

**American Mathematical Society
Committee on Education Meeting
October 18-20, 2012
Washington DC**

Summary

This year's Committee on Education (COE) meeting began with a dinner on Thursday evening where the committee discussed issues and programs of importance to the mathematics community. The meeting itself consisted of presentations and discussions over a day and a half. Attendees included a large number of chairs of departments of mathematics from across the country. Tara Holm, Chair of COE, introduced the speakers and facilitated the meeting:

CBMS MET II Report

Hung-Hsi Wu (University of California, Berkeley) gave a presentation on the Mathematical Education of Teachers II report. The original MET report, published in 2001, was designed as a resource for those involved in the education of mathematics teachers and it had substantial influence on teacher preparation. This follow up report expands on the first utilizing ten years of experience in giving recommendations for the professional development of teachers and it aligns recommendations with the new Common Core State Standards in math.

The MET II report gives recommendations for both teachers and mathematics departments. It notes that prospective teachers need mathematics courses that will develop their understanding of the mathematics they will teach; teachers need opportunities for continued education and professional growth throughout their careers; there are a minimum number of credit hours teachers need in certain math courses to give them sufficient content knowledge for teaching their subjects; and that math teachers should develop mathematical thinking abilities through their coursework and professional development experiences. For math departments, the report suggests that mathematics departments devote time and attention to the importance of teacher training and that they should recognize the need to improve mathematical teaching at all levels.

The MET II report is due out in print in early November 2012 and will also be available online.

The 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences

Martha Siegel (Towson University) talked about the status of the 2015 CUPM Curriculum Guide to majors in the Mathematical Sciences. The Committee on the Undergraduate Program in Mathematics (CUPM) of the Mathematical Association of America (MAA) most recently issued this curriculum guide in 2004. Siegel discussed the upcoming 2015 edition and its features, which includes emphasis on the mathematics major and its various tracks; exploration of interdisciplinary programs with mathematics; attention to cognitive goals and pedagogy; specific attention to placement and assessment; engagement with other disciplines; and acknowledgement of the Common Core Curriculum.

The National Science Foundation has provided a grant to prepare the guide and Siegel discussed its forward focus and its challenges, the next steps in the process and the timetable for completion. She expects a draft of the report to be ready in spring 2014 and the final to be presented to MAA's Board of Governors in January 2015.

So You Think You Can Major in Math: Broadening the View of the Math Major at Bryn Mawr College

Rhonda Hughes (Bryn Mawr College) provided background and statistical information related to the number of math majors at Bryn Mawr College. She described her philosophy towards the teaching of mathematics and gave examples of how Bryn Mawr encourages all students to continue in mathematics. She also discussed the importance of teaching ability and how it affects student learning outcomes when even students of average ability are engaged.

Writing in Mathematics: Opportunities for Mutual Growth

Patrick Bahls (University of North Carolina, Asheville) began his presentation by discussing how mathematics and math education involve writing in many ways, from a scholars' production of research articles to a students' writing as a means of discovery, creativity and analysis. Bahls advocated for using writing exercises to teach students to have a better understanding of what is behind technical definitions and to develop precision, clarity and succinctness in their writing.

Bahls talked about incorporating writing at all levels of the curriculum to enable students to engage the math content of their classes in a more meaningful way. He is not advocating writing as a side project, but rather having mathematicians teach about writing in mathematics as a way to develop students' mathematical communication skills and help them better understand the subject.

Reforming Calculus through Oral Reviews

Mary Nelson (George Mason University) discussed the importance of incorporating oral reviews in the teaching of mathematics in order to improve student learning outcomes. She presented statistical information on how students participating in orals earned better grades and how their grades were directly related to the number of orals they took. She explained that by discussing mathematics verbally, students gain a better understanding of the subject, develop better ways to study and work harder because they feel their instructors are invested in their success.

Nelson also presented some common themes in students' reactions to oral reviews including helping them to understand hard concepts, clarifying things that were unclear and giving them confidence before a written test. She identified which universities are currently using orals and in which subjects.

Developing Tools for Assessment: The Good Questions Project and the Mathematics Applications Inventory

Maria Terrell (Cornell University) gave a presentation on the Good Questions Project at Cornell University, which seeks to improve calculus instruction through the development of questions that increase the understanding of key concepts (much like the Mazur ConcepTests in physics) and create a more active learning environment. She shared some examples of the different types of questions used and talked about assessment questions and their impact on final exam scores.

Specifically, students are asked a question in class and then choose what they think is the correct answer by using a polling system. Students then discuss their ideas with classmates and are polled again. By creating this cycle of discussion, students can improve their understanding of key concepts that teachers can then measure.

The Mathematics Application Inventory (MAI) is another assessment tool that Terrell discussed. This project is a collaborative effort in mathematics and engineering at Cornell whose goal is to assess the effects of integrating engineering applications into core mathematics courses for engineers. Terrell shared sample questions and the MAI's findings related to differences by gender and cognitive domain.

Undergraduate Education Programming at the NSF

Myles Boylan and **Ron Buckmire** (National Science Foundation, EHR-DUE) jointly presented information on some of the many programs in the Division of Undergraduate Education (DUE) at the National Science Foundation (NSF) whose overarching goal is to improve the quality of teaching and the learning environment. Specifically, they talked about the programs Transforming Undergraduate Education in STEM (TUES); Widening Implementation and Demonstration of Evidence-based Reforms (WIDER); Science, Technology, Engineering, and Mathematics Talent Expansion Program Centers (STEP); Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM); and Math and Science Partnership (MSP).

TUES is the broadest program in DUE and is interested in innovative developments in STEM education. Boylan explained the four project types, the award sizes and their deadlines. He also talked about a new program called WIDER whose goal is to promote the widespread adoption of evidence-based teaching. The solicitation for this program is currently being developed.

Buckmire spoke about STEP, its goals, support levels and some features of good proposals, successful projects and expected outcomes. He also talked about S-STEM, its goals, deadlines and special program features. Lastly, they discussed the MSP program details. They also mentioned some new requirements for proposals in general at NSF.

MAA Calculus Study

David Bressoud (Macalester College) discussed the findings of the MAA's study of Calculus I instruction in American colleges and universities. The purpose of the study is to improve understanding of the demographics of calculus students and to measure the impact of aspects of calculus classes that are thought to influence student success.

Bressoud described the timeline of the survey, gave a sampling of the data collected and shared much statistical information from the study including Calculus I student gender information, age distribution, race, SAT/ACT math exam scores, career goals and grades. He also presented student input regarding instructors, assignments and exams.

Students were surveyed at both the start and end of the term and the study examined their desire to continue to Calculus II. Bressoud also discussed the lessons learned from the study including getting the best teachers into the calculus classroom and getting the students actively involved during class.

General Discussion

The meeting was organized purposefully to allow discussion time on topics of general concern and interest which resulted in participation by those attending in conversations related to some general aspects of teaching, teaching practices and types of instructors, as well as ideas on how to disseminate information from the committee's meetings to the broader community. One particular discussion centered on how to gather information on innovative teaching methods that the AMS could compile and make available through its website and possibly other avenues.