

The Role of Elementary Mathematics Specialists in the Teaching and Learning of Mathematics

A joint position of the Association of Mathematics Teacher Educators (AMTE), the Association of State Supervisors of Mathematics (ASSM), the National Council of Supervisors of Mathematics (NCSM) and the National Council of Teachers of Mathematics (NCTM) in response to the release of *Elementary Mathematics Specialists: A Reference for Teacher Credentialing and Degree Programs*¹ (AMTE, 2010).

Our Position

The AMTE, ASSM, NCSM, and NCTM recommend the use of Elementary Mathematics Specialists (EMS) in preK-6 environments to enhance the teaching, learning and assessing of mathematics in order to improve student achievement. We further advocate that every elementary school have access to an EMS. Districts, states/provinces and higher education should work in collaboration to create (1) advanced certification for EMS professionals and (2) rigorous programs to prepare EMS professionals. EMS professionals need a deep and broad knowledge of mathematics content, expertise in using and helping others use effective instructional practices, and the ability to support efforts that help all preK-6 students learn important mathematics. Programs for EMS professionals should include foci on mathematics content knowledge, pedagogical knowledge, and leadership knowledge and skills.

Who are elementary mathematics specialists?¹

Elementary mathematics specialists are teacher leaders who are responsible for supporting effective preK-6 mathematics instruction and student learning. The specific roles and responsibilities of EMS professionals vary according to the needs and plans of each setting but their expertise and successful experience at the elementary level is critical. At the classroom level, an EMS professional may teach mathematics to elementary students in one or more grade levels or work with particular groups of students to provide remedial or enrichment support services. At the school or district level, EMS professionals may work primarily with teachers as coaches, in a professional development capacity or target school-wide improvement in mathematics. In this role, EMS professionals build capacity by strengthening teachers' understanding of mathematics content and helping them develop more effective instruction and assessment. Curriculum, assessment and/or policy development may also be the responsibility of EMS professionals. Whatever the setting or responsibilities, EMS professionals need (1) deep and broad understanding of mathematical content including the specialized knowledge needed for teaching, (2) solid knowledge of the elementary context, (3) expertise in using and helping others use effective instructional and assessment practices informed by knowledge of mathematical learning trajectories, (4) knowledge and skills for working with adult learners, and (5) leadership skills necessary to influence and support educational efforts to improve the teaching and learning of mathematics.

Why are EMS professionals needed?¹

Most elementary teachers are generalists—that is, they study and teach all core subjects which may make it difficult to develop in-depth knowledge and expertise with regard to knowing and teaching elementary mathematics. Over the past two decades, the need for EMS professionals has been predominantly examined from two perspectives: (1) professionals who work primarily with teachers¹⁻⁷ and (2) professionals who work primarily with students¹⁻¹² recognizing that some EMS professionals do both.

NCTM describes the importance of EMS professionals working with teachers in this way:

Teacher-leaders can have a significant influence by assisting teachers in building their mathematical and pedagogical knowledge....Teacher-leaders' support on a day-to-day basis ranging from conversation in the hall to in-classroom coaching to regular grade-level and departmental seminars focused on how students learn mathematics—can be crucial to a teacher's work life.⁴

NCSM also advocates for EMS professionals working with teachers to build knowledge, capacity, and skills:

A single mathematics education leader can have an incredible impact on the development and effectiveness of others.... Leaders in mathematics education at all levels of the school or district organization...are crucial for ensuring attainment of high-quality school mathematics programs.¹³

The National Mathematics Advisory Panel notes the important role of EMS professionals working with students:

The use of teachers who have specialized knowledge in elementary mathematics teaching could be a practical alternative to increasing all elementary teachers' content knowledge (a problem of huge scale) by focusing the need for expertise on fewer teachers.⁵

Evidence of impact of EMS professionals

While the call for EMS professionals began over two decades ago, currently only a few states and provinces offer advanced certification for EMS professionals. As a result, the research on the impact of EMS professionals is still emerging. However, the available research acknowledges that EMS professionals have positive impacts on teachers and students¹⁴⁻²². A number of studies describe positive changes in teachers' practice as a result of interacting with an EMS professional including: actively engaging students^{14, 15}, emphasizing reasoning and problem-solving over skills-based lessons^{15, 16}, using students' work to inform instruction¹⁷, and effectively planning lessons¹⁸. Studies also document that as EMS professionals gained experience, they had significant positive impacts on student achievement¹⁹⁻²¹. As states and provinces move to more widespread implementation of EMS professionals, additional research needs to be conducted to document the impact on the teaching and learning of mathematics.

Guiding Documents

To support districts, states/provinces and higher education, detailed recommendations for content knowledge, pedagogical knowledge, and leadership knowledge and skills can be found in AMTE's *Elementary Mathematics Specialists: A Reference for Teacher Credentialing and Degree Programs*¹ and NCTM's *Curriculum Focal Points*²³. NCSM's *PRIME Leadership Framework: Principles and Indicators for Mathematics Education Leaders*¹³ can further assist schools and districts in supporting the ongoing growth and leadership of EMS professionals. Additional EMS-related resources can be found in the reference list.

NOTES

1. Association of Mathematics Teacher Educators, *Standards for Elementary Mathematics Specialists: A Reference For Teacher Credentialing and Degree Programs* (San Diego, CA: AMTE, 2010), http://www.amte.net/sites/all/themes/amte/resources/EMSStandards_Final_Mar2010.pdf.
2. John Dossey, "Elementary School Mathematics Specialists: Where Are They?," *The Arithmetic Teacher*, 32(1984): 3, 50.
3. Francis Fennell, "We Need Elementary School Mathematics Specialists Now," *NCTM News Bulletin*, (2006), <http://www.nctm.org/about/content.aspx?id=9496>.
4. National Council of Teachers of Mathematics, *Principles and Standards for School Mathematics* (Reston, VA: NCTM, 2000), <http://www.nctm.org/standards/default.aspx?id=58>.
5. National Mathematics Advisory Panel, *Foundations for Success: The Final Report of The National Mathematics Advisory Panel* (Washington, DC: US Department of Education, 2008), <http://www2.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf>.
6. National Research Council, *Adding It Up: Helping Children Learn Mathematics*, ed. Jeremy Kilpatrick, Jane Swafford, and Brad Findell. (Washington, DC: National Academy Press, 2001).
7. Barbara Reys and Francis Fennell, "Who Should Lead Mathematics Instruction at the Elementary School Level? A Case for Mathematics Specialists," *Teaching Children Mathematics*, 9(2003): 277-282, http://my.nctm.org/eresources/article_summary.asp?URI=TCM2003-01-277a&from=B.
8. Conference Board of the Mathematical Sciences, *The Mathematical Education of Teachers (CBMS Issues in Mathematics Education, Vol. 11)* (Providence, RI and Washington, DC: American Mathematical Society and Mathematical Association of America, 2001), http://www.cbmsweb.org/MET_Document/index.htm.
9. Johnny Lott, "The Time Has Come for Pre-K-5 Mathematics Specialists," *NCTM News Bulletin*, (2003), <http://www.nctm.org/about/content.aspx?id=956>.
10. National Council for the Accreditation of Teacher Education, *NCATE/NCTM Program Standards: Standards for Elementary Mathematics Specialists* (2003), http://www.nctm.org/uploadedFiles/Math_Standards/NCTMELEMStandards%281%29.pdf.
11. William Coleman, et al., *Educating Americans for the 21st Century: A Plan of Action for Improving Mathematics, Science and Technology Education for All American Elementary and Secondary Students so that Their Achievement is the Best in the World By 1995* (Washington DC: National Science Foundation, 1983).
12. Hung-Hsi Wu, "What's Sophisticated About Elementary Mathematics: Plenty--That's Why Elementary Schools Need Math Teachers," *American Educator*, 32(2009): 4-14, http://archive.aft.org/pubs-reports/american_educator/issues/fall2009/wu.pdf.
13. National Council of Supervisors of Mathematics. *The PRIME Leadership Framework: Principles and Indicators for Mathematics Education Leaders*, (Bloomington, IN: Solution Tree, 2008).

14. Patricia Campbell, "Empowering Children and Teachers in the Elementary Mathematics Classrooms of Urban Schools," *Urban Education*, 30(1996): 449-475.
15. Kathryn Race, Evelyn Ho, and Leah Bower, "Documenting In-Classroom Support and Coaching Activities of a Professional Development Program Directed Toward School-Wide Change: An Integral Part of an Organization's Evaluation Efforts" (paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA, 2002)
<http://www.raceassociates.com/materials/AEA2002b.pdf>.
16. Jean Becker. *Classroom Coaching: An Emergent Method of Professional Development*,
<http://teachersnetwork.org/TNPI/research/growth/becker.htm>.
17. Maggie McGatha, "Levels of Engagement in Establishing Coaching Relationships," *Teacher Development*, 12(2008): 139-150.
18. Helen Gerretson, Janet Bosnick, and Kathleen Schofield, "A Case for Content Specialists as the Elementary Classroom Teacher," *The Teacher Educator*, 43(2008): 302-314.
19. Herman Meyers and Douglas Harris, *Evaluation of the VMI through 2008*,
http://www.uvm.edu/~vmi/index_files/2008%20VMI%20Evaluation.pdf.
20. Patti Brosnan and Diana Erchick, "Mathematics Coaching and Its Impact on Student Achievement" in *Proceedings of the Psychology of Mathematics Education – North America*, ed. Patti Brosnan, Azita Manochchri, and Doug Owens (Columbus, OH: PME-NA, 2010).
21. Patricia Campbell and Nathaniel Malkus, "The Impact of Elementary Mathematics Coaches on Student Achievement," *The Elementary School Journal*, (2010): in press.
22. Maggie McGatha, "Mathematics Specialists and Mathematics Coaches: What Does the Research Say?" *NCTM Research Briefs*, ed. Judith Reed Quander (Reston, VA: NCTM, 2009).
<http://www.nctm.org/news/content.aspx?id=22839>.
23. National Council of Teachers of Mathematics, *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence* (Reston, VA: NCTM, 2006),
<http://www.nctm.org/standards/content.aspx?id=270>.
24. For additional information see the Elementary Mathematics Specialists and Teacher Leader website (<http://www.mathspecialists.org>).