Elementary Mathematics Specialists: Challenges and Opportunities

A Historical Perspective & Call to Action

Presenters:
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## Elementary Math Specialists Milestones

<table>
<thead>
<tr>
<th>Year</th>
<th>Event(s</th>
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<tbody>
<tr>
<td>1984</td>
<td>NCTM Recommends State Certification for Elem. Math Specialists (EMS)</td>
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<tr>
<td>1987</td>
<td>Exxon Foundation’s support for K-3 mathematics specialists</td>
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<tr>
<td>1989</td>
<td><em>Everybody Count’s</em> supports specialization in mathematics at the elem. level</td>
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<tr>
<td>2000</td>
<td>PSSM suggests models for EMSs and teacher leaders</td>
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<tr>
<td>2001</td>
<td>MET recommends math specialists starting at grade 5.</td>
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<tr>
<td>2003, 2006, 2010</td>
<td>NCTM Presidents Lott, Fennell, and Shaughnessy support EMSs.</td>
</tr>
<tr>
<td>2008</td>
<td>National Mathematics Advisory Panel recommendation for specialists</td>
</tr>
<tr>
<td>2009</td>
<td>ems&amp;tl established at McDaniel College</td>
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<tr>
<td>2010</td>
<td>AMTE Standards and Joint Position Statement</td>
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<tr>
<td>2011</td>
<td>11 states have “math specialist” certification/endorsement</td>
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</table>
MET – Recommendations (2001)

1. Prospective teachers need mathematics courses that develop a deep understanding of the mathematics they teach.

2. Prospective elementary teachers 9-semester hours on fundamental ideas of elementary school mathematics.

8. There needs to be more collaboration between mathematics faculty and school mathematics teachers.

9. The mathematics community needs to be involved in efforts to improve standards for school mathematics, as well as in teacher accreditation.

10. Teachers need the opportunity to develop their understanding of mathematics and its teaching throughout their careers, through both self-directed and collegial study and through formal coursework.

11. Mathematics in middle grades (grades 5-8) should be taught by mathematics specialists.
The Time Has Come for Pre-K-5 Mathematics Specialists
by Johnny W. Lott, NCTM President 2002-2004
NCTM News Bulletin, July/August 2003

The No Child Left Behind Act calls for "highly qualified mathematics teachers" in all classrooms by 2005. To meet this requirement, teachers for the early grades would need both a bachelor's degree and state certification. In reality, the call for student proficiency in mathematics and science demands more than this. I suggest that although there has been a traditional unwillingness to consider the need for mathematics specialists in elementary schools, it is an idea whose time has come.

We Need Elementary School Mathematics Specialists NOW
by Francis (Skip) Fennell, NCTM President 2006-2008
NCTM News Bulletin, November 2006 (PDF)

In 1984, an article appeared in the Arithmetic Teacher that asked an important question — "Elementary School Mathematics Specialists: Where Are They?" This was written by John Dossey, who later served as NCTM president. Now it is 2006, and I am again asking, where are the mathematics specialists? We need you NOW in elementary schools and at every other level in prekindergarten through grade 12 mathematics education.

NCTM's Joint Position on Elementary Math Specialists—It's about time!
by NCTM President J. Michael Shaughnessy
NCTM Summing Up, June 2010

In this message I bring to your attention two new opportunities in our great mathematics education profession. The first is an example of our profession's ability to mount cooperative efforts to improve the teaching and learning of mathematics. The second is an opportunity for you and me to engage in some mathematical reasoning—to "walk the walk," as it were, in step with NCTM's new initiative on Reasoning and Sense Making, described in last month's column.
Testimony
Committee on Labor & Education

• “...while the terms math specialist and math coach are not always clearly or consistently defined, there is potential in this movement.”

• “…I would add that at a time of teacher surplus at the elementary school level, it is perhaps time to scrap the model of elementary teacher as generalist. Why not have specifically trained elementary mathematics specialists starting from day one of their career? Our country can’t wait until such specialists are graduate students.”

May 21, 2008
What Do We Know about the Use of Mathematics Specialists and Coaches in Schools? Clip

(PDF)

Many schools and districts are using mathematics specialists and coaches to improve instruction and student achievement; yet, there is a lack of abundant research on their effectiveness. Preliminary results from the few existing studies suggest:

- There is too little research on mathematics specialists to indicate their effectiveness.
- Preliminary research on mathematics coaches have indicated the potential for improving instructional practice.
- The design of the mathematics coaching program are an important factor.
- Researching the impact of specialist and coaches is difficult because these professionals are often part of a larger professional development program. Isolating the impact of just this component is difficult.

Overall, more research is definitely needed before confident statements can be made about the effectiveness of mathematics coaches and specialists.
Joint Position Statement (2010)

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

A joint position of the AMTE, the ASSM, the NCSM, and the NCTM in response to the release of *Elementary Mathematics Specialists: A Reference for Teacher Credentialing and Degree Programs* (AMTE, 2010).

*Our Position*

The AMTE, ASSM, NCSM, and NCTM recommend the use of Elementary Mathematics Specialists (EMS professionals) in pre K–6 environments to enhance the teaching, learning, and assessing of mathematics to improve student achievement. We further advocate that every elementary school have access to an EMS. Districts, states or provinces, and institutions of 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 pre-K–6 students learn important mathematics. Programs for EMS professionals should focus on mathematics content knowledge, pedagogical knowledge, and leadership knowledge and skills.
EMS Certification

- 2010 Conference PPS
- 2011 Conference PPS
- States w/ Cert & Prog
- States w/ Prog no Cert

Source: AMTE EMS State Certification Conference, 2011
**EMS&TL Project Summary**

The Elementary Mathematics Specialists and Teacher Leaders (EMS&TL) Project is designed to address a number of initiatives related to leadership in elementary mathematics education. The Project has established the Elementary Mathematics Instructional Leader (EMIL) Program as a stand-alone M.S. degree offering within the McDaniel College (Westminster, MD) Graduate and Professional Studies Program. This initiative should serve as a catalyst and model for other institutions as well as provide the momentum to move the Maryland State Department of Education (MSDE) to acknowledge and support Maryland’s PreK-6 and 4-9 Mathematics Instructional Leader (MIL) endorsements.

An important element of the EMS&TL Project has been the creation and continual updating of an online project clearinghouse (www.mathspecialists.org) designed to collect and analyze data and information relative to the impact of the work of the elementary mathematics specialists. The Project’s clearinghouse is also a useful tool for locating and disseminating information relative to similar projects, and for establishing and maintaining a data base designed to document the impact of mathematics teacher specialists and elementary mathematics specialists on student learning and school and school district effectiveness on a national, and to some extent, international level. The major goals of the EMS&TL Project are outlined below.

**PROJECT SPONSORS**

- The Brookhill Foundation
- McDaniel College

**ONLINE EMS CLEARINGHOUSE**

- www.mathspecialists.org

**EMIL GRADUATE PROGRAM**

- McDaniel College’s EMIL courses are designed for certified early childhood educators who seek positions as math instructional leaders and at the elementary school level.

**REGIONAL EMS PROF. DEV.**

- Annual summer seminars focusing on math content, pedagogy, and leadership issues for elementary mathematics specialists within the region and state.

**LEADERSHIP MODULES**

- Development of interactive, online leadership modules for elementary mathematics specialists in partnership with University of Michigan.

“We need elementary mathematics specialists, elementary teachers who know and understand mathematics and can effectively mentor their colleagues. Given the need for students with a mathematics and science background and interest, this project is a first step in that direction, with multiple rational implications.”

- Dr. Francis (Skip) Fennell
  NCTM Past President & EMS&TL Project Director
After spending a year getting to know Teacher A, I could tell she liked/desired detail planning. I asked her if she wanted to plan weekly with me. She agreed, however I then heard from other teachers that she interpreted my offer to mean that the administrator must think she is not a good teacher (not the case). She sees me as a threat. I do not give up. I spend lots of time in the classroom getting to know the students. We plan and I co-teach occasionally. At the end of the year, she tells me how much she loved working with me and how she thinks I have made her a better math teacher.
ems&tl Leadership Framework

Learning Community

Adult Learning  Navigating Relationships  Coaching
ems&tl Project Goals

• A master of science degree program which includes certification as an Elementary Mathematics Instructional Leaders (EMIL);

• A nationally respected clearinghouse (www.mathspecialists.org) designed to address the growth, development, and ongoing needs relative to elementary mathematics specialists;

• Collaborative work with a core group of elementary mathematics specialists from central Maryland. This element of the ems&tl Project provides project leaders with the needs and day-to-day challenges, milestones, and ideas which influence our work;

• Providing professional development opportunities for area elementary mathematics specialists;

• Providing professional development for mathematics specialists – nationally, through the National Council of Supervisors of Mathematics’ (NCSM) leadership conferences, prior to National Council of Teachers of Mathematics regional conferences and during the NCSM Summer Leadership Academy.

• The project seeks to determine the impact of work related to mathematics specialists at the regional and national level through the study of course offerings at the college/university level; review of state certification efforts; and analysis of school and school district programs which involve specialists, with particular attention to student achievement and teacher background.
Leadership Issues Cases
Leadership Issues Modules

EMS & TL
Elementary Mathematics Specialists
& Teacher Leaders Project

Francis (Skip) Fennell
EMS & TL Project Director

Leadership Issues Modules

Introduction  Case Overview  The Case

Transitioning to the Common Core – A First Step

www.mathspecialists.org

ems & tl CLEARING-HOUSE

ems & tl Copyright 2010-11
Pencast Cases
Estimate $49 \times 5 = \underline{\phantom{000}}$
\[ \frac{9}{10} - \frac{0}{3} = \]

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\[ -\frac{5}{6} \]

\[ -\frac{1}{2} \]

\[ -\frac{1}{4} \]
CONFERENCES & EVENTS

Fall Seminars
2011 NCSM Fall Leadership Seminars

Information accurate as of 06/25/2011 -- subject to change

Overview  Dates  Locations  Deadlines  Why you Should Attend  Register for the Seminar  Housing  Contacts, Questions, and Concerns

"Tools and Strategies for Implementing the Common Core State Standards"
For All Mathematics Teachers and Leaders!

Oct 19: Atlantic City  Oct 26: St. Louis  Nov 2: Albuquerque

Why I Joined NCSM
"NCSM provides a community of passionate people—leaders driven by common ideals."

BERGIO MENDOZA
MATHEMATICS DIRECTOR
GRDES K-12

Join me at NCSM...

eNEWS: Our FREE Newsletter
Sign-Up Today
Teacher Leaders Say, “This Worked.”

In this and future issues of the NCSM Newsletter, coaches and other participants in the Elementary Specialists and Teacher Leaders Project (ems&tl) will provide “This Worked” exemplars as daily success stories that help to define the cumulative impact and effect of mathematics teacher leaders at the elementary school level.

This Worked—Math Coaching Cycle

By Sorsha-Maria T. Mulroe

During my third year as a mathematics support teacher, I really struggled with how to be more productive in my role as a “coach.” I worked with teams of teachers and individual teachers in presentation settings and long-range planning, co-taught lessons on particular units of study, conducted classroom “visits,” and aligned the resources our school used for mathematics intervention and after-school mathematics programs. I even dabbled in lesson-study with one intermediate team. But in all this work, being able to sustain deep conversations with teachers about mathematics “grounded in student work and student learning” (Feger, 2004) was

2. Tell me more about what your students know about equivalent fractions that might help them rename an improper fraction such as 5/3?

INSTRUCTIONAL PRACTICE:

1. Which model (linear, area, discrete) would be most appropriate for introducing fractions?

2. Are there manipulatives that are more appropriate to use for a particular model?

3. If we said “three of the five partitions” and “three of the sixteen partitions” rather than “three-fifths” and “three-sixteenths,” would more students identify which fraction was greater sooner?
An Analysis of State Certification Efforts for Elementary Mathematics Specialists: Mathematics, Pedagogy and Leadership

Linking certification guidelines to course offerings
AMTE Standards

• At least 24 semester-hours or appropriate in:
  
  – I. Content knowledge for teaching mathematics:
    
    – Further specialized mathematics knowledge for teaching.
  
  – II. Pedagogical knowledge for teaching mathematics:
    
    – Learners and learning
    – Teaching
    – Curriculum and assessment
  
  – III. Leadership knowledge and skills

• Supervised mathematics practicum
State Certification - Specialists

Specialist/Leader

- ARIZONA
- GEORGIA
- NORTH CAROLINA
- TEXAS

Specialist/Teacher

- CALIFORNIA (MIL)
- MARYLAND
- OHIO
- VIRGINIA
- UTAH
- MICHIGAN
- SOUTH DAKOTA
Certification Titles

- AZ - Mathematics Endorsement K-8
- CA - Mathematics Instructional Leadership Specialist Credential
- GA - Mathematics Endorsement
- MD - Mathematics Instructional Leader (E or M)
- MI - Elementary Mathematics Specialist
- NC - Elementary Mathematics Add-on License
- OH - Mathematics Specialist Endorsement P-6
- SD - Math Specialist K-12
- TX - Master Mathematics Teacher - PreK-5, 4-8, 8-12
- UT - Elementary Math Endorsement, K-6
- VA - Mathematics Specialist for Elementary and Middle Education
Certification Credits/Units

- AZ: 24; 18 in mathematics
- CA: not indicated
- GA: 9
- MD: EMIL (21); MMIL (24)
- MI: not indicated
- NC: 18
- OH: not indicated
- SD: not indicated
- TX: not indicated
- UT: 18
- VA: 30, 21 in mathematics; Masters Degree
- Range: 9 – 30; 5 – program-based

Typically an endorsement

Not indicated – program submission-based
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<tr>
<td>UT</td>
<td>0</td>
</tr>
<tr>
<td>VA</td>
<td>3</td>
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Content Knowledge

- Number and Operations – 10 of 11 states*
- Algebra – 10 of 11 states*
- Geometry and Measurement – 10 of 11 states*
- Statistics and Probability – 10 of 11 states*

- Discrete – AZ and MD [MMIL] – 2 of 11 states
- Calculus – MI and MD [MMIL] – 2 of 11 states
- Processes – 5 of 11 states
- History of Mathematics – 5 of 11 states

*South Dakota – challenging to decode
Pedagogical Knowledge

• Learners and Learning – 8 of 11 states
• Teaching – 11 of 11 states
• Curriculum and assessment – 11 of 11 states
Leadership Knowledge and Skills

- YES (8 of 12 states*)
  - AZ, CA (MIL), MD, NC, OH, SD, TX, VA

- NO (4 of 12 states*)
  - CA (MIC), GA, MI, UT
Mathematics Practicum

- YES
- NO (7 of 11 states)
- Other related requirements: portfolio; tests
An analysis:
Comparing state certification guidelines to course offerings
IHE Analysis - Content

• Typically courses in number, algebra, geometry and measurement and data analysis and probability.
  • from Mathematics Departments (3 of 6)
  • from Education Departments (3 of 6)

• Other (all from Education Departments)
  • Advanced algebra and trigonometry
  • Concepts and applications of calculus
  • Concepts of calculus for elementary education

n = 6 IHE’s
IHE Analysis - Pedagogy

• Typically courses related to the teaching of mathematics, including curriculum and assessment
  • all from Education Departments

• Limited attention to learning – in direct comments, course titles, course descriptions

n = 6 IHE’s
IHE Analysis - Leadership

- Relatively few courses with leadership in the course title or within the course description.
  - Leadership focus seems to be infused throughout the pedagogy courses in most cases.

n = 6 IHE’s
ONLY two institutions have a supervised mathematics teaching practicum as a program component.
Thoughts, Considerations

• Only 11 states with certification
  – All similar AND different

• Program and IHE considerations
  – Home of the program – Mathematics or Education Department?
  – Home of the mathematics courses?
  – Leadership?
  – Learning?
  – Practicum?

• Hard to assess – certification delivery by school districts, regional education support centers, etc.

• Accreditation – coming (NCATE/TEAC – CAEP)
Elementary Mathematics Specialists

Issues and Challenges
ems&tl Leadership Framework

- Learning Community
- Adult Learning
- Navigating Relationships
- Coaching
## Use of Time (%)

<table>
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<tr>
<th>District</th>
<th>Professional Development</th>
<th>Student Support/Intervention</th>
<th>Administrative &amp; Central Office Initiatives</th>
<th>Teacher Support</th>
<th>Parent/Community Outreach</th>
<th>Other</th>
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<td>5.5</td>
<td>31</td>
<td>25</td>
<td>3.7</td>
<td>3.5</td>
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N = 41
As a math specialist/leader/coach my greatest accomplishment(s) has/have been:

• Coaching, mentoring, & motivating teachers to plan, embrace, & implement best practice strategies to increase student motivation...(12)

• Changing teachers’ instructional practices to better develop conceptual understanding and engagement of students...(7)

• Helping improve understanding of math curriculum with teachers & administrators...(6)
As a math specialist/leader/coach my greatest **accomplishment(s)** has/have been:

- Improving content knowledge of teachers and giving them more effective tools to work with... (3)
- Implementing a process of goal setting & looking at student work to develop instruction and intervention...(3)
- Improving student understanding of content...(3)
- Promoting math, making it more visible, building a productive culture for math instruction with the school community (parents, staff, students)...(3)
As a math specialist/leader/coach my greatest frustration(s) has/have been:

• Dealing with teacher resistance to instructional change and best practice...(18)

• Political and structural decisions that affect teacher morale and impact the school community negatively...(5)

• Lack of administrative support and follow through...(4)
As a math specialist/leader/coach my greatest frustration(s) has/have been:

- Lack of support for math instruction [school culture, administration, staff, community]...(3)
- Building conceptual understanding and shaping attitudes of both parents and teachers towards math...(3)
Anecdotal Comments - Accomplishments

• Bringing mathematics intervention into a building that does not have Title I support.
• Helping other educators actually understand mathematics.
• Making math more visible in my school.
• Mentoring 1st year teachers and seeing their growth.
• Having classroom teachers put into practice strategies that I have presented during PD sessions.
• Implementing a process of goal setting, and looking at student work to drive instruction and intervention.
**Anecdotal Comments - Accomplishments**

- Being respected/trusted as a leader in the school community.
- I have seen a huge change in the use of best practices in mathematics in our school.
- Opening the eyes of classroom teachers about the research-based best practices they can use to improve instruction.
Anecdotal Comments - Frustrations

• School cultures that are resistant to change.

• I started as a math leader without current expertise in the conceptual understandings of mathematics.

• I would like to spend more of my time in classrooms with teachers – co-teaching and coaching.

• Content knowledge of teachers.

• Dealing with an administrator that does not have a vision or involvement with teacher professional development.
Anecdotal Comments - Frustrations

• The teachers at my school are not as reflective as I would hope them to be. Many of their conversations are about what is wrong with the students.

• Teachers who are resistant – only want me to cover or plan their lessons!

• I feel that I need more time in each of my buildings to have the impact I hope to make.

• Breaking teachers of the belief that my pulling kids will “fix” them.

• Changing teacher behavior for some “old dogs.”
QUESTIONS?
For more information visit
www.mathspecialists.org