

PROVIDING JOB- EMBEDDED PROFESSIONAL LEARNING FOR MATHEMATICS SPECIALISTS

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ABSTRACT

We know that if professional learning opportunities are to be meaningful and create long-lasting and systemic change, they must be ongoing and job-embedded. One of the most beneficial aspects of having mathematics specialists in schools is that they can provide job-embedded professional learning directly to teachers. Perhaps due to the strong impact mathematics specialists have on teaching and learning, we may overlook the need to provide professional learning to support the growth of mathematics specialists themselves. Just as we provide coaching to teachers to affect their professional growth, we must identify similar opportunities to affect the growth of mathematics specialists. This paper will identify the purposes of these opportunities to include supporting growth in content knowledge, pedagogical expertise, coaching skills, and professionalism and leadership. We recognize that sustained efforts must be undertaken to see significant growth in these areas. Through interviews with individuals from Virginia school divisions and professional organizations, we identify models that can be replicated to provide the recommended professional learning for mathematics specialists.

KEYWORDS

professional learning, mathematics specialists, professional organizations, mathematics supervisors, job-embedded

Mathematics specialist preparation programs prepare teacher leaders to serve in this role in a similar manner to how teacher preparation programs prepare individuals to serve as classroom teachers. However, once teachers begin their work, they are, or should be, provided ongoing professional learning to support their continued growth (Campbell & Malkus, 2013). Too often, we find that mathematics specialists do not have the same type of ongoing support. One reason for this oversight may be that schools and school divisions traditionally designate days in the school calendar when professional development workshops are offered. Mathematics specialists are often called on to lead these workshops for teachers, thus preventing them from receiving assistance toward their own professional growth during this time. Yet, just as teachers need continued professional learning for their growth, school divisions must provide opportunities for mathematics specialists to continue their growth.

Guskey (2002) found the most beneficial form of professional learning for teachers is ongoing and job-embedded. Building on this finding, we posit that professional learning for specialists should strive to provide similar experiences. Professional learning experiences for mathematics specialists should target at least one of four broad areas: content knowledge, pedagogical expertise, coaching skills, and professionalism and leadership (Association of Mathematics Teacher Educators [AMTE], 2013; Campbell & Ellington, 2013). The modes and methods used to present this information may differ depending on the size of the school division and the number of mathematics specialists serving that division.

In this paper, we provide further information on the areas of professional learning needed for mathematics specialists and outline multiple delivery methods. Informed by interviews and surveys of school division mathematics specialists and their supervisors, this paper describes professional learning experiences that have been offered by school divisions and professional organizations across Virginia. The authors of this paper advocate for increased professional learning opportunities for all mathematics specialists and offer recommendations for how these opportunities can be provided in areas where there is not a large group of mathematics specialists.

Professional Learning for Mathematics Specialists

As noted earlier in this paper, the AMTE (2013) and Campbell and Ellington (2013) identified four broad areas of continued learning that will strengthen mathematics specialists' knowledge and skills to carry out their responsibilities. The four areas of learning and examples of how some school divisions in Virginia offer opportunities for professional growth are discussed below.

Professional Learning to Support Content Knowledge

Mathematics specialists must have a deep understanding of the mathematics content when working with teachers in their school building. An informative conclusion based on a study about teaching and learning in grades PK–8 and published in *Adding It Up: Helping Children Learn Mathematics* (Kilpatrick et al., 2001) is that teachers need to deeply understand the mathematics they teach, how students learn mathematical ideas, and how to implement instruction that supports student learning. It reasonably follows that mathematics specialists who are supporting teachers in schools must also have this same deep understanding that teachers need, but for multiple grade levels.

We acknowledge that it is unlikely that a mathematics specialist would have direct experience teaching every mathematics course offered in a school. Because of this, it would be tempting to provide targeted support in understanding the curriculum for each mathematics course. While this approach has its uses, we believe professional learning should focus on what Ball et al. (2008) define as specialized content knowledge and horizon knowledge. Specialized content knowledge is the knowledge that supports structuring and representing mathematics concepts, identifying the mathematics that underpins an instructional task, and anticipating different ways students might think about concepts, including their misconceptions. Horizon knowledge is an understanding of the vertical progression across grade levels which is necessary for teaching a topic at a particular time. This knowledge also requires making connections to what content is to come.

To provide professional learning in specialized content knowledge and horizon knowledge, school divisions have often used rich mathematical tasks. One suburban school division frequently uses these tasks as opening activities during bi-weekly mathematics specialist meetings. This school division employs multiple building-level mathematics specialists who support teachers at one or two schools. The specialists represent elementary, middle, and high schools. The division reports that working on a task is especially beneficial with this diverse group of specialists due to the wide range of mathematics background that the specialists use to approach the task. The specialists begin by individually completing the task and anticipating student strategies and misconceptions. The specialists then engage in discussions about connections among the solution methods and the different mathematical ideas that have come out of the task. The specialists end with a discussion about how they could coach a classroom teacher to effectively implement the task in the classroom.

One Virginia superintendent's region (Virginia Department of Education, n.d.) uses region level meetings for multiple school divisions to provide professional learning for mathematics content to their specialists. The region also holds regular meetings where mathematics specialists work together to curate resources. While the meetings may have the appearance of working meetings, specialists all participate in deep discussions around the learning targets, essential questions, and the essential understandings of state and national standards.

Professional Learning to Support Pedagogical Expertise

Mathematics specialists must have knowledge of a variety of instructional strategies to support mathematics understanding. As the educational landscape moves toward increases in the use of digital curricula and virtual learning, mathematics specialists must have knowledge of the advantages and limitations these types of tools have to offer. The specialist must be able to guide teachers to use tools and strategies that enhance students' understanding of essential mathematics concepts.

Professional learning to support pedagogical expertise includes work with instructional strategies, planning lessons, and understanding student motivation. School divisions often approach professional learning in this domain through book studies. The books chosen for mathematics specialists' book studies might preview instructional methods and models to be rolled out to teachers throughout the division. For example, we have seen school divisions use this approach before implementing a new instructional model with teachers.

Another area for providing professional learning in pedagogical expertise can occur within professional organizations. From the authors' experiences, organizations such as the Virginia Council of Mathematics Specialists (VACMS) and the Virginia Council of Teachers of Mathematics (VCTM) have an easier time bringing in nationally recognized speakers to provide training to a statewide audience as part of a conference or meeting. As with any conference, it is imperative that mathematics specialists participate in follow-up events or conversations to ensure that the experience is ongoing rather than a one-and-done experience.

An urban school division in Virginia uses lesson study (Wang-Iverson & Yoshida, 2005) to support both content knowledge and pedagogical expertise. The division uses monthly meetings of mathematics specialists and mathematics resource teachers to carry out this process. The teams use student-level data to determine the concept and grade level to be studied. After identification of the underlying content, the teams plan a lesson, conduct the lesson, and then reflect on the effectiveness of the lesson.

Professional Learning to Support Coaching Skills

For mathematics specialists to effectively enact change in instruction, they must have the ability to work with teachers as adult learners. When working with an adult learner, it is especially important to devote time to building relationships and developing trust. These skills are part of a broader spectrum of coaching skills that must be supported through sustained professional learning.

As coaching skills may be universal to all instructional coaches and not specific to mathematics, some school divisions provide professional learning to support coaching skills to all individuals who serve as instructional coaches. Professional learning for these cross-content groups has been provided through conferences, book studies, and in-house opportunities.

A large suburban division provides professional learning to support coaching skills through peer observation. Groups of mathematics specialists conduct instructional rounds where they jointly observe several teachers in a school. Afterwards, the specialists debrief and reflect on the experience, focusing on follow-up coaching opportunities that may be necessary. As a variation on peer observation, coaches may also observe each other interacting with a teacher during a coaching cycle. Follow-up discussions focus on the coaching moves utilized and recommendations for ongoing coaching.

Professional Learning to Support Professionalism and Leadership

A mathematics specialist often functions in between two implicitly defined roles in a school—a classroom teacher and an administrator. Mathematics specialists must move in and out of both of those roles while doing their work. This transition between two seemingly different worlds is difficult and requires professionalism and leadership skills. Ongoing professional learning is necessary in this area, particularly as the mathematics specialist works with changing teaching staffs and administration.

Professional learning in this area can occur during mentoring opportunities between a new mathematics specialist and an experienced specialist. In a suburban division, first year specialists are assigned a veteran specialist as a mentor. During structured mentorship meetings, the new specialist shares specific cases and concerns, while the experienced specialist utilizes coaching language to help the new specialist navigate the concerns. Of note to mathematics

specialists who may be the only specialist in their division or region, successful mentorship meetings have occurred virtually. In some cases, instructors of mathematics specialist programs have served as mentors of program participants after they begin working as a mathematics specialist.

Modes and Methods of Providing Professional Learning

Once a decision has been made about the specific content or focus area(s) for professional learning, we turn to the question of how the specialist will access these experiences. In some cases, specialists will benefit from participating along with teachers. Darling-Hammond et al. (2017) suggest that “teacher learning experiences should: (a) be intensive, ongoing, and connected to practice; (b) focus on student learning and address the teaching of specific curriculum content; (c) align with school improvement priorities and goals; and (d) build strong working relationships among teachers” (pp. 9 – 11). But, in addition, mathematics specialists need opportunities to reflect on their coaching practice and to engage in a professional learning community with their peers. The specialists need professional learning to address their specific role and responsibilities.

School divisions across Virginia have used various modes and methods to provide the professional learning described above. We recognize the type of professional learning experiences available to a mathematics specialist may be dictated by the size of the division and the number of mathematics specialists employed by the division. Divisions that have a larger number of mathematics specialists have the flexibility to provide ongoing professional learning experiences through regular meetings. However, Virginia also has school divisions with only one mathematics specialist. In this case, large-scale professional learning is not possible, and it may be up to the individual to assume responsibility for his or her own professional growth. We provide a summary of various approaches throughout Virginia that have been shared with the authors.

Group-Based Professional Learning through Regular Meetings

School divisions with multiple mathematics specialists can pull these specialists together on a regular basis. If these meetings are to occur, and we concur with McGatha and Rigelman (2017, p. 15) who strongly recommend they do, they must be purposefully planned to justify pulling mathematics specialists away from their other roles. Specifically, division-level leaders must use these meetings as an opportunity to provide ongoing professional learning in the areas we outlined in the first section.

These ongoing meetings provide an excellent opportunity for professional learning that serves each of the four purposes described above. Meeting time can be devoted to book studies, work with an outside consultant, peer observation and discussion, building content knowledge, and mentoring conversations. One division reports that professional learning can be obtained while creating and implementing division-level resources. This division had a year-long project where mathematics specialists developed cognitively demanding tasks and associated scoring rubrics. These tasks were then piloted in the specialists’ schools. Throughout the process, teachers grew in their understanding of tasks and authentic assessment. At the same time, the project yielded student work that became the source of mathematical conversations among the

specialists. As a result, mathematics specialists were able to grow in their practice by sharing ideas about how to work with teachers to determine their next steps in the classroom.

Virtual Opportunities

Some mathematics specialists may be in a position where they are the only specialist for their division. In this case, we advocate for a network of mathematics specialists in similar positions. Technology has improved to the point where this network can be virtual, connecting mathematics specialists from across Virginia. These virtual opportunities are particularly helpful when addressing professional learning to support professionalism and leadership skills. Care must be taken to ensure that these virtual check-ins are structured and purposeful. Virginia specialists who participated in the same university preparation program as a cohort have reported that they often meet virtually with each other after the cohort's official work has ended. It is helpful if the rationale for this way of networking is brought up during their course work. Some specialists who have attended the state professional conferences have shared that they continue to meet and consult virtually with specialists from other divisions. One specialist appreciates that she can meet with and gain ideas from specialists in schools and school divisions that are like hers as well as with those that are different from hers.

Professional Organizations

Professional organizations provide another avenue for mathematics specialists to network with each other. Virginia's mathematics specialist community has several state-wide professional organizations to turn to for guidance. These include the VACMS, VCTM, and the Virginia Council for Mathematics Supervision. Each of these organizations provides an annual meeting with opportunities for specialists to learn from established specialists and presenters and network with each other. In addition, these and similar national organizations (e.g., National Council of Teachers of Mathematics and NCSM) provide research and literature dedicated to mathematics coaching. These professional organizations also provide an opportunity for mentorship as new and experienced specialists look out for each other. Some division central office mathematics leaders attend along with the specialists and then use shared experiences during the conference to support follow-up in the school division. Specialists have also brought their administrators to conferences and used this time together to build a partnership and identify strategies that will move the school's mathematics program forward.

Individual Professional Learning

Mathematics specialists, whether they are one of many in a school division or work in more isolated circumstances, must also take the initiative to reflect on areas where they want to grow themselves and seek out opportunities to strengthen those areas. This may include reading journals, participating in conferences, accessing reputable web-based sources for professional learning, participating in grant-supported opportunities with local institutes of higher education, or reaching out to others in similar situations. Mathematics specialists, whether they are part of a larger group of specialists or not, are encouraged to seek out new research about what makes a mathematics specialist effective in their roles.

Conclusion

Throughout this paper, we have defined four different purposes for professional learning for mathematics specialists and explored different models for offering that professional learning. In no way do we insinuate that a professional learning experience should focus on only one of the four purposes. Instead, we recognize that the most effective professional learning may address all four. For example, the application of lesson study addresses content knowledge and pedagogical expertise through researching the mathematics standard and planning the lesson. Professional learning in coaching skills and professionalism and leadership is provided during the conducting of the lesson and debriefing on its effectiveness.

Similarly, we do not intend to state that one delivery model of professional learning is more effective than any other. We do stress that whichever model is used, there must be opportunities for ongoing professional learning that extends beyond traditional professional development workshops. Additionally, the opportunities should be job-embedded so that the specialist can have real-time feedback and learning on the support they are offering for teachers.

School divisions know that professional learning is crucial for teacher growth and thus require teachers to participate in a minimum number of professional improvement activities per year. School divisions need to recognize that professional learning is equally important for the growth of mathematics specialists and should have a similar requirement for completing professional improvement activities. It is the role of the school or school division to determine the quantity of professional learning activities required. It is also the role of the school or school division to provide or support activities that are designed for mathematics specialists to experience growth in one or more of the areas we have outlined. This action will produce mathematics specialists who are continually improving in how they support teaching and learning, resulting in teachers who are better equipped to provide instruction that allows for students to have deep and rich mathematics understanding.

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