

**American Mathematical Society
Committee on Education Meeting &
Mini-conference on Education
October 11-13, 2018
Washington DC**

Summary Report

This year's Committee on Education (COE) meeting launched the first annual Mini-Conference on Education, entitled *Next Steps in the Evolution of Mathematics Education: Moving Beyond Pilots*. The focus of the mini-conference was to engage participants both within and outside of the mathematics community with members of the Committee through talks, discussion, and reflection on education policy, career equity, curriculum and pedagogy. The mini-conference consisted of presentations, panel discussion, and audience interaction over the course of one day. Attendees included a number of department chairs of mathematical sciences from across the country, representatives from umbrella mathematics organizations and federal offices. Katherine Stevenson, Co-Organizer of the Mini-conference on Education, introduced the speakers and facilitated the mini-conference.

“Departmental Practices Supporting Careers in Business, Industry and Government (BIG)”

Rachel Levy (Mathematical Association of America) discussed the opportunities for departments to build faculty capacity, make connections with business, industry, and government (BIG) and motivate cultural shifts in equity and access.

The BIG Math Network works to bring the mathematics community together in order to build job opportunities for mathematical scientists; create regional networks; facilitate connections between students, faculty, recruiters and managers; increase knowledge about internships while also providing viable models for internships and how to prepare for them, through the BIG Jobs Guide. Levy encouraged the use of the BIG Math Network Career Connection Checklist in departmental practice to give undergraduate and graduate students greater exposure to information.

“TPSE: Its Creation, Evolution and Agenda”

Karen Saxe (Associate Executive Director, AMS) discussed the landscape of mathematics and policy within the United States. Saxe gave an overview of TPSE Math including listing the board of governors, executive director, staff, and funders. The mission of TPSE Math is working to facilitate an inclusive movement to strength post-secondary education in mathematics by working closely with faculty leaders, university administrators, membership associations and relevant disciplinary societies in the pursuit of mathematically relevant education for all students. Key action priorities of TPSE Math include the lower and upper division pathways, teaching technologies and methodologies, and broader graduate education. Saxe referenced the next steps in fulfilling TPSE's mission, to further create strong partnerships and collaborations; and cultivate new leaders from mathematics.

Uri Treisman (The University of Texas at Austin) discussed the goals of TPSE Math in academic success and faculty development. Key themes included the emphasis on structural change in both upper and lower division pathways in mathematics to increase undergraduate student success. Treisman detailed TPSE's role in reforming lower division pathways at two and four year institutions by encouraging the spread of innovation, the standard of ownership being a normative practice, the change in standards of responsible practice and the change in relevant statutes administrative codes and regulations. The Dana Center Mathematics Pathways Model addressed increasing student success in mathematics pathways

aligned with their program of study through quick structural change and continuous improvement. Treisman discussed TPSE Math's role in promoting reform of upper division pathways by highlighting the importance of investing in faculty development, as well as responding to evolving career opportunities and demand from other departments for mathematics courses through regional meetings.

“The role of Mathematics in the Study of Visual Processing in the Brain”

Ellen Hildreth (Wellesley College) began her presentation by discussing how the brain processes information as a basis for sensory perception, thought and action—requiring a cross disciplinary approach from subjects centered in computational modeling, psychology, neuroscience, and cognitive science. She presented examples from human visual processing, which included the visual guidance of motor behavior to understand human behavior's role in machine learning and development of vision research.

Hildreth discussed the importance of early exposure and learning to applications of mathematics through combining a multitude of academic courses in undergraduate and graduate institutions. She connected the interdisciplinary approach of characterizing formal representations of sensory perception with the foundational necessity of mathematics used to formulate and analyze solutions to problems faced by biological systems and intelligent machines, and interpret complex data at a conceptual level. Early exposure to applications of mathematics introduces students to fields with compelling research challenges and successes; and introduces interdisciplinary study of intelligence.

“From the Heat Equation to Financial Security”

Sonin Kwon (Mass Mutual) spoke about why mathematics education matters in the financial industry; what skills are useful for work in the industry; and why mathematics students' way of thinking gives them a unique advantage in the workplace.

Kwon explained that students who major in mathematics are often conditioned to understand the concept of formulas, outside of simply solving equations. Mathematical thinking affords students the key skill of critical thinking, understanding logical thinking storylines and hypothesis, presenting evidence based debates, formulating conjectures, and creating or collecting models to check one's understanding. Kwon explained that financial and accounting majors often lack the understanding of concepts and derivation of formulas, which is a foundational nature mathematicians are trained to possess. Although mathematicians are equipped with quantitative skills, Kwon explained that it is imperative for students to also be exposed to interdisciplinary courses which will give them other necessary skills needed in the workplace.

“Panel on Next Steps - General”

John Ewing (Math for America), **Jim Ham** (AMATYC), **Deanna Haunsperger** (MAA) **Vince Lucarelli** (NSA) **Chris Rasmussen** (CBMS & NAS) **Michelle Schwalbe** (BMSA&NAS) and **Lee Zia** (NSF).

John Ewing moderated the panel. Each panelist described their own background and affiliation and then discussed course preparation, content and pedagogy. They discussed issues related to the expansion of the mathematics community, as well as educational and career development in mathematics. They also spoke of ways to advance mathematics education, including improvement of communication and collaboration with relevant allies; and encouraging institutional change in both undergraduate and graduate education.

“Rethink STEM”

Jake Steel (U.S. Department of Education) a former mathematics teacher who was brought to the White House by way of the Domestic Policy Council, assisted in the Office of Science and Technology Policy (OSTP) in the development of the State and Federal 5 year STEM strategic plan, introduced by the Obama Administration in 2013. Steel began his presentation by giving an overview of the strategic plan efforts in improving STEM education over the last five years and connected the Trump Administration’s assessment of these education standards. He discussed the priorities expected in the following 5 year STEM plan executed under Trump’s Administration which included expanding partnerships through workplace learning, re-skilling and upskilling, certifications or credentialing; fostering STEM ecosystems; innovation and entrepreneurship; digital platforms for teaching; and supporting the contextual integration of the mathematical sciences.

Jake Steel discussed the Department of Education’s interest in improving the teaching profession by daily collaboration with parents, advocacy and community members. Steel outlined Secretary of Education Betsy DeVos’s eleven policy priorities for education in the United States. Priority six details the promotion of science, technology, engineering, and math (STEM) education, particularly focused on computer science.

“Math Achievement: Law, Policy, and Post-Secondary Opportunity”

Christopher Edley Jr. (Opportunity Institute) began by discussing the importance of the landmark employment discrimination case, *Griggs v. Duke Power Company*, decided by the U.S. Supreme Court in 1971. The court ruled unanimously against the intelligence testing practices of the Duke Power Company because of its requirement of a high school diploma or equivalent for its lowest level employees. The court found the requirement to have a disparate impact on the black community in North Carolina. It decided that if such employment requirements disparately impact minority groups, businesses must demonstrate that such requirements are reasonably related to performing the job.

Christopher Edley argued that requirements in secondary and post-secondary mathematics education also cause a racially disparate impact in communities across the United States. Edley addressed how math is an enabler of opportunities and choices, but equally a barrier. Math requirements are often used for college entry or completion of general education requirements, the consequence of which can lead groups of individuals to fall below the line of educational standard in mathematics, closing the door on opportunities and re-directing a student’s future. Edley challenged the educational system to change its structure to improve the probability of student success, opening pathways to STEM coursework, graduation and careers.

“Panel on Next Steps -- Equity and Policy”

Helen Grundman (AMS), **Manmohan Kaur** (Benedictine University), **Nichole Lindgren** (TODOS), **Karoline Pershell** (AWM), **Karen Saxe** (AMS), **Nathaniel Whitaker** (UMass, Amherst).

Helen Grundman moderated the panel. Each panelist described their own background and affiliation and then held a discussion in response to the afternoon presentations by Jake Steel (U.S. Department of Education) and Christopher Edley, Jr. (Opportunity Institute).

The panel answered questions on the advancement of STEM education through institutional changes and faculty accommodations to create open and fair educational structures. Members of the panel discussed the foundational pathways in education at the K-12 level that connected to the expansion of STEM education at the undergraduate level. Panelists discussed the variation of educational equity in mathematics and provided resolutions for department faculty and policy makers to participate as gatekeepers to further education in science, technology, engineering, and mathematics.

“What Math Do We Want Non-STEM College Majors to Know”

Manil Suri (University of Maryland, Baltimore County), presented ideas on how to bring mathematics to a broader community and advocated for a restructuring of our education system. Specifically, he discussed rethinking the mathematics general education requirements for students who will not benefit from those courses. He emphasized the use of cross-disciplinary courses focusing in on a narrative-based approach through subjects like art integration. He highlighted the importance of adding “A” into STEM. The STEAM approach would help non-STEM students have a better understanding of mathematics, which could have broader implications in informal math education and outreach and aid in academic success for students.

*Submitted by Paula O. Olugbemi
Assistant to the Associate Executive Director, AMS Office of Government Relations
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