American Mathematical Society
Committee on Education Meeting
October 26-28, 2017
Washington DC

Summary Report

The focus of this year's Committee on Education meeting was on preparing graduate students for teaching-focused and non-academic jobs. The meeting itself consisted of presentations and discussions over a day and a half. Attendees included a number of chairs of departments of mathematics from across the country. Douglas Mupasiri, Chair of COE, introduced the speakers and facilitated the meeting.

MAA Overview: CoMInDS and PIC Math
Doug Ensley (Mathematical Association of America) introduced two MAA programs to attendees – "College Mathematics Instructor Development Source" (CoMInDS) and "Preparing Students for Industrial Careers" (PIC Math). Additionally, he spoke to the group about the "Progress through Calculus" (PTC) program.

CoMInDS provides an online resource suite of instructional materials and research products related to Teaching Assistant professional development. PIC Math prepares mathematics students for industrial careers by engaging them in research problems from business, industry and government. The PTC program is a three-part survey of department chairs at all U.S. graduate-degree granting institutions that looks at courses in mainstream pre-calculus/calculus sequence; enrollment data for courses; and departmental practices to support pre-calculus/calculus sequence.

Revitalizing Graduate STEM Education for the 21st Century
Layne Scherer (National Academies of Science, Engineering, and Medicine - NAS) is the study director for the committee on *Revitalizing Graduate STEM Education for the 21st Century*, a report by NAS that looks at: the state of graduate STEM education in the U.S.; how can we improve career outcomes for students (and employers); how does graduate education funding affect students; how can we foster strong mentoring in graduate education; how are graduate education and graduates responding to globalization; how is graduate education changing; and how can we make sure this report has national impact.

Scherer discussed input the committee has received from public comment at listening sessions and from presentations thus far. Key themes include student infrastructure and policies, graduate student data, careers and competencies, degree experience and buy-in. She referred the group to the previous publication *The Mathematical Sciences in the 2025* which emphasizes that most careers in the near future will require very strong mathematical and science backgrounds. This means that academic mathematical scientists will need to prepare students for this regardless of their degree choice.

The final open session on this report will be held on November 7, 2017. The report will then be developed and is expected to be released in 2018.

A Report from the AMS Education and Diversity Department
Helen Grundman (American Mathematical Society) began her presentation on the new AMS Education and Diversity Department by talking about AMS strategic planning and how it contributed to the creation of this new department. The department seeks to promote diversity and inclusion at all stages of the mathematics 'pipeline.' Its initial focus is on graduate education in the mathematical sciences including the preparation of students entering graduate school, the mentoring of students for success and the promotion of diversity and inclusiveness at the graduate level.

Grundman reported on department activities and initial goals, visibility and participation with other groups, as well as ongoing AMS inclusion initiatives and external funding opportunities.

**Teaching the Future Professoriate: Clarkson University's Summer Institute
for Teaching Assistants**
Catherine Snyder and Peter Turner (Clarkson University) spoke to the group about Clarkson University's Summer Institute for Graduate Teaching Assistants. They talked about the development of the program, including the rationale behind it and its pilot program and timeline. The pilot program for this intensive "boot camp" started in 2016

The program is designed specifically to address the needs of teaching assistants. It is a four week curriculum that focuses on 1) STEM literacy including fundamentals of planning, assessment, methods, and student interaction; 2) STEM teaching methods including strategies for helping students deconstruct text, identifying literacy needs and common misconceptions, scaffolding of instruction and differentiation; 3) STEM teaching lab which allows them to practice teaching with peer and instructor feedback; and 4) professional communications including career planning, professional dispositions and communication skills.

The pilot program for this intensive "boot camp" launched in 2016 and is mandatory for all TAs in the School of Arts and Sciences at Clarkson. However, in summer of 2018 the program will open up to students from other colleges and universities, and will include early career faculty (especially in engineering) as well.

NSF-EHR Opportunities for Graduate Training in Mathematics
Tara Smith (NSF-EHR/DGE) and Ron Buckmire (NSF-EHR/DUE) began their presentation by giving a brief overview of the National Science Foundation (NSF) and the Directorate for Education and Human Resources (EHR) in particular. They outlined a number of programs in the EHR Division of Undergraduate Education (EHR-DUE) and the EHR Division of Graduate Education (EHR-DGE).

Buckmire presented to the group some opportunities that impact graduate students in the Division of Undergraduate Education including STEM education programs like S-STEM (Scholarships in STEM) and IUSE: EHR (Improving Undergraduate STEM Education), cross directorate STEM education programs like IUSE: HIS (Improving Undergraduate STEM Education in Hispanic-Serving Institutions) and other programs like LSAMP: BD (LSAMP Bridge to the Doctorate) and AGEP (Alliance for Graduate Education and the Professoriate.

Tara Smith talked about trends in U.S. graduate education and discussed NSF goals related to STEM workforce development, including investments in graduate education. The Division of Graduate Education has a number of programs to prepare students in STEM fields including NRT (NSF Research Traineeship Program), IGE (Innovations in Graduate Education), GRFP (Graduate Research Fellowship Program), SFS (CyberCorps Scholarships for Service), and ECR (ECR-Workforce Development).

NSF priorities for training graduate students and associated DMS funding opportunities
Nandini Kannan and Matt Douglass (NSF-MPS/DMS) presented information on the programs in the Division of Mathematical Sciences at NSF-MPS. Douglass talked about the INCLUDES program (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science).

NSF INCLUDES is a national initiative that seeks to enhance U.S. leadership in science and engineering discovery and innovation by developing STEM talent from all sectors and groups in society. The objective of this program is to develop and bring together representative organizations and consortia from

different sectors that will position inclusion and equity as core values for excellence in STEM and make the science and engineering workforce better reflect the diversity of U.S. society.

Kannan presented information on the NSF's ten Big Ideas of which the INCLUDES program is one. Other research ideas in which mathematics can play a key role are Harnessing the Data Revolution, Understanding the Rules of Life and the Quantum Leap. Kannan also discussed TRIPODS (Transdisciplinary Research and Principles of Data Science) and that program's desire to get more proposals from the mathematics community.

Introduced in 2016, Big Ideas identifies areas of national importance for future investment at the frontiers of science and engineering. See https://www.nsf.gov/about/congress/115/10bigideas.jsp for more on The Big Ideas.

EDT: Math to Industry Boot Camp
Dan Spirn (Institute of Mathematics and its Applications/University of Minnesota) began by presenting information on the tightening job market for math PhDs in academia. He talked about past programs at the Institute of Mathematics and its Applications (IMA) and how the Math-to-Industry Boot Camp is different from other Enhanced Doctoral Training programs.

The Math-to-Industry Boot Camp is an intense six-week summer session designed to provide graduate students with training and experience intended to help them gain employment outside of academia. The program is targeted at PhD students in pure and applied mathematics. The boot camp consists of technical and soft skills training, as well as team projects including those sponsored by industry participants.

Being a professor at a teaching-oriented college or university: What every graduate advisor/director needs to know
Suzanne Dorée (Augsburg College), Katherine Stevenson (California State University), Robert Mignone (College of Charleston) and Karen Saxe (AMS Washington Office Director, Macalester College) participated in this panel discussion on excellence in teaching.

Dorée introduced the panel members who each then described their institutions, departments, programs, students and faculty. Panelists represented a diverse mix of institutions and described how their departments deal with issues surrounding teaching, including providing aspects of excellent teaching, examples of pedagogies and how teaching is evaluated for tenure promotion. The panel looked at different ways to assess excellence in teaching, including teacher evaluations, classroom visitation and student outcomes.

Issues Resulting from Reliance on Non-Tenure Track Faculty sat GVSU
Karen Novotny (Grand Valley State University) began her presentation by describing Grand Valley State University, its students and faculty. She discussed the categories of faculty (tenured/tenure track, affiliates, visitors and part-time adjuncts) in the mathematics department and their workloads, as well as the majors and courses.

Novotny discussed the challenges of managing workloads with an inadequate number of tenured/TT faculty who must teach most of their calculus classes, in addition to the upper level mathematics courses, because other faculty are not qualified to do it.

She explained that due to the makeup of their teaching staff, the university has three main issues: 1) without more tenured/TT faculty, foundation and calculus courses must be taught primarily by contract faculty who aren't trained in advising, have no long term commitment to the institution and are unlikely to establish important student-faculty relationships; 2) all mentor and support new TT faculty and share the service load, but there is too much work and not enough workers; 3) it is hard to find qualified part-time adjuncts due to low pay and ACA restriction on the number of credit hours they can teach.

This kind of faculty pressure and resulting service overload is a very big problem that is causing the department to miss opportunities for recruiting students into math majors.

Educational Activities at the NASEM Board on the Mathematical Science and Analytics
Ben Wender (Board on Mathematical Sciences and Analytics) began his talk by giving a brief history of the National Academies of Sciences, Engineering and Medicine (NASEM). He explained that NASEM provides advice to the federal government to inform sound policy making and is organized by divisions focused on broad topic areas. It acts as an interface between researchers and the broader policy making community and is not part of the federal government but rather a private, non-profit organization.

NASEM is loosely organized into 8 divisions, only one of which is focused on mathematics. The Board of Mathematical Sciences and Analytics (BMSA) is one of many boards in this division. BMSA and CATS (Committee on Applied and Theoretical Statistics) are the two boards representing the mathematical sciences and are tasked with promoting and advancing their fields. They have published a number of reports.

Wender spoke about two ongoing education-focused activities at BMSA and CATS. One is "Envisioning the Data Science Discipline: The Undergraduate Perspective," funded through NSF and which seeks to describe what data science education should look like in 20 years if there were no constraints. Its final report is due out in early 2018. The other project is "The Data Science Education Roundtable," funded predominantly by the Moore Foundation and which seeks to strengthen ties between industry and academia (the American Statistical Association is a sponsor). There was some discussion on whether the AMS should consider being a sponsor of this project. The committee also discussed more participation by AMS in NASEM activities and potential sponsorship of future projects.

Submitted by Anita Benjamin
Assistant Director, AMS Washington Office
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