

**American Mathematical Society
Committee on Education Meeting
October 22-23, 2004
Washington DC**

Summary Report

The Committee discussed a number of issues related to mathematics education including: professional development for teachers; assessing exit exams; evaluating curricular effectiveness; implementing mathematics standards; improving the quality of mathematics education; programs and funding at the National Science Foundation; and issues in undergraduate and graduate education. Guests of the Committee included representatives from the NSF, Achieve, Math for America, the American Mathematical Association of Two-Year Colleges, the Mathematical Sciences Education Board and the U.S. Department of Education. The meeting was very well attended with 87 participants, including over 50 chairs of masters and doctorate-granting departments of mathematics representing institutions from across the country.

Achieve's Projects and Activities in K-12 Education

Laura McGiffert of Achieve Inc. spoke primarily on the organization's efforts in assessing exit exams. She also discussed their work on developing mathematics expectations for the end of eighth grade. For the past year and a half, Achieve has been working on "backmapping" (looking backward to see what steps are necessary to achieve the outlined goals) those expectations from eighth grade down through kindergarten. A draft of these expectations is due to be out in December 2004.

Achieve has also been working on identifying what knowledge and skills high school graduates should possess in order to be prepared for success in college and in the world of work. High school exit exams can measure these factors and Achieve, in partnership with Michigan State University and other expert advisors, has been conducting studies in six states (FL, MA, MD, NJ, OH, TX) to analyze mathematics and English language arts exams. Achieve reached three conclusions: the tests are not overly demanding and high school graduates can be expected to pass them; the exams will need to be strengthened over time to better measure the knowledge and skills high school graduates will need to succeed in the real world; and states should not rely exclusively on these tests to measure everything that is important in the education of our youth.

AMATYC's New Mathematics Standards for Two-Year Colleges

Susan Wood (J. Sargeant Reynolds Community College), past president of the American Mathematical Association of Two-Year Colleges (AMATYC), introduced AMATYC's 1995 publication entitled "Crossroads in Mathematics: Standards for Introductory College Mathematics Before Calculus." These standards are being revised and updated in a new publication, "Beyond Crossroads: Implementing Mathematics Standards in the First Two Years of College." The final written version is due to be released in November 2006, along with a small number of digital products.

In updating and building upon the 1995 edition of *Crossroads*, AMATYC hopes to improve student learning at the introductory college level by communicating a renewed vision and guidelines for curriculum, pedagogy, research, professional development and assessment. It was widely felt among two-year college math faculty that information on implementation of the standards was missing from the first *Crossroads*. Therefore, the focus of the new document is five implementation standards in the following areas: learning environment; instructional strategies; curriculum development; assessment; and professionalism.

Math for America

Irwin Kra, professor of mathematics at SUNY Stony Brook and the Executive Director of Math for America (MfA), discussed the work of this new foundation which was established in early 2004 to improve the quality of mathematics education in U.S. schools by addressing the problem of teacher quality. MfA has launched two inaugural programs that create opportunities for more than 200 high school math teachers in New York City public schools – the New York City Newton Fellowships for prospective math teachers and the Newton Master Teacher Fellowships for current New York City high school math teachers.

The Newton Fellowship program seeks to add 180 new math teachers to NYC high schools over five years. This program recruits college seniors and mid-career professionals with math or math-related backgrounds and provides training and strong financial incentives to get them into the New York City public school system as high school math teachers. Forty fellows will be chosen in 2005. The Newton Master Teacher program rewards teachers who demonstrate outstanding mathematical and pedagogical skills with a \$50,000 award. Ten master teachers will be chosen in 2005.

In the near future, Math for America intends to expand their programs to other cities in the U.S., but eventually they would like to see a federally-funded national program. MfA is also developing other programs expanding beyond high school grades.

Report on U.S. Department of Education Mathematics and Science Partnerships (MSP) Program

Pat O’Connell Ross with the U.S. Department of Education presented an update on the Mathematics and Science Partnership (MSP) program after its first year. This initiative is the signature program of the “No Child Left Behind” Act of 2001 and focuses on professional development for mathematics and science teachers to improve their content knowledge and pedagogical skills. Proposals are solicited through an open competition in each state. States are then responsible for reviewing and awarding project grants to promising programs aligned to the priorities established by the state. States are asked to make multi-year awards and to make grants large enough to measure results. In 2003, the majority of states focused their priorities on elementary and middle school mathematics. Most states also made 2-3 year awards with project funding at the \$100,000 to \$500,000 level.

Ross also briefly discussed the U.S. Department of Education’s Mathematics and Science Initiative (MSI), which focuses on achieving three goals: creating more public awareness of the importance of mathematics and science education; improving teacher quality; and investing in

research to improve our knowledge of what boosts student learning in mathematics and science in the classroom.

Ross also reported that the U.S. Dept. of Education has held summits on both mathematics and science in the last 1.5 years and is interested in replicating those summits around the country. As a result the Department has joined with NASA to fund an organization that will work with states that are interested in hosting such summits, which will bring together the academic and business communities, along with public school systems, to talk about mathematics and science education.

Report on Programs and Issues from the National Science Foundation's (NSF) Division of Undergraduate Education (DUE)

Elizabeth Teles and John Haddock with NSF-DUE discussed a number of programs at DUE. The newest effort is the Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences (UBM). The goal of this program is to enhance undergraduate education and training at the intersection of the biological and mathematical sciences and to better prepare undergraduate biology or mathematics students to pursue graduate study and careers in fields that integrate the mathematical and biological sciences. Another program is the Mentoring Through Critical Transition Points in the Mathematical Sciences (MCTP) program. MCTP provides a system for mentoring students at points of transition in a mathematical sciences career path.

The NSF Director's Award for Distinguished Teaching Scholars (DTS) was also discussed. This award identifies and rewards individuals who have contributed significantly to the scholarship of their discipline and to the education of students in science, technology, engineering and mathematics (STEM) and who exemplify the ability to integrate their research and educational activities. Additionally, the STEM Talent Expansion Program (STEP) and the Advanced Technological Education (ATE) program were also discussed.

A brief presentation was given on DUE's new Teacher Professional Continuum (TPC) and the Course, Curriculum and Laboratory Improvement (CCLI) programs. The TPC program seeks to help better understand the development of infrastructure and models of implementation, to advance the research base and to develop resources in K-12 education. The CCLI program seeks to improve the quality of STEM education. Currently, the program is broken down into four tracks: adaptation and implementation; educational materials development; national dissemination; and assessment of student achievement. However, CCLI has recently been changed to address three phases instead: exploratory projects; expansion projects; and comprehensive projects.

Panel Discussion on Aspects of VIGRE Projects That Can, Should, or Are Likely to Continue After Termination of NSF Money

Alejandro Adem (Univ of Wisconsin-Madison), Al Boggess (Texas A&M Univ), Robert Greene (UCLA) and Doug Ulmer (Univ of Arizona) headed up a panel discussion on successful projects at their individual institutions that have been funded by NSF Grants for Vertical Integration of Research Education in the Mathematical Sciences (VIGRE). These projects: integrate research and educational activities; enhance interaction between students and faculty; broaden the

educational experiences of students to prepare them for career opportunities; and motivate students to seek an education in the mathematical sciences.

It is unclear at this time whether funding for VIGRE will be provided in the long term and at what levels.

Report from the NSF Division of Mathematical Sciences on VIGRE Type Programs

John Conway and Hank Warchall with the NSF Division of Mathematical Sciences (DMS) gave some background information on the work of DMS and noted that the DMS is primarily focused on funding research in the mathematical sciences, but that it also has an educational component that includes training programs such as the new “Enhancing the Mathematical Sciences Workforce in the 21st Century” (EMSW21) program, which includes VIGRE, RTG and MCTP as its three components.

The EMSW21 program has replaced VIGRE as the primary educational program at DMS and it combines VIGRE, RTG and MCTP under its umbrella. The goal of the EMSW21 program is to increase the number of U.S. citizens, nationals and permanent residents who are well prepared in the mathematical sciences and who pursue careers in the mathematical sciences and other NSF-supported disciplines. The EMSW21 budget for FY 2005 is slated to be \$18.5 million, \$10 million of which is to fund VIGRE alone. However, although funding for VIGRE has not declined in size since the shift to EMSW21, the FY 2005 budget will not allow for renewal of all five year VIGRE awards which are now closing. This is why RTG and MCTP become more important.

Research Training Groups (RTG) will provide funds for groups of researchers having related research goals in the mathematical sciences to foster research-based training and education. The budget for RTG is \$4 million with a possibility of six awards of up to \$500,000 per year for five years. The Mentoring Through Critical Transition Points (MCTP) program will provide a system of mentoring devoted to points of transition in a mathematical sciences career path that are critical for success -- from undergraduate studies to the early years in a tenure track position. The budget for MCTP is \$4.5 million, plus a contribution from the NSF’s Directorate for Education and Human Resources. There is a possibility of five MCTP awards of up to \$500,000 per year for five years.

Report from Subcommittee Evaluating AMS Graduate Education Activities

A written evaluation of AMS graduate education activities was given with Robert Greene (UCLA) and Alejandro Uribe (University of Michigan) surveying these activities and programs including: data collection and publication which provides a systematic record of graduate mathematics education; employment activities including the employment center at the Joint Mathematics Meeting, “math.jobs.org” and the Employment Information in the Mathematical Sciences (EIMS) employment listing service; fellowship and membership activities such as the AAAS Mass Media Fellowship program; and, the forum on graduate studies held at the Joint Meetings. They also looked at the AMS’ work on the Committee on Teaching Assistants and Part Time Instructors with the MAA.

Report on MSEB's Project "On Evaluating Curricular Effectiveness: Judging the Quality of K-12 Mathematics Evaluations"

Donald Saari (University of California – Irvine) presented a report by the Mathematical Sciences Education Board (MSEB) which was a review of evaluations that others have produced concerning the effectiveness of the thirteen sets of mathematics curriculum materials developed with support from the NSF and six sets of mathematics curriculum materials that were generated commercially. The MSEB committee which undertook this evaluation was able to identify and examine almost 700 studies on these 19 curricula. Studies deemed relevant were then categorized into four evaluation methodologies: content analyses, comparative studies, case studies and synthesis studies. The committee solicited expert testimony on these evaluations, held workshops, developed an evaluation framework, and produced a report on their findings.

In the report, recommended practices were made for evaluators including: representativeness; documentation of implementation; curricular validity of measures; multiple student outcome measures; content analyses and comparative analyses; and, case studies. Recommendations were also made for use by the three primary curricular evaluators -- the federal agencies that develop curricula, publishers and state and local districts and schools.

Comments on State Mathematics Standards From a Group of Mathematicians

Roger Howe (Yale University) reported on his participation in a state standards comparison project at the Park City Mathematics Institute (PCMI). The National Council of Teachers of Mathematics (NCTM) was able to use the PCMI as a venue for state standards comparison activity between NCTM and the Association of State Supervisors of Mathematics (ASSM) to see how much commonality there was in these 50 sets of state standards to determine to what extent there was a defacto national curriculum. The NCTM-ASSM comparison project found that: 1) there was substantial commonality in the early years between sets of standards; 2) there were broad similarities at higher grades, but little concordance on details. A report on these comparisons is being drafted now. It will be posted on the PCMI website with a possible print publication.

Panel Discussion on Issues and Challenges in Undergraduate Mathematics Education

Deanna Caveny (College of Charleston), Robin Forman (Rice University), Bogdan Vernescu (WPI) and Lynne Walling (University of Colorado, Boulder) headed up a panel discussion on some of the issues and challenges in undergraduate mathematics education. Panelists presented their views and experiences in trying to meet the needs of students. They highlighted programs that their institutions are utilizing to address these needs and also discussed areas where improvement is needed.

CoE activities at Atlanta, GA Joint Mathematics Meetings, January 2005

Events hosted by the Committee on Education that are scheduled for the Joint Mathematics Meeting in Atlanta in January 2005 were highlighted, including a Special Session entitled "Mathematicians Work on Mathematics Education" and a panel discussion entitled "Mathematicians as Educators." In addition, it was reported that the annual department chairs workshop will be held Tuesday, January 4th and that there will be a Special Session on "Mathematical Sciences' Contributions to the Biomedical Sciences" and a session on areas in biomedical science where contributions from the mathematical sciences is critical.

Date of Next Meeting

The next meeting of the AMS Committee on Education was scheduled for Friday-Saturday, October 28-29, 2005 in Washington, DC.

Submitted by Anita Benjamin
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