

**American Mathematical Society
Committee on Education Meeting
October 23-24, 2009
Washington DC**

Summary Report

The Committee discussed a number of issues related to mathematics education. Guests of the Committee included representatives from the National Science Foundation, U.S. Department of Education, Intel Foundation, Council of Chief State School Officers, Mathematical Association of America, National Science Board, and the Conference Board of Mathematical Sciences. The meeting was well attended, with over 60 participants, including 30 chairs and representatives of mathematical sciences department.

Mathematicians + Teachers = Intel Math

Wendy Hawkins (Executive Director, Intel Foundation) gave a brief history of Intel and its Education Initiative. Since its founding forty years ago, Intel has worked to: improve teaching and learning; advance math, science and engineering education and research; and advocate for educational excellence worldwide. It does this through programs that : provide professional development to teachers and technology access to underserved youth; recognize K-12 schools for implementing innovative math and science programs; and recognize the work of talented students through fairs and competitions.

Hawkins discussed Intel's latest project created with the help of Dr. Ken Gross (University of Vermont) and funded by the U.S. Department of Education's Math Science Partnership. This 80 hour professional development course for elementary and middle school teachers is called *Intel Math*. The program focuses on teacher content knowledge (90% versus 10% on pedagogy) and emphasizes deepening their conceptual understanding of mathematics.

The program is designed to be co-taught by a mathematician and a teacher. In order to encourage teachers to participate, the program works with state or district departments of education to provide compensation. Since 2007, the program has trained 720 teachers in Massachusetts, California, New Jersey and Arizona.

National Science Board's STEM Innovators

Matthew Wilson (AAAS Science & Technology Fellow, National Science Board) provided background information on the National Science Board, including its statutory obligations of being the policy making body for the National Science Foundation and serving as a body of advisors to both the President and to Congress on broad, national policy issues related to science and engineering research and education.

In 2007, the National Science Board released its *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering and Mathematics (STEM) Education System*. This action plan examined teacher and workforce issues and focused on creating a coherent STEM education system, but it did not address the needs of future STEM innovators. Wilson presented statistics on the lack of development opportunities for talented STEM students in the U.S. With this in mind, the Board has launched a project entitled "Preparing the Next Generation of STEM Innovators: Identifying and Developing our Nation's Human Capital." The goal of the project is to develop recommendations for the NSF and the federal government on identifying and developing highly talented and motivated students.

A panel of experts was convened in August 2009 to begin work on this project. Wilson highlighted a number of emerging themes that came out of the two-day panel discussion and summarized their findings. The Board will present the panel's findings and their recommendations in a report to be published in spring 2010.

Mathematics Initiatives at the U.S. Department of Education

The Mathematics and Science Partnership (MSP) program is charged with increasing student performance in math and science by enhancing the content knowledge and teaching skills of classroom teachers. Pat Johnson (Team Leader, Mathematics and Science Partnership, U.S. Department of Education) summarized MSP project participation and funding levels, and discussed their characteristics and evaluation designs.

Johnson then discussed the Administration's new "Race to the Top" competition for states to win \$4.35 billion in grants to support education reform and innovation. Additional grants will also be available through other programs for a total of some \$10 billion for states and districts making real, comprehensive reform in math and science education.

Two rounds of awards for the "Race to the Top" competition will begin in November 2009 with applications that must address four central areas of reform: 1) development of rigorous college and career-ready standards and high quality assessments that are valid and reliable for all students; 2) establishment of preK-college and career systems that track progress and foster improvement; 3) improvement of teacher effectiveness and the equitable distribution of high quality teachers; and 4) intensive support for lowest performing schools.

Role of Professional Societies in Achieving Widespread Implementation of Good Classroom Practice

Linda Slakey (Director, Division of Undergraduate Education, National Science Foundation) shared her sense of the challenges in undergraduate STEM education. She then talked about the research available on how students learn and what constitutes an effective teaching model. In particular, she discussed the 'student centered practice' of teaching. She also discussed how learning differs from field to field and how many faculty are unaware of new approaches to teaching or are resistant to using new methods.

Slakey went on to discuss 'student centered practice' in more detail and asked for perspectives from attendees on the need to move from passive to engaged pedagogy, on the state of their local environments and on the status of mathematics as a field. She engaged the audience to discuss these questions so that she would have an idea from their perspective of where NSF-DUE can help move student learning along the spectrum. She also talked about how professional societies are a critical leverage point in getting their members involved in the shift to engaged pedagogy.

Common Core Standards Initiative: Ensuring All Students are College and Career Ready

Scott Montgomery (Deputy Executive Director, Council of Chief State School Officers--CCSSO) described the importance of the Common Core State Standards Initiative, how common standards will impact students and states, and what the process will be to produce them.

The Initiative seeks to have states collectively develop and adopt a core set of academic standards in mathematics and English language arts. Currently, every state has its own set of standards, which means that public education students are learning to different levels in each state. This initiative has enlisted 48 states and 3 territories (AK and TX have not signed on) in the effort to prepare U.S. students to compete with their American peers, as well as with students from around the world.

This Initiative is being led by the CCSSO and the National Governors Association in partnership with ACT, the College Board and Achieve. A draft of the college and career ready standards is to be finalized in October 2009 and a draft of the standards for grades K-12 is to be finalized in January 2010. Adoption of the common core state standards is voluntary for states. Those choosing adoption agree that the common core will represent 85% of the state's standards in mathematics and English language arts.

What do Students Really Learn in a Mathematics Class?

Harvey Keynes (Education Director, Geometry Center at the University of Minnesota) and Brian Lindaman (Montana State University) explained their study to determine student understanding of sequences and series and how their understanding was affected by the instruction given. The study originated from a desire to measure the effectiveness of instruction in the University of Minnesota Talented Youth Math Program (UMTYMP).

Keynes and Lindaman described the UMTYMP program in terms of its students and the subject matter covered. They then presented their observations and conclusions from the survey, which included a broad determination that instructional focus on conceptual problem-solving and group work aided students' understanding more than lecture-based approaches.

The Klein Project

William McCallum (Director, Institute for Mathematics and Education, University of Arizona) began his presentation by talking about Felix Klein and his book *Elementary Mathematics from an Advanced Standpoint*, which was intended to provide encouragement for mathematics teachers. In celebration of the 100th anniversary of the publication of Klein's book, The Klein Project will produce a book about mathematics, a Wiki website and a DVD resource for teachers worldwide.

The design team for the project met in June 2009 and agreed to focus initially on the book portion of the project. The project is expected to last four years and the team is currently looking for contributions and ideas on the book's structure, chapter names, etc. They are looking to hold conferences all over the world to get wide input on the book, which will be published internationally and translated into many languages.

McCallum encouraged attendees to contribute to the project and stressed that feedback is welcomed at any stage. The project hopes to receive short written briefs that describe inspiring examples of important ideas or moments in recent mathematical history. The next meeting of the design team will be in April 2010.

Inquiry Based Learning

Michael Starbird (University of Texas at Austin) and Katherine Socha (St. Mary's College of Maryland) explained that inquiry based learning (IBL) is very much a guided effort to help students develop a particular skill or learn a particular concept. IBL mathematics classes are participatory and as such create an atmosphere that allows for a more thorough understanding of the subject. However, they cautioned that not all mathematics classes lend themselves to be taught in this manner.

Starbird and Socha provided information to attendees on the Academy for Inquiry Based Learning and on resources and activities involving IBL, including workshops, mentoring programs and course notes.

AMS Survey of Online Testing

Alan Tucker (SUNY at Stony Brook) presented an overview, along with the methodology and findings, of the AMS Homework Software Survey, which was funded by NSF-DUE. Departments of mathematics and statistics were invited to participate. Highlights of the survey include: 1) the highest number of users of homework software were in Ph.D. departments -- with only 30% of M.S. departments and 13% of B.S. departments using software; and, 2) courses that most frequently used software were College Algebra and below (87%), Calculus for Scientists (60%) and Precalculus (55%) and when homework software was used in these classes, MyMathLab was chosen 50% of the time followed by WebAssign at 25% of the time.

Most departments experienced some initial faculty resistance to using homework software -- with students and non-tenure track faculty being more receptive to the software and TAs being most receptive. The acceptance of a particular software was also dependent on the type of department—Ph.D., M.A. or B.S., private or public.

Other Discussion

Larry Gray opened the floor for discussion during the meeting and called on Jerry Dancis (University of Maryland) to present a public letter written by some in the mathematics community to U.S. Secretary of Education Arne Duncan that outlines recommendations on improving teacher quality by focusing on teacher preparation and professional development.

Additionally, the Committee itself discussed other areas in which it might work to further mathematics education. One suggestion was to create a resource for talented mathematics students that would inform them of opportunities including summer and academic year programs, math circles, conferences, etc – Deborah Hughes Hallett will spearhead this effort. Also, because of the importance of math content to teacher development and training in K-12 (particularly K-8), a suggestion was made to have the Committee encourage AMS members to get involved in this issue. Larry Gray will lead this effort and will begin by collecting information on work that has already been and is being done in this area, eventually perhaps crafting a statement on the importance of content knowledge to teacher education and development.

COE Activities at San Francisco, CA Joint Mathematics Meetings, January 2010

Larry Gray reported that the AMS Committee on Education will host a panel discussion at the Joint Meetings in San Diego, CA in January 2010 entitled “The Common Core State Standards: will they become our national K-12 math curriculum?” Panelists will include Scott Baldrige (Louisiana State University) and William McCallum (University of Arizona), among others. The panel discussion will be held on Saturday, January 16th from 8:30 am to 10:00 am.

Date of Next Meeting

The committee chose October 29-30, 2010 as the date for the next meeting of the AMS Committee on Education. The meeting will be held in Washington, DC.

Submitted by Anita Benjamin
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