

provided this unplanned third-year funding during difficult budget times is testimony to the widespread positive perception of the Mathematics Specialists' work. This volunteer funding has had the additional benefit of providing an unanticipated third year of Cohort I program implementation data for research analysis. The Cohort II Specialists, supported by NSF and local division funds, began their two-year placements with the 2007-2008 school year.

The policy leader interviews were conducted in August and September 2007 at the conclusion of the Cohort I Specialists' second year. This round of interviews represents the second phase of the TPC grant's parallel utilization study which focuses on local school and division implementation of the grant's elementary school Mathematics Specialists program. The first round of interviews had been carried out in July and August 2006 at the conclusion of the Cohort I Specialists' first year. The grant's two policy associates interviewed the principals of the twelve Cohort I schools regarding their decisions about the assignment, responsibilities, integration, and support of their Specialists [1].

Methodology

The five partner divisions include three cities, Portsmouth (four Specialists), Richmond (eight Specialists), and Virginia Beach (four Specialists), and two counties, Spotsylvania (two Specialists) and Stafford (six Specialists). The divisions vary in size, ranging in enrollment (as of 9/30/2007) from 15,000 to 72,000 students. They also vary in the percentage of students enrolled in free and reduced lunch programs, from 17% to 71%. The passing rate for all students in the five partner divisions on state standardized testing in mathematics for the 2004-2005 school year showed this range: 76, 77, 81, 85, 88.

The superintendents were asked to identify two or more policy leaders to discuss division-level decisions and implementation issues regarding Mathematics Specialists. A total of twelve people participated in the interviews. These individuals included one school board member, three division superintendents, four superintendents (or deputies or directors) for instruction, three mathematics supervisors, and one grants manager. The policy associates traveled to the school divisions to conduct the interviews in person.

The prospective interviewees were sent an outline of discussion items a few weeks prior to the meeting, and this outline served as an informal structure for the actual interviews. The four major areas of discussion related to the division's decision to participate in the grant, local implementation decisions, state government support, and perceptions of the Mathematics Specialists' impact. Additional comments and concerns were welcomed.

Interview participants were prepared for the discussion and appeared pleased to have the opportunity to speak about division involvement, results, and plans. They received summaries of the notes taken by the interviewers during discussion so that they had opportunities to approve, correct, and add to their remarks.

Summaries and Observations—Partner Divisions’ Decisions to Participate

Achievement Levels — Policy leaders’ explanations of their decisions to become grant partners unsurprisingly reflected the desire to raise math achievement. A division superintendent bluntly stated, “Participation in this effort was a no-brainer—just common sense. Our math scores were not good.” An assistant superintendent for curriculum and instruction observed that, while the division mathematics scores were not satisfactory, “There is also the need and desire to improve the mathematical abilities of average students to prepare them for advanced courses. Employing Mathematics Specialists is not seen as just a remedial program.”

Accountability Programs — The motivation of federal legislation (No Child Left Behind Act) and state regulations (*Regulations Establishing Standards for Accrediting Public Schools in Virginia*) enacted over the last decade was acknowledged [2, 3]. These two accountability programs provide data sources for planning instructional strategy and accelerate the drive for improvements.

Compatibility with Local Efforts — All those interviewed spoke at length about their existing local efforts to improve mathematics instruction. These included dedicated personnel such as Title I teachers, locally funded math coaches, Lead Teachers, mathematics program supervisors, and Mathematics Specialists. At least two divisions had operating Mathematics Specialist programs prior to their grant participation. Professional development through such initiatives as a math and science center, supervisor introduction of new lesson plans and instructional strategies, and a math academy providing annual training to elementary school classroom mathematics teachers are examples of teacher education efforts in one or more partner divisions. The NSF-TPC grant was perceived as a welcome extension or enhancement of ongoing efforts.

Attractiveness of Grant Model — With this experience in retooling curriculum and retraining teachers, the policy leaders stressed the usefulness of the grant model. They saw the rigorous mathematics content courses, the focus on classroom teacher education, and the daily imbedded on-site assistance as crucial components and as drivers of their individual decisions to participate.

They praised the several strong content and leadership courses in the Mathematics Specialist preparation program. After all, said a superintendent, “Teaching content is what schools are about; our main job is academic instruction.” They appreciated the focus on Specialists educating the classroom teachers in mathematics content areas and in becoming comfortable teaching math. Their enthusiasm for a school-based program was evident: “Having ‘resident expertise’ among the teacher corps is a big positive for teachers, for instruction, and ultimately for the children”; and, “We recognize the direct benefit to schools of one well-qualified teacher with no classroom responsibilities; staff buys into this in-building model because classroom teachers need help.”

Summaries and Observations—Implementation Decisions

The NSF-TPC grant design required each of the five participating divisions to identify a total of twelve triples of schools with comparable student demographics and student performance on Virginia’s *Standards of Learning* examinations. One school from each triple was randomly selected to receive a Cohort I Specialist beginning with the 2005-2006 school year; a second school was randomly selected two years later to receive a Cohort II Specialist beginning with the 2007-2008 school year; the third school year was the control. The participating divisions also selected the individuals to receive Specialist training and support, and to be assigned as Mathematics Specialists at the randomly selected schools for the duration of the grant.

School Selections — The primary factors division leaders used in choosing the triples were student achievement data and school leadership/climate. The strong need for improved mathematics instruction evidenced by low test scores was an important consideration for school selection. However, at least one policy leader expressed the need to have “middle of the road” schools represented, apparently apprehensive that a very academically troubled school would be an unsuitable location for this research initiative. According to an assistant superintendent for curriculum and instruction, the schools that were selected in that division had stable faculties and student populations. She considered these important attributes as the newly minted Specialists “begin to deal with the challenges of interacting with established veteran teachers.” Division leaders were aware of “local politics” in selecting the lucky receiving schools. The Specialists also have proven popular with parents and principals. One division leader observed, “Other schools are jealous that they were not selected.”

Divisions used varied methods to place their Specialists. In one division, the mathematics director made the assignments. Another division used a formal selection process that included a

review panel. A third allowed each of the schools to choose its grant-sponsored Specialist from among those in the division pool.

Third-Year Cohort I Mathematics Specialist Retention — Division leaders were queried about the unanimous decision to continue the Cohort I Specialists for the unexpected third year. The opinion of one division superintendent, “This NSF grant Mathematics Specialist program is one of those things that really works, a very effective program,” was shared by personnel in other divisions. This superintendent noted that the grant program is a perfect fit with the local mathematics program which includes building teaching capacity: “We are adding specialists in content areas to help our classroom teachers even though it means taking the very best ones out of the classroom.” All divisions are filling the gap between the General Assembly appropriations and the actual cost with a combination of local and federal funds.

Projection for Continuing Mathematics Specialists Post Grant — None of the interviewees responded “no” when asked if the division was likely to continue employing the Mathematics Specialists after the grant funding ceased. However, while the desire to continue is evident, the funding is not. A division superintendent affirmed his intention to continue “given the results we have seen and the focus on mathematics divisionwide that the Specialists have generated.” However, all were realistic and cognizant of budget pressures and competing needs. A deputy superintendent for instruction promised only to look at continuing on a yearly basis, observing that her school division really had “stepped up” financially in order to participate in the Mathematics Specialist program to the extent it has while faced with trimming an already flat budget.

Summaries and Observations—State Government Support

Preparation and Training — Most of those interviewed spoke positively of current levels of support from institutions of higher learning and were pleased at the number of institutions offering graduate programs for Mathematics Specialists. Mention was made of helpful relationships with specific local teacher training programs. The grant-sponsored preparation program was appreciated for content rigor, leadership and coaching skill development, interaction with other Mathematics Specialists in training, and raising awareness of the importance of strong mathematics instruction. At the same time, there was agreement that even more rigorous classroom teacher preparation programs are essential, particularly in mathematics content. Some held the opinion that the current Virginia preK-6 licensure requirement for twelve semester hours of mathematics is insufficient.

Most policy leaders expressed approval of the recent adoption of Virginia endorsement standards for K-8 Mathematics Specialists. They stated that these standards set requirements that help human resources personnel evaluate applicant qualifications and skills during the local hiring process, and demonstrate the value of the Mathematics Specialist position.

State Financial Assistance — Only those educational positions mandated by state law receive a measure of direct state funding, proportional to the calculated wealth of the local government [4]. Currently, the “Virginia Standards of Quality” require, and the state government provides, some financial assistance for such positions as building principals, classroom teachers at set student-to-teacher ratios, guidance counselors, instructional technology resource teachers, and others.

The Virginia Board of Education did recommend to the 2007 General Assembly that it amend the “Standards of Quality” to mandate that divisions employ one Mathematics Specialist per 1,000 students in grades K-8. This requirement was introduced for consideration during the session, but it was not enacted. Therefore, local divisions continue to bear the full expense of employing Mathematics Specialists should they choose to employ them—and should they be able to find them.

A key factor in the legislature’s failure to adopt the mandate is its high cost to both state and local government under the current funding methodology whereby state and local governments share the costs of mandated positions. The Virginia Department of Planning and Budget estimated the cost to the state to implement the Mathematics Specialist initiative at \$27.2 million for FY08 [5]. The proposed change would have generated a significant cost to local school divisions as well, a cost approximately equal to the state’s contribution.

Competition for personnel with mathematics credentials is fierce throughout today’s economy. A division superintendent reported continuing difficulty recruiting mathematics teachers even though the division has begun offering a \$1,000 bonus for each of three years in an attempt to attract mathematics teachers at the secondary level. An assistant superintendent for curriculum and instruction pointed out that Mathematics Specialists are expensive teachers as they have credits and/or degrees beyond a bachelor’s, more years of teaching experience than new hires, and are in much shorter supply than the typical elementary school teacher.

It was not surprising that local policy leaders were equivocal about the imposition of a state mandate while at the same time identifying financial assistance as critical to the maintenance and expansion of the current Mathematics Specialist program. As noted earlier, the funds

provided by the NSF and the Commonwealth of Virginia for grant-sponsored Specialists require a significant local supplement and expire before (Cohort I) or at the end (Cohort II) of the 2008-2009 school year.

The divisions would welcome some form of state assistance, perhaps using the largely discontinued incentive funding model that Virginia utilized frequently in past years. Under the incentive funding model, local school divisions who chose to employ specified educational positions received a set sum from the Commonwealth, which had to be supplemented locally, as encouragement to exceed the “Standards of Quality.” One policy leader was of the opinion that a measure of state funding for a Mathematics Specialist might influence the local school board to make up the remaining cost, which would still be considerable.

Wary of the big local cost of a state mandate, another division superintendent suggested exploring a model in which local divisions could choose among a menu of state mandated positions. Perhaps, he mused, one division might choose a Mathematics Specialist rather than a guidance counselor for School A, but make the opposite choice for School B, depending on the different challenges facing the two schools. State financial assistance for elementary teachers taking additional coursework to improve their understanding of mathematics and delivery of instruction also was recommended as an indirect method of state support.

Advocacy Efforts — The policy leaders were satisfied that their division staff kept them well-informed of legislative proposals and advocacy opportunities relating to Mathematics Specialists, and they maintained contact with legislators and communicated their local needs when encouraged to do so. Grateful for the third-year payment for the Cohort I Specialists, they were not at all optimistic that future funding—other than the possibility of local sources—was likely.

Two superintendents reported using staff to update the school board on statewide initiatives related to Mathematics Specialists and/or to provide in-depth reviews of local, state, and national efforts in this area at board retreats. Two divisions reported media attention such as newspaper articles and radio interviews; one division wished the local business and technology community showed more concern and involvement with mathematics in the schools. Local publicity, it was observed, is akin to walking on a political tightrope. Good news about the “haves” is apt to lead to dissatisfaction among the “have-nots.”

Summaries and Observations—Perceptions of Mathematics Specialists' Impact

Effectiveness by Formal and Informal Measures — All of the division representatives interviewed were firmly convinced of the effectiveness of their Mathematics Specialists and the program model. They reported both informal observations and assessment data to support their responses.

Scores on assessments, such as those used in the division's math series and the number of students scoring "pass-advanced" on the Virginia *Standards of Learning* assessment, were reported improved in half of one partner division's participating schools. Informally, an instructional leader reported that schools with Specialists showed differentiated instruction to a much greater degree than is typical in schools without Specialists. Moreover, administrators believed one could tell which classroom teachers in a school "took advantage of the Mathematics Specialist's service" and which did not.

Administrators from another division reported that all feedback from principals and others involved with the grant schools had been positive. Teachers appreciated the support they received, particularly help with implementing the division's new math series, and valued the relationships they developed with their Mathematics Specialists. In yet another division, the Specialists themselves had reported that they were pleased with the progress made by their assigned schools. The interviewees stressed the criticality of having the "right" Specialist with the knowledge and personality to boost their school's classroom teachers' confidence in their own abilities to teach math.

A division superintendent was convinced that coaching is the best way to achieve improvement in the classroom. The schools that have Mathematics Specialists have increased the level of student mathematics achievement. The division's program evaluation department reported that pass rates in schools having a Specialist for two years increased by fourteen points; schools without a Specialist saw a one-point increase. The evaluation report recommended that additional professional development about peer coaching models and the roles of Mathematics Specialists be provided, and that the Specialist program be expanded to all elementary and middle schools.

School Interest in Program Expansion — Everyone reported great interest among elementary school staff in expanding the program. The instructional gains and teacher satisfaction observed in the participating schools were obvious to non-participating schools. A division superintendent mentioned that two additional elementary schools were considering how to use their local staffing

allocation creatively to get Mathematics Specialists in the coming year. An instructional leader noted that the new focus on teaching numerous algebraic concepts at the elementary level was another motivator for schools to request Specialists.

Everyone noted that mathematics achievement in middle schools is a concern across Virginia and predictably reported great interest in expanding the program to their middle schools in order to prepare students for high school mathematics courses. Some divisions have one or more locally funded middle school Specialist(s). One division partnered with a nearby university on a math project which supported one part-time, middle school Mathematics Specialist for the 2007-2008 school year. Another division, also with low middle school mathematics scores, reported that some of its middle school teachers are taking K-8 mathematics education programs provided by a local university. One superintendent, impressed with the potential of the program to work at the middle school level, said, “We simply *must* find other sources of funding.”

Conclusion

The policy leaders representing the partner divisions agreed on the need for improved mathematics instruction as the path to improved student achievement, and on the effectiveness of the NSF-TPC grant program model in this regard. They shared the goals of their students becoming better at mathematics and their teachers becoming better at teaching it.

They were alike in their dedication to crafting local initiatives to boost mathematics achievement. However, they all jointly viewed present local efforts as insufficient for meeting the needs of all students and schools, and believe the prospects of state financial support for mathematics improvement programs are dim. Most gratifyingly, they were unanimous in their confidence about the effectiveness of the grant’s in-school coaching model and their desire to implement it in all elementary and middle schools.

Next Phase of the Study

Following the 2007-2008 school year, the policy associates will interview the principals of the Cohort II schools, again focusing on local school implementation of the Mathematics Specialist program during the first year. The interview items will be similar to those used during the 2006 interviews of the Cohort I principals. In addition, the policy associates will compile data regarding the retention of Cohort I Specialists in 2008-2009, their fourth year and the grant’s final year. They will also inquire as to the intentions of the partner divisions to employ Mathematics Specialists originally placed through the NSF grant after the grant has ended. ■

References

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