Intersections of Mathematics and Math Education:
Research and Practice K-20
Abstracts

Saturday 10:15 – 12:15
Karen Graham, University of New Hampshire
Karen King, New York University
Annie Selden, New Mexico State University
Natasha Speer, University of Maine

Saturday 3:15 – 5:15
Katherine Socha, Math for America
Maura B. Mast, University of Massachusetts, Boston
Juliana Belding, Harvard University and Ginger Warfield, University of Washington
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Saturday 10:15 – 12:15

Research in Mathematics Education: Looking Back and Looking Forward

Karen Graham, University of New Hampshire

Abstract: This talk will provide an overview of research in mathematics education K-20 over the last 40 years; the major themes and methodologies that have shaped the research and informed practice. We will also look forward to what might be important focus areas in the future.

A Mathematics Education Researcher's Travels: Perspectives on Mathematics Education Research from Academia, Government, and Professional Societies

Karen King, New York University

Abstract: In this talk, I describe my perspective on research in mathematics education, its past and future, through my travels as a faculty member in departments of teacher education and mathematics across the country, a program officer at the National Science Foundation and now the Director of Research at the National Council of Teachers of Mathematics. Through the lens of my various experiences, I will present one perspective on the future of mathematics education research PK-20 and the role of mathematicians and mathematics educators in that future.

Helping Students with Proving: A Tale of Two Whole Class Teaching Experiments

Annie Selden, New Mexico State University

First, I will discuss a whole class teaching experiment for helping advanced undergraduate and beginning graduate mathematics students construct proofs. This course has been taught seven times since Fall 2007 and each time we are learning something more about students' proving capabilities. For example, there are certain aspects of proving that mathematicians do automatically, but that students are often unaware of. We define the *formal-rhetorical* part of a proof to be those aspects of a proof that can be written by examining the logical structure of the statement of a theorem and by unpacking associated definitions.

Examples include writing the first and last lines, "unpacking" the meaning of the last line, and considering what strategy one might invoke to prove that. Writing the formal-rhetorical part of a proof can expose "the real problem(s)" to be solved. We call the remainder of the proof the *problem-centered* part.

Second, I will discuss a voluntary proving supplement for an undergraduate real analysis class. This has been taught three times to since Fall 2009. Each week, one proof problem was selected or created to "resemble in construction" an assigned homework proof problem that the real analysis teacher intended to grade in detail, and that could be improved subsequently and resubmitted for additional credit. The supplement proof problem could be solved using actions similar to those useful in proving the corresponding assigned homework proof problem. However, the supplement proof problem was *not* a template problem, and "on the surface" would often not resemble the assigned proof problem.

The teaching for both the proofs course and the supplement has been informed by our theory of actions in the proving process and by our division of proofs into their formal-rhetorical and problem-centered parts.

TITLE
Natasha Speer, University of Maine
ABSTRACT

Saturday 3:15 – 5:15

Is one of these things not like the others? Comparing Math for America with other national teacher preparation and professional development programs
Katherine Socha, Math for America

Math for America is a 7-year-old professional development

program that supports public secondary school mathematics teachers. Despite the similarity of names, MfA differs greatly from the Teach For America model. This talk will explore similarities and differences between MfA, TFA, and a few other nationally recognized teacher development programs that emphasize mathematics teaching.

Common Sense and Mathematics: The Role of Quantitative Reasoning in Teacher Education and K – 12 Instruction
Maura B. Mast, University of Massachusetts, Boston

The book *Mathematics and Democracy*, published in 2001 by the National Council on Education and the Disciplines, begins its argument for the importance of teaching quantitative literacy with the statement that "The world of the twenty-first century is a world is awash in numbers." But does K – 12 mathematics education in the United States prepare students for the numeracy – and the numerical common sense – they will need as adults? While the new Common Core standards call for students to "reason abstractly and quantitatively," it is not clear how teachers will be trained to teach their students to use mathematics in context. In this talk, we will discuss possible approaches to teacher education that include quantitative literacy, as well as new initiatives to teach quantitative literacy in the K – 12 setting.

The Common Core State Standards
Juliana Belding, Harvard University and Ginger Warfield, University of Washington

The Common Core State Standards, launched in 2010 and now adopted by forty-four states, include a set of standards for mathematical practice which likely seem second nature to mathematicians. As a result, we are in a unique position to help design and lead professional development for teachers around these standards, i.e. to provide mathematical experiences in which these standards arise naturally. First we will give some examples and talk briefly about some of the challenges and possibilities of translating such experiences back to the middle and high school classroom. Then we will discuss the implications for assessment, and why it is that we all need to stay acutely conscious of developments on that front.