

CIPS Support in Mathematics from the Maine Mathematics and Science Alliance (MMSA)

Contact Information

For information about MMSA's math staff development program, contact Laurie Mitchell (Lmitchell@mmas.org or 287-4594). She will refer you to a team member.

Background on MMSA

MMSA promotes excellence in K-16 STEM (science, technology, engineering, and math) education through exemplary professional development with teachers and other educational leaders. Our strength is translating research and educational standards into effective teaching and learning practice statewide and across the nation. As one of the major K-16 STEM education organizations in Maine, we provide resources, professional development, and policy support to educators. We are committed to ensuring that all students meet or exceed state and national standards.

Providing CIPS Support

The Maine Mathematics and Science Alliance provides assistance to K-12 schools across Maine seeking support in creating and/or sustaining a CIPS plan for improvement in mathematics. MMSA works closely with administrators and teachers to determine how best to meet the needs of teachers and students. We work with schools in supporting a range of students, including those who are English language learners and those who have special needs.

Our aim is to identify and build on the strengths of teachers and existing school programs. We will work with schools to create a CIPS plan and to customize a professional development program. We provide a range of professional development opportunities, as well as mentoring and strategies for parent involvement. Our goal is to develop a relationship with staff and create a sustainable and ongoing plan for school improvement in mathematics. We do this through in-person workshops, classroom visits, videoconferencing and on-line support.

Below is a description of components that could be integrated into a CIPS plan. Key to this work is creating a sustained professional development plan that leads to long-term changes in student achievement.

A. Content Focused Mentoring and Coaching (on site)

We use a collaborative approach designed to guide teams of teachers toward improved practice in mathematics education. The centerpiece of this work is content-focused mentoring which involves building pedagogical content knowledge around the eight *Standards for Mathematical Practice*. These standards, found in *the Common Core State Standards for Mathematics*, provide a clear vision

of best “practices, processes, and proficiencies”. Because our strength is team mentoring, we encourage inclusion of educational technicians and special education staff. An important goal of mentoring and coaching is the building of reflective practice, which helps educators internalize these practices. Through a blend of consulting, collaborating, and coaching, MMSA embeds mentoring in all of the PD described below, or it can be offered as a customized service.

B. Ten Key Professional Development Components

1. Book Study (on site or videoconferencing)

Possible book choice: Young Mathematicians at Work series by C.T. Fosnot and M. Dolk

- Constructing Number Sense, Addition and Subtraction (K-2)
- Constructing Multiplication and Division (3-5)
- Constructing Fractions, Decimals and Percents (6-8)
- Constructing Algebra (K-12)

A book study provides the opportunity for teachers in one school or across a district to engage in discussion around a series of issues faced in the mathematics classroom. This series is not curriculum specific and offers many tangible examples of teachers working with students in classroom settings. A book study can provide teachers from different teaching backgrounds a common place from which to begin a discussion about teaching and learning mathematics. It encourages collaboration and serves as a means to increase both pedagogical and content knowledge of mathematics.

2. Common Core State Standards (CCSS) (on site or in conference setting)

MMSA can help teachers and administrators begin to make sense of the CCSS and how they relate to your curriculum and teaching practice. Analysis of the eight *Mathematical Practices* described in the CCSS provides a useful springboard for discussion around teaching pedagogy and best practices. MMSA can help teachers understand content standards and work toward alignment of the CCSS with current curriculum materials.

3. Curriculum Topic Study (CTS) (on site or in conference setting)

MMSA can facilitate a Mathematics CTS with a group of teachers by grade level or across grade spans. CTS helps teachers build a bridge between state and national standards, research on students’ ideas in mathematics, and opportunities for students to learn mathematics through improved teacher practice. The process has been called “the missing link” for implementation of standards-based and research-informed education.

4. Differentiation and Response to Intervention (RtI) (on site or in conference setting)

MMSA can provide direction for effective interventions that help students experiencing challenges in mathematics. Many literacy strategies can be adapted to address content vocabulary, oral and

written communication in mathematics, and the use of concrete experiences to build background knowledge and understanding.

Buchanan, K., & Helman, M. (1997, December). Reforming mathematics instruction for ESL literacy students. CAL Digest No. EDO-FL-98-03. Washington, DC: Center for Applied Linguistics.

5. Early Mathematical Thinking (EMT) (on site or videoconferencing)

MMSA will provide assessment materials and an introduction to EMT as a formative assessment screening tool for K-5 numeracy and measurement skills. In addition, we offer five half-day professional development workshops designed to increase teachers' pedagogical and content knowledge of Counting/Place Value, Addition/Subtraction, Multiplication/Division, Fractions and Measurement. The EMT assessment provides one means by which teachers can identify where student mathematical understanding is breaking down, thereby allowing them a point from which to support struggling students.

Early Numeracy Research Final Report Summary

<http://www.education.vic.gov.au/studentlearning/teachingresources/maths/enrp/default.htm>

Thomas, G., Tagg, A., & Ward, J. (2003) *An Evaluation of the Early Numeracy Project 2002*. Wellington, NZ: Learning Media.

6. Examining Student Work (on site)

MMSA can provide professional development for teachers on how to use student work as a form of formative assessment used to guide instruction. A variety of models are used to give teachers practice in describing, analyzing and interpreting student work. With a clear sense of what their students know, teachers are better able to guide them toward logical next steps in their learning.

Loucks-Horsley, (2003), *Designing Professional Development for Teachers of Science and Mathematics*, Corwin Press.

7. Lesson Study (on site)

Lesson study is an ongoing collaborative approach to professional development widely used in Japan. MMSA can facilitate the process of teachers working together to:

- Formulate goals for student learning and long-term development;
- Collaboratively plan a "research lesson" designed to bring to life these goals;
- Conduct the lesson in a classroom, with one team member teaching and others observing and gathering evidence on student learning and development;
- Reflect on and discuss the evidence gathered during the lesson, using it to improve the lesson, the unit, and instruction more generally.

Garet, Porter, Desimone, Birman, Suk Yoon. "What Makes Professional Development Effective? Results from a National Sample of Teachers." *American Educational Research Journal*, Vol. 38, No. 4 (Winter, 2001), pp. 915-945.

Research compilation on lesson study: <http://www.tc.edu/lessonstudy/research.html>.

8. NECAP Analysis (on site)

MMSA can help teachers and administrators analyze NECAP results and provide suggestions for possible ways to integrate NECAP preparation into the curriculum. Topics of discussion might include:

- Looking at trends in the data to determine areas of general weaknesses.
- Determining possible reasons for areas of weaknesses (i.e. curriculum sequence/content; unfamiliar format; individual weaknesses in mathematical understanding).
- Effective ways to integrate NECAP practice into classroom content.

9. Professional Learning Communities (PLC) (on site and videoconferencing)

MMSA supports teachers and administrators in implementing a PLC. Helping educators engage in meaningful dialogue around the teaching and learning of mathematics encourages collaboration as well as insights that directly affect students' learning. PLC meetings might include mini-workshops on content or pedagogy topics requested by the group, sharing of assessment strategies, analysis of student work or addressing specific classroom challenges. Research on professional learning communities shows that when implemented over a sustained period of time, and when shaped by teachers to meet their needs, PLCs lead to growth in teachers' effectiveness in the classroom.

Fulton, Doerr, & Britton (2010), "STEM Teachers in Professional Learning Communities: A Knowledge Synthesis" National Commission on Teaching and America's Future, WestEd.

Carlson, Stemmer, Moore, Teuscher, and Joyner, 2011), "Key Variables for Establishing and Sustaining Highly Effective Professional Learning Communities." Paper presented at MSP Learning Network Conference, January 22-25, Washington DC.

10. Support for Educational Technicians (on site)

MMSA can help develop the mathematical content and pedagogical knowledge of the staff often asked to work with the highest risk students. Professional development may include:

- Previewing the content in upcoming units of instruction.
- Developing an understanding of common student misconceptions with respect to specific content.
- Developing an understanding of specific manipulatives and mathematical tools and how they can be used to help students develop conceptual understanding of mathematical ideas.
- Learning to ask questions that uncover student understanding and guide students toward a correct answer.

C. Parental Involvement (on site)

MMSA can work directly with parents as well as working with teachers to plan parent communication strategies and Family Math Nights.

Parents' Night

MMSA engages parents in hands-on activities, open discussion, or online workshops around how children construct an understanding of mathematics. Topics include:

- Consideration of how math teaching has changed over time.
- Ways in which teachers strike a balance between teaching for procedural and conceptual understanding.
- Methods and materials used in teaching for understanding.
- The role of discussion in a mathematics classroom.
- Ways in which parents can support their children's mathematics development at home.

Family Math Night

MMSA can work with teachers to plan Family Math nights that will engage parents and children in doing math together. Parents will have the opportunity to try some of the activities their children do in class and to learn how manipulatives, games, discussions and partner work all help to build a child's deep understanding of mathematics.

Research on parent involvement shows that it is essential to work collaboratively with families and to understand the backgrounds and "funds of knowledge" that parents bring to the table.

Civil, Bernier, & Quintos (2003) "Parental Involvement in Mathematics: A Focus on Parents' Views." Paper presented at the American Education Research Association, Chicago, Illinois.

Planning and Costs

MMSA will meet with you at no charge to discuss your needs. Collaboratively, we will develop a CIPS plan that makes optimal use of your own staff resources as well as MMSA consultants (see attached bios). This plan will likely involve a combination of on site work, videoconferencing, and online forums. When feasible, we encourage neighboring CIPS schools to work together to sponsor staff development opportunities with MMSA consultants to make the work more cost effective.

MMSA's rates for on-site professional development are as follows:

- Full day (6 – 7 hours of contact time) \$1,000
- Half day (3 – 3.5 hours of contact time) \$600
- Mileage and expenses are additional.

We encourage schools to take advantage of virtual conferencing and web-based formats when planning staff development with MMSA. We will work with you to set up the Tandberg systems that are available in all Maine districts. We offer video conferencing and web-based professional development at \$150 per hour of contact time.

Finally, because MMSA is committed to sustained professional development, our consulting services are discounted for schools that work with us over the course of an academic year.

MMSA Math Consultants

MMSA's math team is composed of:

- **Jan Mokros** (Team leader and Specialist in parent involvement in math)
- **Meghan Southworth** (6-12 Mathematics Specialist)
- **Nancy Chesley** (K-5 Mathematics, Science & Literacy Specialist)
- **Amy Yankee** (K-5 Mathematics Specialist)

In addition, MMSA employs consultants from the University of Maine system who have taught 6-12th grade mathematics education methods courses.

Math Team Background Information



Jan Mokros joined the Maine Mathematics and Science Alliance (MMSA) as its Executive Director in 2008. Dr. Mokros is a developmental psychologist and mathematics educator, who received her Ph.D. at the Institute of Child Development at the University of Minnesota. Her current research involves examining the impact of real-time electrical monitoring on students' understanding of energy and graphing. She also co-directs the Reach Center, an initiative to promote math and science engagement and achievement among promising K-12 students throughout Maine.

Prior to coming to MMSA, Dr. Mokros was a long time staff member at TERC, where she was an author of the curriculum *Investigations in Number, Data, and Space* and directed the evaluation and research efforts on this project. She also started the teacher professional development program that accompanies *Investigations*, a program that has reached over 10,000 teachers since its inception. More recently, Dr. Mokros has led projects to bring math to science centers, zoos, aquariums, and after-school programs. She has developed activities, games, and a book, *Math and Your Kids: Beyond Facts and Flashcards* (Heinemann) to help parents incorporate engaging math into their everyday family lives. Dr. Mokros also has been involved in higher education as a professor and administrator. She launched San Francisco State University's Center for Science and Mathematics Education, which focuses on recruiting and retaining K-12 science and math teachers.



Meghan Southworth received her Bachelor's of Science in Secondary Mathematics Education with highest distinction from the University of Maine at Orono in 1995. Prior to coming to work for MMSA, Meghan was a middle school mathematics teacher in MSAD #34 (Belfast) for 12 years and she holds a current Professional Certificate to teach grades 7-12 Mathematics in Maine. During her tenure, she was involved in numerous leadership and school improvement initiatives. She was a teacher leader in the Broadening Educational Access to Mathematics in Maine (BEAMM) Project, a

mentor in the Northern New England Co-Mentoring Network (NNECN), and a Connected Mathematics Project (CMP) curriculum trainer. In 2005, Meghan won the Presidential Award for Excellence in Science and Mathematics Teaching. In 2007, she completed the Davis Fellowship Research Internship for Teachers at The Jackson Laboratory in Bar Harbor, Maine.

Meghan works in the areas of leadership, school-based programs, materials development, project management, and mathematics professional development. She has extensive experience and expertise in the implementation of standards-based mathematics programs, particularly CMP at the middle level. Since 2007, she has worked with numerous CIPS schools across Maine, individualizing professional development plans to meet the unique needs of their mathematics teachers. The most successful plans have been sustained, multi-year interventions incorporating such elements as lesson study, coaching and mentoring, model and team-taught lessons, book studies, and ongoing PLC work around formative assessment and collaborative examination of student work. Meghan focuses on deeper understanding of and alignment with the *Common Core State Standards for Mathematics* in all of the teacher activities she facilitates – particularly the eight Standards for Mathematical Practice.



Nancy Chesley is a K-5 Mathematics, Science, and Literacy Specialist at the Maine Mathematics and Science Alliance. With 31 years of experience in elementary education, she works in the areas of mathematics and science professional development and literacy integration. Nancy was an elementary teacher for 26 years in MSAD #51. She received several grants, including *Using Wisconsin Fast Plants to Teach Graphing*. Her publications include Project SEED's *Using Paper Airplanes to Teach Mathematics* and *Using Pine Trees to Teach Measurement*. Her mathematics-based curriculum for the University of New Hampshire's Forest Watch earned her the Gary Lauten Award in 2006. Nancy has presented her work at state, regional, and national conventions.

As co-director of the Early Mathematical Thinking Enhancement Project, she trained over 100 educators to use the K-4 Early Mathematical Thinking screening tools for formative assessment. She analyzed student work for differentiation and RTI and developed presentations for mathematical content and pedagogy. She conducted book studies, facilitated alignment work with the Common Core State Standards for Mathematics, and presented research-based instructional strategies, including integration of mathematics, science, and literacy.

Nancy participated in the Maine Governor's Academy for Science Education Leadership and Maine's NASA Teacher Leader Program. She received the Christa McAuliffe Fellowship in 2000, the PAEMST (Presidential Award for Excellence in Elementary Mathematics and Science Teaching) in 2001, and the Milken Foundation National Distinguished Educator Award in 2002. She was president of the Maine Science Teachers' Association. Nancy served on the National Assessment of Educational Progress (NAEP) committee developing the framework for assessment items. She graduated from the University of Southern Maine with a degree in Elementary Education and an M.Ed in Language Literacy with additional graduate credits in mathematics. Nancy remains a certified K-8 teacher and literacy specialist.



Amy Yankee is a K-5 Mathematics Specialist with 25 years of experience in elementary education. She has worked as a classroom teacher, teacher trainer, and mathematics learning specialist. She taught in Worcester, MA (Gr.4), Cambridge, MA (PK; Gr.1; teacher trainer), McLean, VA (Gr.3; teacher trainer) and Tokyo, Japan (Gr.3). Her work as a K-8 learning specialist and tutor (Marblehead, MA and Freeport, ME) includes working both with children needing enrichment in mathematics as well as support. Amy graduated from Brown University with a BA in psychology and from Lesley University with an M.Ed in Elementary Education.

Amy's work at MMSA is primarily in the area of mathematics professional development. She is the co-director of the Early Mathematical Thinking (EMT) Enhancement Project, introducing teachers to the EMT screening tool and supporting their understanding of formative assessment and mathematics teaching through a series of workshops on content and pedagogy. Amy works closely with administrators and teachers in schools seeking to boost student achievement through CIPS plans, implement new curricula, prepare students more effectively for state testing, or align their curriculum and practice to the Common Core State Standards. Amy uses a variety of professional development methods to help focus teachers' attention on mathematics content and pedagogy, student work, assessment, differentiation, and classroom discussion. She has created test preparation materials that correlate NECAP released items to curriculum content and suggests ways to use them to reinforce both math concepts and test taking strategies. In addition to working with teachers, Amy also engages parents in discussions and problem solving experiences designed to help them understand changes in mathematics education and effective ways to support their children's learning.