



eMSS

An Online, Content-Focused Mentoring Program for Secondary Math and Science Teachers

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Overview of the eMSS Program

eMSS, Electronic Mentoring for Student Success, is a nationwide teacher mentoring program in which beginning science and math teachers are matched with a mentor who has experience teaching their same science or math subject and grade level.

Through eMSS, new and veteran teachers collaborate in an interactive and facilitated professional learning community to exchange information, ideas, and experiences in order to advance high-quality science and math instruction for all students. eMSS began in 2002, when the National Science Foundation (NSF) awarded a five-year grant to the National Science Teachers Association (NSTA), the New Teacher Center (NTC) at the University of California at Santa Cruz, and Montana State University's Science/Math Resource Center (MSU-SMRC) to develop the innovative eMSS project.

The New Teacher Center opened in 1998 with a mission to transform the lives of new teachers and administrators through intensive, mentor-based induction, reversing long-standing neglect of new teacher development. This mission was established based on the need to ensure that every new teacher in the country has the highest level of support. We have since become the nation's foremost organization working in the area of new teacher and principal support. We work in 40 states and internationally with state departments of education, school districts, schools, institutes of higher education, and educational non-profits to develop and launch teacher induction programs in K-12 schools. We want to insure that the nation's poor, minority, and English learner students, those most often taught by inexperienced teachers, receive the education and college preparation they need and deserve.

The Crisis in Math and Science Education

Numerous reports have outlined the crisis facing math and science education in the U.S. The National Academy of Sciences in their 2005 report, "Rising Above the Gathering Storm," point out that the state of science education in our country is deteriorating compared to the rest of the world and that this has the potential to imperil our economic future. Increasing student achievement is at the forefront of educational reform, and research has shown that teacher quality has a significant impact on student performance (Goe & Stickler, 2008).

While recognizing the importance of teacher quality, school districts are faced with a shortage of qualified math and science teachers. According to Richard Ingersoll (2007), over half of all teachers leave the classroom within five years and the demand for new math and science teachers exceeds the supply. Ingersoll's thorough analysis of the data indicates that the solution to the teacher shortage must include efforts to both recruit and retain teachers. Ingersoll also makes the case that retention can only be made possible by improving the conditions of the job including increased support for teachers¹.

In an effort to better support and retain teachers, districts and educational agencies are implementing induction programs that provide professional development for beginning teachers. Induction programs are designed to increase teacher retention by providing support to teachers during their first few years of teaching. A key component of many induction programs is mentoring: matching a beginning teacher with a more experienced teacher for support. Mentoring programs range from an informal connection with an experienced teacher, often referred to as the "buddy system," to a full-time mentor engaged in formative assessment processes with the beginning teacher. Successful mentoring and induction programs not only increase teacher retention, but also improve teachers' competence and effectiveness (Weiss & Weiss, 1999).

The Alliance for Excellent Education (2004) states that secondary teachers have unique induction needs and content-specific mentoring is recommended as a way to provide support. Even the most robust mentoring program may be challenged to provide subject-specific mentoring for secondary math and science teachers due in part to the lack of qualified mentors available in specific subject areas. Additionally, new teachers don't have equal access to high-quality induction and mentoring. For example, Susan Moore Johnson (2004) found that 61 percent of teachers in high-income schools were matched with mentors at the same grade level as compared with only 28 percent in low-income schools.

Effective Professional Development

Professional development that focuses on how students learn, pedagogical content knowledge, instructional practice, and disciplinary content knowledge can lead to improved student achievement (American Educational Research Association, 2005; Borasi and Fonzi, 2002; Desimone, L., Porter, A., Garet, M., Yoon, K., and Birman, B., 2002; Kennedy, 1998; Borko, 2004). Kedzior and Fifield (2004) draw these same conclusions from their synthesis of the literature and add that teachers begin to actively engage their students in developing ideas once they have a deeper understanding of the content. Borko (2004) makes the argument that when teachers have a powerful understanding of the content, consisting of subject-matter knowledge for teaching, understanding of student thinking, and instructional practices, it enables them to foster students' conceptual understandings.

¹Other reports that have keyed in on the shortage of math and science teachers include:

- Before It's Too Late, 2000, by John Glenn's Commission on Mathematics and Science Teaching for the 21st Century
- A Commitment To America's Future: Responding To The Crisis In Mathematics & Science Education, 2005, Business Higher Education Forum
- Core Problems: Out of Field Teaching Persists in Key Academic Courses and High-Poverty Schools, 2008, The Education Trust

The American Educational Research Association, in a 2005 research brief, states:

What matters most is what teachers learn. Professional development should improve teachers' knowledge of the subject matter that they are teaching, and it should enhance their understanding of student thinking in that subject matter. Aligning substantive training with the curriculum and teachers' actual work experiences also is vital.

The time teachers spend in professional development makes a difference as well, but only when the activities focus on high quality subject-matter content. Extended opportunities to better understand student learning, curriculum materials and instruction, and subject matter content can boost the performance of both teachers and students.

The AERA outlines the need for quality professional development and asserts it is one of the most important investments of time and money that district leaders can make.

Online Professional Development: Learning at a Distance

Online professional development is being offered more frequently and according to the Association for Supervision and Curriculum Development, online courses are the fastest growing type of teacher training (Kleinman, 2004).

In 2006, the Southern Regional Education Board (SREB) revised the National Staff Development Council standards for professional development and adapted them for *online professional development*. The SREB identified six necessary components of online professional development. They include:



In addition to the need to address key components in an online professional development program, it is also important to attend to the research in the area of online instructional design. Zheng, L. & Smaldino, S. (2003) have identified in the research literature, five elements of instructional design that should be a part of all online professional development. They include:

- *Learner considerations*: The unique needs of each participant including attitude or interests, prior skills, knowledge, experience, and learning styles and interaction
- *Content organization*: Consideration of the content and sequence of information as well as identifying goals and objectives
- *Instructional strategies*: Selection of instructional strategies that enable all learners to participate in active learning
- *Learning Environment*: Examination of the technology used and how the tools, resources, and pedagogical features are integrated to advance comprehension
- *Evaluation*: Assessment of the course from the perspective of amount learned, integration of new skills into practice, and student satisfaction with the experience

Incorporating these elements in an online professional development program leads toward a more effective course.

Best Practices in Effective Mentoring

Another consideration in selecting an online mentoring program is how the program utilizes best practices in mentoring. Numerous studies point to the fact that mentoring is a key component of new teacher induction. (Stansbury & Zimmerman, 2000; Villani, 2002; Weiss & Weiss, 1999). Online content-focused mentoring is a cost-effective way to meet the needs of both the district and beginning teachers. By providing a content-focused online mentor, districts are building capacity within their own teaching staff to improve student achievement.

The research literature identifies both structural (design) and experiential recommendations for mentoring new teachers. McAleer (2008) has clearly outlined the recommendations from a review of the literature.

Structural (Design Features) Recommendations for Mentoring	Experiential Recommendations for Mentoring
<ul style="list-style-type: none"> • Content focused • Intensive and sustained • Trained mentors • Resources • Structured curriculum • Developmentally appropriate 	<ul style="list-style-type: none"> • Active learning • Collaboration • Peer networks and support • Opportunities for reflection

e-Mentoring for Student Success (eMSS): An Online Program for Beginning Math and Science Teachers

Online professional development that is inclusive of online content –focused mentoring is an optimal solution. While there are many different online professional development options available today, not all programs are the same. It is prudent to look to the recommendations and criteria outlined in the professional development and distance learning research, and the research on mentoring to help guide the selection of an online professional development program that best meets the needs of beginning science and math teachers.

The eMSS program for beginning math and science teachers was developed based on both the research and practitioner literature on professional development, online learning, and mentoring. eMSS is designed with beginning math and science teachers in mind based on the New Teacher Center's expertise in mentor development and beginning teacher needs. eMSS offers a variety of science- and math-curriculum options for beginning teachers that are designed to support teachers' immediate short-term needs, inquiry into teaching practice, and understanding of content. eMSS is a year-long program that emphasizes the key structural features of an effective mentoring program. This includes:

- **Structured Curriculum that is Developmentally Appropriate for New Teachers**

To meet new teacher needs, eMSS utilizes two curriculum tools called Dilemmas and Inquiries.

Dilemmas are short, open-ended scenarios that poses a question about a specific teaching issue. Mentees and mentors participate in online facilitated discussions offering possible solutions to a Dilemma. The nature and structure of a Dilemma invites a wide range of ideas, offers opportunities to exchange contrasting viewpoints and motivates teachers to respond. Dilemmas offer opportunities for mentees to have a quick, easy, interesting, and useful way to participate in eMSS.

Inquiries are conversation guides designed to help mentees—with the help of mentors—to deepen their teaching practice and boost their effectiveness with students. The Inquiries, which form the core of the eMSS program, are online conversations based on classroom practices. Each Inquiry is flexible and adaptable for a mentee's own special teaching situation. A group of mentees and mentors, guided by a facilitator, work together on an Inquiry over a period of eight weeks. There are three sessions of Inquiries offered during the year: fall, winter, and spring. Each session offers a choice of topics so mentees can select an area relevant to their teaching. Inquiries follow a Plan, Practice, and Reflect cycle. This cycle allows mentees to dig deep into a topic in a manner that can be applied to other aspects of their teaching. The Inquiries incorporate all of McAleer's experiential recommendations for a mentoring program.

- **Content Focus**

One unique feature of the eMSS program is the linkage of content through experienced content facilitators and content specialists. eMSS differentiates itself from other online programs by providing access to content specialists—practicing scientists from universities in the areas of physics, life science, chemistry, earth science as well as mathematics educators. Content specialists engage weekly by posting questions, providing information on content-specific topics, responding to questions about their specific content, clarifying misconceptions, and posting probing questions about the content. The beginning teachers have a unique opportunity to engage with university scientists and mathematicians on a daily basis!

In addition, content-rich discussion forums offer opportunities to engage in dialogue and to ask questions around specific content areas. A special forum, the Topic of the Month, is a discussion based on research and best practices in math or science. These facilitated and structured discussions offer beginning teachers an opportunity to examine relevant topics in their teaching practice and explore pedagogical content strategies within each content area.

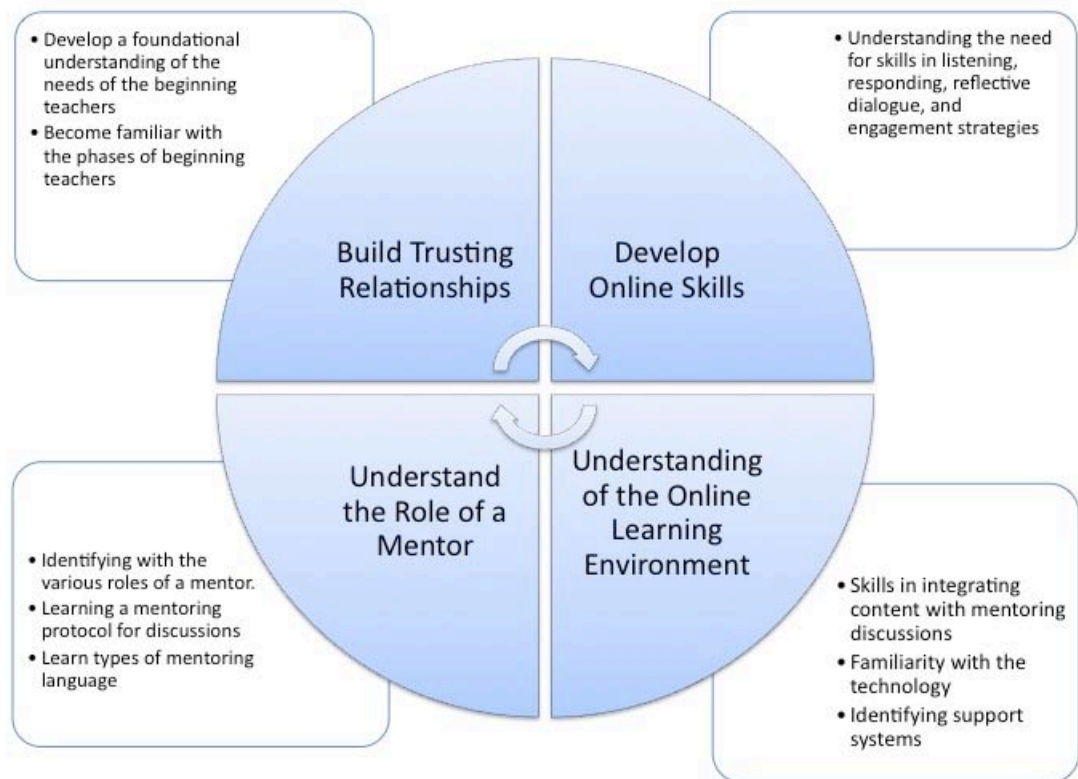
• High-Quality eMSS-Trained Mentors Support Mentees

Equally important to the strength of eMSS is the quality of the people involved in the program. An online mentoring program requires a multitude of educators to support the beginning teachers. While a small staff manages the program, it is the mentors and facilitators whose day-to-day interactions with the beginning teachers comprise the heart of the eMSS program.

The selection process to become an online mentor or facilitator is rigorous. eMSS mentors must be experienced math or science teachers who have taught five or more years. On average, eMSS mentors have taught 12 years. . Mentor selection is a multiphase process beginning with an application. The mentors selected for eMSS have an impressive array of credentials, including:

- Involvement in their own district's mentoring and induction programs
- Nationally Board Certified Teachers
- Department chairs
- State and local leadership roles in a variety of professional organizations
- Several State Teacher's of the Year

In order for a mentor to be accepted into the eMSS program, they must successfully complete a three-week, online summer institute. During the institute, potential mentors are engaged in intensive professional development with the goals of building trusting relationships, strengthening online skills, and understanding the role of a mentor and the online learning environment.



The summer institute allows potential mentors to learn in the online environment, ensuring that online mentoring is a “good fit” for the mentor. The summer institutes are highly facilitated and prospective mentors are required to engage in dialogue and contribute to the discussions.

At the end of the three-week summer institute, mentors are scored on participation and completion of all components of the institute. Facilitators use a discussion rubric to evaluate the mentors’ skills online. Mentors must attain a specific score on the discussion rubric to be successful. Mentors who successfully complete the institute are placed into a pool of available mentors to be matched with beginning teachers in the fall. Mentors who do not successfully complete the institute are released from the program.

At the launch of the eMSS website in August, successfully trained mentors are expected to login to the site and begin preparing for the mentees they will be assigned. Ongoing professional development throughout the year is part of the eMSS experience for mentors to ensure the beginning teachers are supported effectively. Mentors have a series of expectations they must uphold for the duration of the year. Program staff monitors the mentors’ activity and engagement to ensure a high degree of support for the beginning teachers.

• **High-Quality Facilitation to Ensure Collaboration, Learning, and Reflection**

eMSS facilitators are critical to maintaining an effective online mentoring program. In her dissertation on the facilitation of eMSS (2007), Taylor illustrated that an established, structured facilitator training program was a necessary component of an effective online community. Her research indicated that areas that were highly facilitated showed improvement. These included:

- *The content of the dialogue:* The content was accurate, misconceptions were addressed, and discussions were relevant to a new teacher
- *On task/moving forward:* Conversations were on task and moving forward; clear and specific questions were addressed, sense making and summarizing conversations, and conversations are taken to a higher level
- *Community building:* A positive culture of trust, collegial relationships, and encouragement was created
- *Reflections and reflective practice:* Examining one’s immediate skills and competencies and/or a descriptive analysis of one’s performance were addressed.

Like mentors, facilitators go through a rigorous selection and training process. Current facilitators and program staff members identify those mentors who have demonstrated advanced skills in online dialogue, are beginning to ask probing questions of others, have an innate sense of keeping the discussion focused, and have effective writing skills. Potential facilitators are tapped from the mentor pool and are asked to apply. The program staff screens the applications and those selected are asked to undergo an intensive, three-week institute in May.

The facilitator institute is based on research in the area of online learning. The work of Collison, Elbaum, Haavind, and Tinker, (2000) and Salmon (2000) provide the conceptual framework for the curriculum. Facilitators use the work of Salmon to guide their efforts in community building and questioning. The work of Collison et al. is used for discussion strategies and skills.

The facilitator institute is led by experienced facilitators and overseen by the program staff. Those who successfully complete the institute are then asked to put those skills into practice in the summer institutes. While leading the summer institutes they are simultaneously being coached and mentored by program staff and experienced facilitators. This “on-the-job” training creates a pool of highly skilled and motivated facilitators.

There are nine different facilitation roles in eMSS, each with its own specific responsibilities. Facilitators also participate in ongoing professional development throughout the year in order to continually refine their skills. A discussion forum specifically for the facilitators is also available to discuss strategies, challenges, and successes of their facilitation. Designated program staff members oversee the facilitators' work and continually provide coaching tips and suggestions to improve the process.

• Access to Science and Math Resources

Numerous online websites offer a variety of resources for teachers. Lesson plans, web tools, references, blogs, handouts, etc., are common types of resources available. For a beginning teacher, the vast array of options can be overwhelming. In addition, many sites offer no vetting of the materials that are posted and no mechanism is in place to ensure their quality and accuracy. There is also no support for beginning teachers in how to access the resources for their specific teaching context.

eMSS has a vast array of resources that are vetted by program staff, the National Science Teachers Association, and the content specialists in the program. A comprehensive resource area is organized into categories for ease of use. Program participants also have opportunities to share personal resources. Content specialists and facilitators view the personal resources that are posted to ensure the quality of the materials.

In addition, mentors often share personal resources with their mentees. Mentors are encouraged and trained to engage in dialogue about shared resources. Rather than "pushing out" resources to mentees, mentors support mentees in adapting the resources to their own context.

Beginning Teachers Experiences in eMSS

The research literature is very clear on the type of experiences beginning teachers need in order to accelerate their growth and practice. eMSS, through its design, program implementation, and selection of mentors and facilitators builds a foundation of experiences for the beginning teacher that is guided by this research. The online community offers multiple venues for collaboration for the beginning teacher: with a mentor, with a small, self-selected group discussing a dilemma of practice, with content-focused small groups, and with content specialists. The different venues for collaboration allow many opportunities for networking and support. This sustained and intensive online community of practice provides the beginning math and science teacher with the necessary experiences to improve teacher practice and student achievement.

Technology Considerations

The underlying component of an online mentoring program is the technology that supports the interaction. The technology platform must be easy to use, be customized to meet the unique needs of an online professional learning community, and provide a variety of tools.

The eMSS program utilizes the New Teacher Center Learning Environment, powered by the Sakai platform. To support access for all users, this platform is web-based, compatible with different operating systems and varying Internet connectivity. The navigation and tools are user friendly. The platform includes a log in and password feature to ensure a safe and secure access. To support new users, an orientation to the online environment is provided with access to multimedia tutorials, help documents, and technical support staff for troubleshooting. Dedicated technical support staff are available to respond to both novice and expert users to help with requests in a manner that is personal and attentive to the users' needs. The technical support provided for an online mentoring program must be timely and responsive. User satisfaction diminishes greatly when there are technical issues that are not resolved quickly and efficiently. The technical support also includes platform maintenance, updating, and enhancements.

Program Management

A final consideration when selecting an online mentoring program to meet the needs of the beginning teacher is the administration and management requirements. The program should be a turnkey operation that requires limited time by district staff to implement. eMSS is a complete teacher mentoring program inclusive of training, stipends, and program administration.

eMSS provides the following program management services:

- A complete online Collaborative Learning Environment (NTC-Learning Environment) program with facilitation
- An informational website including online participant applications and a participant database
- High-quality, fully trained online mentors
- Stipends for all mentors and facilitators
- Mentee matching with a content-focused mentor
- Online mentee orientation
- An option for mentees to receive academic credit for their participation
- Teacher professional development certificates for program participants
- Program monitoring and reporting
- Ongoing program evaluation
- Technical support

One of the services eMSS staff provide is program monitoring and reporting. Program staff administer pre- and post-surveys to the entire participant pool, which can be disaggregated by program. In addition, data reporting such as the amount of activity and posting is also available for each program.

As an eMSS Client, the involvement can be customized to the Affiliates needs. General responsibilities include:

- Maintain regular communication with eMSS program team through a designated Affiliate Coordinator
- Recruit and select new science and math teachers (mentees).
- Acceptance of mentee applications (optional)
- Strive to integrate eMSS with state and local induction programs
- Facilitate an online Affiliate discussion area for participants from the region (optional)

The New Teacher Center

eMSS (Electronic Mentoring for Student Success)

eMSS addresses the challenges of retaining beginning math and science teachers and accelerating their growth by leveraging an online technology network to extend flexible, personalized content-focused support to beginning teachers nationwide. But it is not just about content-specific support: it is about access for teachers to a vast array of math and science resources; it is about access to a nationwide network of math and science teachers; it is about being matched with a mentor who has experience teaching the same subject and grade level; and it is about a guided curriculum that engages beginning teachers in planning, applying practice to their classroom, and reflecting with their mentor and other beginning teachers who are working on similar goals.

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