Research Presession Planning Committee

NCTM Research Committee

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(2011–2014)
North Carolina State University

Robert Q. Berry, Board Liaison (2011–2014)
University of Virginia

Kathryn B. Chval (2012–2015)
University of Missouri

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University of Massachusetts Amherst

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University of North Carolina at Charlotte

Erica Walker (2011–2014)
Teachers College, Columbia University

Jeffrey Wanko (2013–2016)
Miami University

Michael Fish, Staff Liaison (2013)
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University of Arizona

Michigan State University

Denise Spangler, Awards (2012–2014)
University of Georgia

University of South Florida
The Research Conference will be held at the Ernest N. Morial Convention Center in New Orleans.

Registration will be held in Lobby A. **Registration is required for attendance, and badges must be worn for all sessions.**
- Monday, 4:00 p.m.–7:00 p.m.
- Tuesday, 7:30 a.m.–3:00 p.m.

On Wednesday, the Research Conference is open to all registered attendees of the NCTM Annual Meeting and the NCSM Annual Conference. Badges from these conferences will be required for attendance for all sessions on Wednesday.

A light reception will be held on Monday evening in Room 220/221/222 from 8:30 p.m. to 10:00 p.m. following the opening session at 7:00 p.m. in Room 208/209/210.

Two sets of Research Posters Sessions will take place in Room 217/218
- 5:45 p.m.–6:45 p.m. on Monday
- 5:00 p.m.–6:00 p.m. on Tuesday

The Call for Papers for the 2015 NCTM Research Conference, April 13–15, Boston, MA, will be available online by mid-June, 2014.

The NCTM Bookstore will be open on Wednesday 10:00 a.m.–7:00 p.m. in the Exhibit Hall.

This year the program committee has added brief research reports to the program. These sessions are 30 minutes in duration. The presentation is shared during the first 20 minutes and followed by 10 minutes of questions and audience participation.
## Invited Sessions

### Opening Session

#### Arthur Levine

**The Coming Transformation of American Education: Implications for Mathematics Education**  
Monday, April 7th, 7:00 p.m.–8:15 p.m.  
Room 208/209/210

**Pursuing and Utilizing the NSF CAREER Award**  
Tuesday, April 8th, 8:30 a.m.–9:45 a.m.  
Room 211

**Best Practices from Mathematics Education and Special Education Research**  
Tuesday, April 8th, 10:00 a.m.–11:15 a.m.  
Room 216

**The NCTM Research Conference: A Brief History and Future Directions**  
Tuesday, April 8th, 10:00 a.m.–11:15 a.m.  
Room 220/221/222

**The Algebra Project: Working for Quality Math Education for Students**  
Tuesday, April 8th, 10:00 a.m.–11:15 a.m.  
Room 208/209/210

**Successful Calculus Programs: Two-Year Colleges to Research Universities**  
Tuesday, April 8th, 1:15 p.m.–2:30 p.m.  
Room 219

**Reasoning and Sense Making with Technology in Middle School**  
Tuesday, April 8th, 3:30 p.m.–4:45 p.m.  
Room 219

**The Smarter Balanced Assessment Consortium Mathematics Reasoning Project**  
Tuesday, April 8th, 3:30 p.m.–4:45 p.m.  
Room 216

**Building Research Communities in Mathematics Education**  
Wednesday, April 9th, 8:30 a.m.–9:45 a.m.  
Room 219

**Perspectives on Linking Research and Practice: Thoughts from the Field**  
Wednesday, April 9th, 8:30 a.m.–9:45 a.m.  
Room 220/221/222

### Plenary Session

#### Philip Uri Treisman

**A Practical Theory of Productive Persistence in Mathematics Education**  
Wednesday, April 9th, 10:00 a.m.–11:15 a.m.  
Room 208/209/210

**How Should the Enacted Mathematics Curriculum be Conceptualized and Studied?**  
Wednesday, April 9th, 1:15 p.m.–2:30 p.m.  
Room 219

**Writing Research for Teachers: Putting Results Into Practice**  
Wednesday, April 9th, 1:15 p.m.–2:30 p.m.  
Room 216

**Mathematics Teacher Educator: Information for Potential Authors**  
Wednesday, April 9th, 1:15 p.m.–2:30 p.m.  
Room 220/221/222
Floor Plans
Welcome!

On behalf of Research Committee of the National Council of Teachers of Mathematics (NCTM) and the Special Interest Group/Research in Mathematics Education of the American Educational Research Association, we welcome you to NCTM’s Research Conference. The Research Conference serves multiple purposes. First, it brings researchers together annually to examine and discuss current issues in mathematics education. Second, it is an opportunity for researchers to receive feedback on their work and to benefit from exposure to alternative points of view. Third, it affords beginning scholars opportunities to interact and network with experienced researchers in the field. Finally, it is an opportunity to capitalize on the collective wisdom available when researchers and practitioners come together to discuss mathematics education and research.

We would like to thank the members of NCTM’s Research Committee, members of the executive board for the SIG/RME, and members of the research community who served as reviewers. Your work is greatly valued and appreciated. Moreover, we would like to thank the staff at NCTM for helping us with the logistics of the conference, registration, printing the program, and so on. Also, we would like to thank all the presenters for agreeing to participate. Finally, we would like to thank everyone in attendance, and we hope that you will find the conference helpful to you in a number of ways.

Sincerely,
Karen Hollebrands,
NCTM Research Committee, Chair

Maria Blanton,
AERA SIG/RME Co-Chair

Paola Sztajn
AERA SIG/RME Co-Chair

Michael Fish
NCTM Research Committee, Staff Liaison

Opening Session—Monday, 7:00 p.m.

The Coming Transformation of American Education: Implications for Mathematics Education

Arthur Levine
Woodrow Wilson National Fellowship Foundation, Princeton, New Jersey

Room 208/209/210

See Session #22.1 for full details.
Introducing the New NCTM Conference App!

Now available on Google Play and the Apple App Store. Use the Conference App to:

- View the full agenda
- Keep your finger on the pulse of the conference
- Find trending sessions and topics
- Connect with attendees, view photos and comments.
For your safety and because of fire regulations, only those with seats will be allowed in meeting rooms. To comply with fire codes, we will have to ask any persons sitting on the floor or standing to leave the room.

Please remember:
• All meeting rooms will be cleared between presentations.
• All seats are available on a first-come, first-served basis.
• Reserving spaces in line or saving seats is not permitted.
• As a courtesy to the speaker and your colleagues, please turn off your cell phone during all presentations.
5:45 p.m.–6:45 p.m.

6 Framework of Social Justice Approaches to Mathematics Education

Poster Session
I provide a framework by which to evaluate and better understand similarities and differences in various approaches to social justice mathematics. The purpose of this framework is to aid researchers and practitioners in creating a common way to analyze these various approaches using a common set of criteria.

Trevor T. Warburton
University of Utah, Salt Lake City

7 Identity, Remediation, and Urban Mathematics Education: A Follow-Up Study

Poster Session
The subject of this presentation is a follow-up study in which first-year undergraduates’ mathematics learning experiences are the central analytic focus—specifically, their mathematics identities. The purpose of the study is to shed light on mathematics socialization in non-credit-bearing remedial mathematics courses.

Gregory V. Larnell
University of Illinois at Chicago

8 “It’s Negative”: Preconceptions of Integer Products and Quotients

Poster Session
This session shares fifth-grade students’ preconceptions and intelligent overgeneralizations of negative number products and quotients. Implications for teaching, curriculum, assessment, and research due to the ways students transferred ideas from other mathematical knowledge to negative numbers will be discussed.

Julie A. Nurnberger-Haag
Michigan State University, East Lansing

9 “Measurement Club”: Helping to Fill an Educational Gap

Poster Session
A “Measurement Club” focusing on informal experiences and exploration with measurement was implemented after the second graders in our longitudinal study demonstrated difficulty learning more advanced concepts or regressed from levels of thinking previously demonstrated. Results on children’s measurement understanding will be presented.

Douglas W. Van Dine
University of Denver, Colorado
Douglas H. Clements
University of Denver, Colorado
Julie Sarama
University of Denver, Colorado

10 Middle School Teachers’ Knowledge for Teaching Solids of Revolution

Poster Session
We investigate teachers’ mathematical knowledge for teaching (MKT) solids of revolution in the middle grades. We use data from four focus group sessions with pre- and in-service teachers who discussed a series of animated vignettes. The vignettes provoked participants to draw upon different components of their MKT for scaffolding students’ work.

Jennifer A. Eli
University of Arizona, Tucson
Gloriana Gonzalez
University of Illinois at Urbana-Champaign, Champaign

11 Persistent and Problematic Errors in Algebra I

Poster Session
Student work in four algebra 1 topics is analyzed to examine the types of errors made during problem-solving practice. Common errors within topics and persistent errors across topics are identified. The relation between making these errors during the school year and poor performance on end-of-year standardized test items is examined.

Julie L. Booth
Temple University, Philadelphia, Pennsylvania
Francie Eyer
Strategic Education Research Partnership Institute, Washington, D.C.
E. Juliana Paré-Blagoev
Strategic Education Research Partnership Institute, Washington, D.C.

Room 217/218, Capacity: 400
12
Preparing Mathematics Teachers: Does edTPA Assess for Culturally Relevant Pedagogy?
Poster Session
This session will share the results of a study that explores the extent to which the fifteen Secondary Mathematics edTPA rubrics assess for elements of culturally relevant pedagogy. Results indicate that the edTPA assessment shows promise in evaluating mathematics teacher candidates’ preparedness to serve the needs of diverse student populations.

Matt Griffin  
*University of Maryland, College Park*

Maria Hyler  
*University of Maryland, College Park*

Roderick Carey  
*University of Maryland, College Park*

13
Preservice Teachers’ Perceptions on the Interaction between Assessment and Engagement
Poster Session
This study looked at three preservice math teachers’ perceptions of the interaction between engagement and assessment during an eight-day summer workshop. After descriptive analysis of the data, preliminary findings show that questioning techniques and teacher feedback are topics that preservice teachers relate to both engagement and assessment.

Anneliese E Haines  
*Rutgers University, Newark, New Jersey*

Lina Sanchez Leal  
*Rutgers University, Newark, New Jersey*

14
Preservice Teachers’ Responding Based on Children’s Mathematical Understanding
Poster Session
During this poster presentation, I will expose and discuss the background, results and implications of a study designed to examine the preservice teachers’ capacity to attend to children’s strategies interpret and respond based on children’s mathematical understanding in the context of scaffolded activities as they progress in their mathematics methods course.

Mary Njeri Gichobi  
*Iowa State University, Ames*

15
Problems That Prospective Mathematics Teachers Had While Using Cabri 3D
Poster Session
In the current study, we identified prospective mathematics teachers’ problems during their uses of Cabri 3D to solve minimization problems contextualized in three-dimensional geometry.

Samet Okumuş  
*North Carolina State University, Raleigh*

Karen Hollebrands  
*North Carolina State University, Cary*

16
Poster Session
We examined 480 dissertations on the use of technology in mathematics education and developed a Quality Framework (QF) that provided structure to consistently define and measure quality. Dissertation studies earned an average of 64.4 percent of the possible quality points across all methodology types compared to studies in journals that averaged 47.2 percent.

Robert N. Ronau  
*University of Louisville, Kentucky*

David Pugalee  
*University of North Carolina at Charlotte*

17
Teacher Learning of Learning Trajectories in Professional Development
Poster Session
Our research investigates teachers’ learning of mathematics learning trajectories and student-centered instructional practices in a professional development setting. Our poster will share findings of the ways elementary grades teachers’ knowledge developed during the professional development and report a conjectured progression of teacher learning.

P. Holt Wilson  
*University of North Carolina at Greensboro*

Paola Sztajn  
*North Carolina State University, Raleigh*

Jared Webb  
*University of North Carolina at Greensboro*
18
Test Item Analysis and Modification: Implications of Teachers’ Perceptions
Poster Session
This session will present qualitative analysis of teachers’ perceptions of the value of structured test item analysis. Analysis of the nature and quality of their modifications of items will also be presented, along with a discussion of implications for pre- and in-service teacher development.

Patricia D. Hunsader
University of South Florida, Sarasota-Manatee
Barbara Zorin
University of South Florida, St. Petersburg
Denisse R. Thompson
University of South Florida, Tampa
Room 217/218

19
The Impact of Stereotype Threat on Adolescent Female Math Students
Poster Session
This study found effects of stereotype threat on adolescents’ math performance and attitudes. Implicit intelligence theories moderated effects such that girls with an entity view of intelligence had a larger difference between performance in the experimental versus control group compared to girls with an incremental view of intelligence.

Patricia Hale
California State Polytechnic University, Pomona
Bettina Casad
University of Missouri–St. Louis
Room 217/218

20
The Journey of Preservice Teachers Creating Culturally Responsive Mathematics Lessons
Poster Session
This study explores the creation of culturally responsive mathematics lessons. The researcher investigated the process using lesson plans, student reflections, critical feedback from peers, and peer evaluation of the lessons. Findings provide understandings to assist teacher educators to promote creating culturally responsive mathematics lessons.

Rhonda L. Williams
University of Florida, Gainesville
Room 217/218

21
The Problem of Transition from School to University Mathematics
Poster Session
A survey among preservice teachers in Germany shows that the

transition from school to university mathematics is experienced in the context of a major revolution regarding their views about the nature of mathematics. Motivated by the survey, the author presents a concept for an undergraduate course helping to bridge the gap.

Ingo Witzke
University of Cologne, Germany
Room 217/218

22
Tracking Math Teacher Trajectories: Initial Results of a Longitudinal Study
Poster Session
Initial findings of a longitudinal study of mathematics teacher recruitment and retention efforts at one university show teachers in the alternative certification pathway were more likely to switch schools than traditional entrants. Overall persistence was similar for the two groups. Possible explanations and implications are discussed.

William C. Zahner
Boston University, Massachusetts
Robert Afonso
Boston University, Massachusetts
Room 217/218

22.1
The Coming Transformation of American Education: Implications for Mathematics Education
Opening Session
Six powerful forces have the capacity to transform American education—demographics, the economy, government, technology and learning research, privatization and convergence of knowledge producers. This session discusses the nature of the changes occurring and their potential consequences for education, specifically math education.

Arthur Levine
Woodrow Wilson National Fellowship Foundation, Princeton, New Jersey
Room 208/209/210
23
A New Classroom Observation Instrument for Assessing K–16 Mathematics Classrooms

Discussion Session
This session will describe the development of a new observation instrument that is mathematics-specific, spans K–16 mathematics, offers improved validity and reliability, and encompasses the Standards for Mathematical Practice. The instrument may be helpful for educators/researchers engaged in classroom evaluations of K–16 mathematics teaching.

Jim Gleason  
University of Alabama, Tuscaloosa
Tracy L. Weston  
University of Alabama, Tuscaloosa
Stefanie D. Livers  
University of Alabama, Tuscaloosa
Jeremy Zelkowski  
University of Alabama, Tuscaloosa

24
Connecting Data and Chance through Modeling

Research Symposium
Three projects present work on using modeling to understand and/or facilitate learning of core ideas in data and chance in students ranging from middle school through university. In this context, modeling involves creating simplified versions of real-world processes and using them to study or draw inferences about the target processes.

Cliff Konold  
University of Massachusetts Amherst
Richard Lehrer  
Vanderbilt University, Nashville, Tennessee
Robert DelMas  
University of Minnesota, Minneapolis
Discussant: Patrick W. Thompson  
Arizona State University, Tempe

25
Developing a Theory of Mathematical Knowledge for Equitable Teaching

Discussion Session
This presentation describes efforts to design a math methods course that enables mathematics teachers to identify, and later design and enact, equitable teaching practices, and it details the development of the instrument (Mathematical Quality and Equity video codes) used as the framework for this work.

Imani Goffney  
University of Houston, Texas
Jennifer Chauvot  
University of Houston, Texas

Room 207

26
Elaborations on the Construction of Quantitative and Algebraic Reasoning

Research Symposium
Quantitative reasoning (QR) can support students’ construction of rich mathematical meanings and serve as a foundation for algebraic reasoning (AR). Yet students at different levels of sophistication reason with quantities in significantly different ways. This session explores how school mathematics can be organized to support students’ QR and AR.

Hwa Young Lee  
University of Georgia, Athens
Amy J. Hackenberg  
University of Indiana, Bloomington
Amy Ellis  
University of Wisconsin–Madison
David R. Liss II  
University of Georgia, Athens
Discussant: Heather Lynn Johnson  
University of Colorado Denver

Room 208/209/210
Interactive Paper Session
Presider: Robert Q. Berry
University of Virginia, Charlottesville

Children’s Mathematics Interactions with Virtual Manipulatives on iPads
The purpose of this project was to build theory and knowledge about the nature of young children’s thinking and interacting with touch-screen mathematics apps on the iPad. Results of children’s mathematical interactions will be discussed in terms of learning progressions, time to mastery, accuracy/speed ratios, children’s strategies, and representation use.

Patricia S. Moyer-Packenham
Utah State University, Logan
Jessica F. Shumway
Utah State University, Logan
Stephen I. Tucker
Utah State University, Logan
Jennifer Boyer-Thurgood
Utah State University, Logan
Jessica Hunt
Utah State University, Logan
Arla Westenskow
Utah State University, Logan
Emma Bullock
Utah State University, Logan

From Research to Practice:
Measuring Length in First Grade
As part of a NSF-funded study on learning trajectories (LTs), we conducted a classroom teaching experiment on length measure in a first-grade classroom. We present multiple analyses, including (a) findings supporting the LT, but also suggesting revisions of its instruction; and (b) challenges in bridging from research into practice.

Douglas H. Clements
University of Denver, Colorado
Douglas W. Van Dine
University of Denver, Colorado

The Messy Practice of Assessment in Pre-K Mathematics
In this session we open a discussion about issues that arise using clinical interviews to assess young children’s mathematical skills. We share background on the current climate driving increased mathematics assessment in the early years and data to promote discussion about what we can learn, but not assume, from clinical assessments, and what the obstacles are when using them with young children.

Kelly Harrigan
University of Wisconsin–Madison
Anita A. Wager
University of Wisconsin–Madison

Area Measurement: Non-Square Units and New Connections
The purpose of this paper session is to report the results of a research project that explored the ways elementary and middle school students resolved area measurement tasks with a variety of area units. The results extend the existing literature on the ways students resolve area measurement tasks. Instructional implications will be discussed.

Amanda L. Miller
Illinois State University, Normal

Challenges Students with and without Disabilities Experience Using Diagrams
This session presents findings and implications for practice from a study that examined challenges students experienced when using a diagram to solve word problems. A total of nine challenges were identified, which students with learning disabilities consistently experienced more than high-achieving peers.

Delinda van Garderen
University of Missouri, Columbia
Amy Scheuermann
Minnesota State University, Mankato

Multiple Representations of Mathematical Concepts through a Semiotic Lens
Proficiency in mathematics has long been described as the ability to fluently move between different ways of interpreting and representing mathematical concepts. This session will outline a semiotic-based approach that treats mathematical concepts as a combination of patterns of semantic relations that contextualizes the content within a set of social practices.

Michael Gilbert
University of Massachusetts Boston
Fabian Torres-Ardilla
University of Massachusetts Boston

Room 203/204
Interactive Paper Session
Presider: Allyson Hallman-Thrasher
Ohio University, Athens

Example-Based Insights, Viable Arguments, and Technical Handles
Findings from a generative study that develops a framework for communicating example-based viable arguments for generalizations are reported. Identified are three types of technical handles that appear constructive in communicating viable arguments when examples or example-based conceptual insights are expressed.

David A. Yopp
University of Idaho, Moscow

Geometry Teachers’ Perspectives about Students’ Difficulties Remembering
The study examines geometry teachers’ reactions to an animated vignette where a class solves a problem about isosceles right triangles. Participants discussed students’ difficulties remembering procedures with radicals and identified a teaching problem: letting students use approximations could compromise students’ identification of numerical patterns. Participants proposed ways to support students.

Gloriana Gonzalez
University of Illinois at Urbana-Champaign, Champaign

Remediating Conceptually: A Look at Conceptual and Procedural Growth
Conceptual and procedural growth will be presented for first-semester freshmen enrolled in a sequence of two remedial mathematics courses aimed at remediating topics conceptually. These results will also be compared to the conceptual and procedural growth of students in a traditional remedial sequence focused on procedural facility.

Rachel M. Bachman
Weber State University, Ogden, Utah

Preservice Teachers’ Beliefs on Constructing and Critiquing Valid Arguments
Discussion Session
This study investigates preservice teachers’ understandings of constructing and critiquing valid arguments and focuses on elements they believe constitute viable arguments. Implications associated with misunderstandings and the actions taken to help preservice teachers support students in constructing mathematical arguments will be discussed.

Cory A. Bennett
Idaho State University, Pocatello

Preservice Teachers’ Beliefs on Constructing and Critiquing Valid Arguments
Discussion Session

Measuring Teachers’ Fidelity of Implementation to CME Project Algebra 1
Research Symposium
Two observational tools designed to measure teachers’ fidelity of implementation to CME Project Algebra 1, a curriculum that emphasizes mathematical practices, will be presented. Discussion will include instrument design, fidelity data, and recommendations for measuring implementation of curricula that support high-level thinking among students.

Zuzka Blasi
Education Development Center, Waltham, Massachusetts

Mike Steele
University of Wisconsin–Milwaukee

Pursuing and Utilizing the NSF CAREER Award
Research Symposium
This session will provide an overview of the NSF Faculty Early Career Development (CAREER) Program for junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research. Recent CAREER awardees will discuss their experiences.

Jeffrey J. Wanko
School of Education, Health, and Society, Miami University, Oxford, Ohio

Anna Shusterman
Wesleyan University, Middletown, Connecticut

Luis Saldanha
Arizona State University, Tempe

Laurie Rubel
City University of New York, Brooklyn

Debra I. Johanning
University of Toledo, Ohio
33
Theorizing Racism: Unpacking Supremacy, Privilege, and Justice in Mathematics Education

Discussion Session
This symposium will facilitate a critical conversation around racism in mathematics education, with a focus on examining issues of supremacy, privilege, and justice. Mathematics education scholars will explore new research directions and conceptual tools. An interactive format will allow participants to engage presenters and one another.

Na’ilah Suad Nasir  
University of California, Berkeley

David W. Stinson  
Georgia State University, Atlanta

Danny B. Martin  
University of Illinois, Chicago

Maxine McKinney de Royston  
University of California, Berkeley

Room 220/221/222

34
Best Practices from Mathematics Education and Special Education Research

Research Symposium
We explore how the synergy between mathematics education and special education can enhance the mathematical learning of all students, including struggling learners. We discuss special education identification and urban education, assessment and intervention in the elementary grades, and algebra-readiness interventions for middle grades.

Rose Vukovic  
New York University, New York

Karen D. King  
National Science Foundation, Arlington, Virginia

Karen S. Karp  
University of Louisville, Kentucky

Amy Lingo  
University of Louisville, Kentucky

Barbara J. Dougherty  
University of Missouri, Columbia

Diane Bryant  
University of Texas at Austin

Discussant: Michelle Stephan  
University of North Carolina at Charlotte

Room 216

35
Conceptualizing and Supporting Development: Learning Area Measurement in School

Research Symposium
We explore how area measurement develops in elementary curricula, how children’s understanding of area concepts develops in K–5 using trajectories, and the instructional implications of technological tools highlighting conceptual relationships in area measurement, chiefly the interplay between the lengths of two-dimensional shapes and their areas.

Jeffrey E. Barrett  
Illinois State University, Normal

Jack Smith  
Michigan State University, Williamston

Christine Massey  
University of Pennsylvania, Philadelphia

Douglas H. Clements  
University of Denver, Colorado

Cheryl L. Eames  
Illinois State University, Normal

Room 206

36
Curriculum Alignment as a Dynamic Process of Selective Interpretation

Discussion Session
The mathematics curricula of China, Israel, and Australia are examined for their commonalities and differences with specific attention to curricular alignment, which is presented as an active, purposeful process of selective interpretation by national, state, regional, and school agencies. Comparison across different school systems in different countries facilitates the interrogation of local practices and assumptions. Differences in curricular structure and alignment processes raise questions for the implementation of the U.S. Common Core State Standards for Mathematics.

Yiming Cao  
Beijing Normal University, China

Einav Aizikovitsh-Udi  
Beit Berl Academic College, Gedera, Israel

David Clarke  
University of Melbourne, Carlton, Australia

Room 212

37
Developing Common Core Mathematical Practice #7 in an Algebra Classroom

Discussion Session
Participants will provide feedback on the methods used in a design experiment to understand how classroom students look for and use structural similarities in algebraic representations. The curriculum in use is the CME Algebra 1 text, chosen for its problem-based approach and its focus on the development of Habits of Mind.

Roser A. Gine  
University of Massachusetts Lowell

Room 206
38  
High School Integrated Curricula and College Level Mathematics Performance

Discussion Session
It is important to understand the relationship between various high school mathematics curricula and students’ subsequent college mathematics achievement, course-taking patterns and persistence. An NSF funded program of research (2007–11) examined this issue over four years of college work for 10,000+ students in thirty-two four-year institutions.

Thomas R. Post  
*University of Minnesota, St. Paul*

William Bush  
*University of Louisville, Kentucky*

Robert Reys  
*University of Missouri, Columbia*

Room 207

39  
Implementing Mathematical Modeling in the Common Core Era

Research Symposium
Mathematical modeling is an area that our research indicates will prove particularly challenging to find success with given factors such as the lack of clarity around what counts as a mathematical modeling task. A goal of this research symposium is to explore some of the challenges and benefits of implementing modeling as described in CCSSM.

Michelle Cirillo  
*University of Delaware, Newark*

John A. Pelesko  
*University of Delaware, Newark*

Jinfa Cai  
*University of Delaware, Newark*

Discussant: Christian R. Hirsch  
*Western Michigan University, Kalamazoo*

Discussant: Elizabeth Phillips  
*Michigan State University, East Lansing*

Discussant: Sherry Fraser  
*Interactive Mathematics Program, Sausalito, California*

Room 214

40  
Interactive Paper Session

**Presider: Susan Gregson**  
*University of Cincinnati, Ohio*

Positioning in Small Groups during Mathematics Problem Solving
Through the results and data of a longitudinal study, this interactive paper presentation will ask the audience to identify in video clips and discuss the factors mediating the positioning process and participation of Latina/o students during mathematics problems in small groups.

Carlos A. López Leiva  
*University of New Mexico, Albuquerque*

The Development of Underrepresented Students’ Mathematics Identities
This study examined the mathematics identity development of underrepresented (low-income and first-generation-college) twelfth graders who participated in a college outreach program. The results indicate that program participation can help students develop positive math identities that can serve as a vehicle to recruit underrepresented students into mathematics and math-related majors in college.

Alison Marzocchi  
*University of Delaware, Newark*

The Promise of Qualitative Metasynthesis for Mathematics Education
How does a collective body of qualitative research findings contribute to our understanding of topics within mathematics education? This session will provide a rationale, definition, and procedure to conduct qualitative metasynthesis as a means of discovering patterns across and interpreting qualitative studies in mathematics education.

Kateri Thunder  
*James Madison University, Harrisonburg, Virginia*

Robert Q. Berry  
*University of Virginia, Charlottesville*

Room 203/204
41
Interactive Paper Session
Presider: Sandy M. Spitzer
Towson University, Maryland

Correlating Professional Noticing and Mathematics Knowledge for Teaching
This presentation describes how participation in an innovative learning experience correlated with the Mathematics Knowledge for Teaching of Pre-service Elementary Teachers (PSETs). The learning experience focused on the professional noticing of children’s numeracy and developed the capacity to attend to, interpret, and respond appropriately to the mathematical thinking of children.

Molly H. Fisher
University of Kentucky, Lexington
Jonathan N. Thomas
Northern Kentucky University/Kentucky Center for Mathematics, Highland Heights
Sara Eisenhardt
Northern Kentucky University, Highland Heights
Edna O. Schack
Morehead State University, Kentucky
Cindy Jong
University of Kentucky, Lexington
Janet L. Tassell
Western Kentucky University, Bowling Green

How Various Aspects of Teachers’ Mathematical Knowledge Affect Instruction
Following twenty-one in-service teachers enrolled in a master’s program for four years, I examined how changes in different aspects of teachers’ knowledge corresponded to changes in their practices. Results indicated that teachers’ specialized and pedagogical content knowledge corresponded to different aspects of instruction.

Yasemin Copur-Gencturk
University of Houston, Texas

What Knowledge Do Teachers Need for Effective Formative Assessment?
In this paper, we draw on the results of a large-scale field test of TASK, an instrument that was developed to measure teachers’ knowledge of student thinking within the context of looking at student-generated work to investigate the relationships between: (1) teachers’ analysis of student thinking; (2) the ability to situate student strategies in a learning trajectory; and (3) instructional decision making.

Caroline B. Ebby
University of Pennsylvania, Philadelphia
Philip Sirinides

42
Recognizing Opportunities for Productive Use of Student Thinking
Discussion Session
Participants will be introduced to and use a framework that considers the significance of student mathematical thinking and the pedagogical opportunities that thinking might create. The affordances and complexities of using the framework to analyze classroom discourse and to support teachers in productively using student thinking will be discussed.

Keith R. Leatham
Brigham Young University, Provo, Utah
Blake E. Peterson
Brigham Young University, Provo, Utah
Shari L. Stockero
Michigan Technological University, Houghton
Laura R. Van Zoest
Western Michigan University, Kalamazoo

43
The Algebra Project: Working for Quality Math Education for Students
Research Symposium
The Algebra Project is working the demand side to establish a standard for the bottom quartile of the nation’s high school students. Students entering high school in the bottom quartile should graduate ready to do college math for college credit. We will present a report from the field, how far we have come, and how far we have to go.

Robert P. Moses
The Algebra Project, Cambridge, Massachusetts
Bill Crombie
The Algebra Project, Cambridge, Massachusetts
Andre Hargunani
Augustus Hawkins High School, Los Angeles, California
José Antonio Orozco
Augustus Hawkins High School, Los Angeles, California
Discussant: OneLA- Industrial Areas Foundation
One LA-IAF, Los Angeles, California

Room 205
44
The NCTM Research Conference: A Brief History and Future Directions

Research Symposium
Learn about the history of the NCTM Research Conference and engage in conversations with other mathematics educators and the NCTM Research Committee about future directions for the conference.

Members of the NCTM Research Committee and Members of the SIG/RME Board of Directors
J. Michael Shaughnessy
Portland State University, Oregon
Patricia Campbell
University of Maryland, College Park
Larry Hatfield
University of Wyoming, Laramie
Judith Sowder
San Diego State University, California

45
A Learning Trajectory for Children’s Understanding of Variable

Brief Research Report
We share results from a design research study by which we identified a trajectory in grades K–2 children’s understanding of variables and variable notation as they explored functional relationships. Our findings suggest that even young children can begin to think in quite sophisticated ways about these core algebraic concepts.

Maria Blanton
TERC, Cambridge, Massachusetts
Barbara Brizuela
Tufts University, Medford, Massachusetts

46
Disrupting Popular Conceptions of Young Mathematicians

Brief Research Report
Our research explores “what might be” through case studies of disrupting popular conceptions of mathematics and young mathematicians in two ways: Grades 1–3 children engage with mathematics concepts from the high school curriculum (such as linear functions and infinity and limit), and they publicly share their learning with the wider community.

George Gadanidis
University of Western Ontario, London, Canada

47
Emphasizing Equality over Equity: District Decision-Making Regarding Algebra I

Brief Research Report
This presentation examines issues of equity under consideration by district mathematics decision-makers regarding students’ opportunities to learn algebra I. Trends from a national data set reveal decision-makers’ emphases on equality rather than equity, and a focus on “real life” mathematics over attending to aspects of students’ culture.

Lindsay M. Keazer
Michigan State University, East Lansing
Beth Herbel-Eisenmann
Michigan State University, East Lansing
Anne Traynor
Michigan State University, East Lansing

48
Examining the Influence of Tasks, Goals, and Anticipation on Instruction

Brief Research Report
This study investigates the impact that three factors [(a) the use of high-level tasks, (b) the identification of specific learning goals, and (c) the collaborative anticipation of student engagement in selected focus tasks] have on teachers’ ability to implement cognitively demanding tasks at a high level.

Samuel L. Eskelson
University of South Florida, Tampa
Margaret Smith
University of Pittsburgh, Pennsylvania

49
Findings from Preservice Mathematics Teachers’ Thinking in Arguing and Proving

Brief Research Report
This presentation shares findings from a study of four preservice secondary mathematics teachers’ thinking in proof and argumentation. Analysis suggests recall of prior mathematical experiences and visual representations play a large role in the construction of proofs and arguments.

Lisa Rice
University of Wyoming, Laramie
50
Students’ Instrumented Activity Using Etoys to Construct Trigonometric Functions

Brief Research Report
In this study I asked how students’ use of a computer-programming environment called Etoys shaped their work on a problem about modeling with sine and cosine functions. The constraints of the Etoys syntax forced students to be explicit about the roles of variables and quantities in compositions of functions.

Anna F. DeJarnette
University of Illinois at Urbana-Champaign, Urbana

Room 211

51
Students’ Reasoning about Angle Measure in Dynamic Geometry Instructional Games

Brief Research Report
Currently, NCTM and the CCSSM focus heavily on mathematical reasoning and sense making. In this study, we analyze the reasoning elementary and middle-school students use as they determine angle measure in several dynamic geometry instructional games. We also investigate the links that students construct between spatial and numerical reasoning.

Michael T. Battista
The Ohio State University, Columbus
Candace Joswick
The Ohio State University, Columbus
Kathryn Battista
The Ohio State University, Columbus

Room 220/221/222

52
Students’ Reasoning about Invariance of Volume as a Quantity

Brief Research Report
In this session, we will present the results of a qualitative research project that explored students’ reasoning about volume invariance and how their reasoning related to levels of sophistication in volume measurement.

Melike Kara
New York University, New York
Craig J. Cullen
Illinois State University, Normal

Room 214

53
The Impact of Early Colleges on Mathematics Teaching and Learning

Brief Research Report
This paper presents the results of the experimental study of the Early College High School (ECHS) model, implementing a universal algebra policy. It examines the impacts on mathematics outcomes for well-prepared and underprepared students in a longitudinal sample of ninth to eleventh graders. Qualitative analyses examine mathematics teaching at ECHS.

Nina P. Arshavsky
SERVE Center at UNCG, Chapel Hill, North Carolina
Julie Edmunds
SERVE Center at UNCG, Durham, North Carolina

Room 215

54
Toward an Analytical Framework for Contextualized Mathematics Instruction

Brief Research Report
Despite widespread recommendations to connect instruction to the “real world,” evidence suggests this practice is underutilized in many classrooms. To support teachers, researchers, and instructional designers, an analytical framework is offered. The framework sorts instructional activity according to how nonmathematical contexts are referenced.

Luke T. Reinke
University of Pennsylvania, Philadelphia

Room 212

55
Using Situated-Mediated Identity Theory to Explore Black Students’ Experiences

Brief Research Report
This qualitative study examines the experiences of black undergraduate students majoring in STEM disciplines at an elite, predominately white institution. Utilizing a sociocultural perspective on learning, the findings will aid in understanding the process by and conditions under which these students come to achieve.

Oren L. McClain
University of Virginia, Charlottesville

Room 203/204

56
Vacant Lots and Basketball Courts: Civic Engagement through Mathematics

Brief Research Report
What is the role of mathematics education in the civic development of youth? This paper examines how students’ conceptions of themselves as citizens as well as their conceptions of math are affected after a mathematical investigation into the disproportionate distribution of vacant lots and basketball courts in their city.

Vivian Y. Lim
University of Pennsylvania, Philadelphia

Room 207
Examining the Questions Posed to Elementary Students during Mathematics

This session has two purposes. First, we will share descriptive data about the types of questions posed to students across seventy lessons in twenty-four classrooms at four elementary schools. Second, we will identify how the teachers across schools differed in their questioning and describe factors that were potential influences.

Temple A. Walkowiak
North Carolina State University, Raleigh

Natalie J. Hawley
Wake County Public Schools, Raleigh

Eileen G. Merritt
University of Virginia, Charlottesville

Sara E. Rimm-Kaufman
University of Virginia, Charlottesville

Improving Teachers’ Core: Influence of PD on Teacher Knowledge

The results of pre- and post-test teacher knowledge measures following a CCSSM-targeted professional development (PD) will be reported. A description of the PD model and how features of the model influenced changes in teacher knowledge will be provided. Data showed growth in teachers’ conceptual understanding, pedagogical content knowledge, and overall test scores.

Erin Krupa
Montclair State University, New Jersey

Corey Webel
University of Missouri, Columbia

Jason McManus
Montclair State University, New Jersey

Supporting Teacher Development in Algebra: Impacts from the DELTA Study

This presentation shares results from three different modes of professional development on knowledge and practices of elementary mathematics teachers: (a) a weeklong institute supporting use of a unit; (b) participating in a self-guided digital media experience supporting use of a unit; and (c) using the guidance in the unit alone. Along with quantitative results, illustrative examples are also provided.

Adrienne A. Smith
Horizon Research, Chapel Hill, North Carolina

Courtney Layne Nelson
Horizon Research, Inc., Chapel Hill, North Carolina

Despina Stylianou
The City College of New York, New York

Synergy in Linking Research and Practice: Students’ Use of Multiple Tools

Motivated by a need to prepare students for the Common Core, this teaching experiment followed an iterative design. A teacher and researcher collaborated in planning, enacting, and revising instruction on a daily basis. Results on how to support students in using computer algebra systems (CAS) and paper-and-pencil as well as multiple representations will be shared.

Nicole L. Fonger
North Carolina State University, Raleigh
60
Knowledge for Teaching Informal Line of Best Fit
Research Symposium
Study of the informal line of best fit marks students’ introduction to statistical association, a fundamental statistical concept. We will present three research studies concerning the knowledge for teaching informal line of best fit and will engage participants in tasks and discussion concerning statistical knowledge for teaching.

Stephanie Casey
Eastern Michigan University, Ypsilanti
Nicholas H. Wasserman
Teachers College, Columbia University, New York, New York
David C. Wilson
State University of New York Buffalo
Adam Molnar
University of Georgia, Athens
Discussant: J. Michael Shaughnessy
Portland State University, Oregon

61
Mathematics Teaching in Urban Classrooms: Perspectives from Teachers and Researchers
Research Symposium
This interactive symposium focuses on discussion with audience members as researchers and teachers share cases of their own practice or the practice of other urban mathematics teachers. The discussion addresses unique challenges in urban classrooms for successful mathematics teaching based on reform efforts, spanning grade levels and settings.

Frances K. Harper
Michigan State University, East Lansing
Aki Murata
University of California, Berkeley
Mariel Triggs
University of California, Berkeley
Kara Kamikawa
Stanford University, California

62
Novel Explanations of Developmental Change in Numerical Estimation
Discussion Session
A prominent view in developmental psychology holds that children’s numerical thinking shifts from using logarithmic to linear mental representations. New evidence showing that proportional reasoning better explains children’s performance will be discussed, with the goal of fostering exchange between cognitive science and math education researchers.

Hilary Barth
Wesleyan University, Middletown, Connecticut

63
Research on Instructional Interventions: Taking Stock and Moving Forward
Discussion Session
Although there are important research studies on instructional interventions in mathematics classrooms, their number is disproportionately smaller than the number of studies that have documented problems of practice for which solutions are sorely needed. This discussion group will take stock of progress thus far and will consider ways of moving forward.

Gabriel J. Stylianides
University of Oxford, United Kingdom
Andreas J. Stylianides
University of Cambridge, United Kingdom

64
Successful Calculus Programs: Two-Year Colleges to Research Universities
Research Symposium
Students leaving STEM majors is a major national problem, and models of introductory STEM courses that retain students in the STEM pipeline are lacking. In this session we report on case studies of seventeen different calculus programs (from two-year colleges through research universities) with programs that contribute to student success.

Chris Rasmussen
San Diego State University, California
David Bressoud
Macalester College, St. Paul, Minnesota
Eric Hsu
San Francisco State University, California
Sean Larsen
Portland State University, Oregon
Vilma Mesa
University of Michigan, Ann Arbor
65  
Using Practice as a Site for Professional Learning for Teaching  
Discussion Session  
The session examines the use of practice as a context for professional development with a focus on three learning goals: (1) developing mathematical knowledge for teaching; (2) learning to analyze and reason about specific instructional practices and considerations; and (3) improving teachers' actual enactment skills with specific teaching practices.

Deborah Loewenberg Ball  
University of Michigan, Ann Arbor  
Hyman Bass  
University of Michigan, Ann Arbor  
Nicole Garcia  
University of Michigan, Ann Arbor  
Julie McNamara  
University of Michigan, Ann Arbor  
Michaela Krug O’Neill  
University of Michigan, Ann Arbor  
Meghan M. Shaughnessy  
University of Michigan, Ann Arbor

66  
Using Representations of Practice in Survey Research with Mathematics Teachers  
Research Symposium  
We illustrate and discuss the two research programs’ theoretical and methodological efforts to conceptualize, develop, and validate a suit of online, context-based instruments for studying mathematics teachers’ beliefs, norms, and obligations. The panel addresses the importance and challenges of researching teacher decision making on large scale.

Daniel Chazan  
University of Maryland, College Park  
Orly Buchbinder  
University of Maryland, College Park  
Justin K. Dimmel  
University of Michigan, Ann Arbor  
Ander Erickson  
University of Michigan, Ann Arbor  
Kristi Hanby  
University of Michigan, Ann Arbor  
Discussant: Patricio G. Herbst  
University of Michigan, Ann Arbor  
Discussant: Randolph Philipp  
San Diego State University, California

67  
Writing and Responding to Reviews  
Research Symposium  
This session will examine the manuscript review process from the reviewer’s and the author’s point of view. Using an article recently published in JRME as an example, the session will examine constructive criticisms in the initial reviews and how the author responded.

Jessica Pierson Bishop  
University of Georgia, Athens  
Cynthia Langrall  
Illinois State University, Normal  
Discussant: Andrew Izsak  
University of Georgia, Athens

68  
A Transformational Approach to Similarity: Results from the LTG Study  
Brief Research Report  
The Common Core emphasizes teaching geometric congruence and similarity based on transformations, a stark contrast to most previous standards. In this brief report session, we share findings from research on a professional development program focused on teacher learning needs related to this shift in geometry content.

Courtney Layne Nelson  
Horizon Research, Inc., Chapel Hill, North Carolina  
Daniel Heck  
Horizon Research, Inc., Chapel Hill, North Carolina  
Kristen Malzahn  
Horizon Research, Inc., Chapel Hill, North Carolina

69  
Beginning Secondary Teachers’ Use of Tasks to Support Equitable Spaces  
Brief Research Report  
An opportunity to learn frameworks can be used to support equitable classroom spaces. This session presents an opportunity to learn a continuum for tasks to help researchers think concretely about how the collection of tasks teachers use support students’ opportunities to learn.

Ayanna D. Perry  
North Carolina State University, Raleigh
70
Characterizing Teachers’ Goals for Student Learning

Brief Research Report
In this study, a secondary school teacher’s goals for student learning were coded using a framework developed from earlier work. Observed lessons spanned the use of both conceptually rich and conceptually poor curricula. Some unexpected findings of this study are shared, along with its implications for professional development.

Frank S. Marfai
Arizona State University, Tempe
Room 219

71
Gender Differences in Self-Efficacy and Mathematical Modeling Tasks

Brief Research Report
This study investigates gender differences regarding perceived self-efficacy and students’ performance on mathematical modeling tasks. Participants included 122 female and 103 male eighth- and ninth-grade students. Although male and female students differ in modeling self-efficacy beliefs, no gender differences were found on the modeling test.

Anu Sharma
University of Florida, Gainesville
Room 208/209/210

72
Male Domination to Masculinization: Chronicling Gender Equity in Mathematics Education

Brief Research Report
This report reviews the methodological and theoretical approaches to gender equity research in mathematics education. The literature was grouped into three analytical lenses—achievement, participation, and Critical Race Theory—to track gender equity’s development as a research paradigm in addition to its implications for mathematics teaching.

Luis A. Leyva
Rutgers Graduate School of Education, New Brunswick, New Jersey
Room 203/204

73
Mathematics Teacher Educators Supporting Prospective Teachers in Learning about CCSSM

Brief Research Report
We present findings from a survey of nearly 400 mathematics teacher educators (MTEs) related to their roles supporting prospective teachers in learning about the Common Core State Standards for Mathematics (CCSSM). We focus in particular on the activities MTEs use to engage prospective teachers with CCSSM and MTEs’ goals for those activities.

Corey Drake
Michigan State University, East Lansing
Jill Newton
Purdue University, West Lafayette, Indiana
Denise A. Spangler
University of Georgia, Athens
Room 205

74
Productive Struggle in Teaching and Learning Middle School Mathematics

Brief Research Report
Mathematics researchers suggest that struggling to make sense of mathematics is a necessary component of learning mathematics with understanding. Based on a study of student-teacher interactions that classified types of student struggles, teacher responses, and outcomes that were productive or not, a Productive Struggle Framework was developed.

Hiroko Kawaguchi Warshauer
Texas State University, San Marcos
Room 216

75
“Purely Ideological” Mathematics: A Case Study of Mathematics and Politics

Brief Research Report
I present an ethnographic study of an activist group that fought against cuts in the Toronto city budget in 2012. I discuss activists’ views on ideology and mathematics, how activists used mathematics, and the emerging division of labor that allowed them to do so despite widespread anxiety around mathematics.

Indigo Esmonde
University of Toronto, Canada
Room 220/221/222
76
Reasoning-and-Proving Opportunities for Teachers in Secondary Geometry Textbooks

Brief Research Report
This study extends previous work focused on secondary geometry student textbooks. Results are reported on the analysis of additional opportunities for students to reason-and-prove as mediated through teacher editions. Specifically, additional exercises, examples, and solutions all provide different opportunities than those shown in student texts.

Nicholas J. Gilbertson
Michigan State University, East Lansing
Lorraine M. Males
University of Nebraska–Lincoln
Kimberly C. Rogers
Bowling Green State University, Ohio
Samuel Otten
University of Missouri, Columbia

Room 212

77
Relational Understanding: Equivalent Fractions in Two Latino Classrooms

Brief Research Report
Investigation of relational understanding of fraction equivalence in two bilingual Latino classrooms strongly suggests the importance of supporting students to develop figurative and operative knowledge (Piaget, 1977) while providing multiple opportunities to relate these kinds of knowledge to students’ social, cultural, and linguistic resources.

Higinio Dominguez
Michigan State University, East Lansing

Room 211

78
Unpacking the CCSSM Time and Money with Learning Trajectory

Brief Research Report
This session describes the Time and Money Learning Trajectory (LT) developed by our project. We present results from teaching experiments with first and second graders on their conception of time and money using LT-based tasks developed specifically to support students in coordinating multiple composite units as the targeted proficiency level.

Dicky N. Ng
Friday Institute, North Carolina State University, Raleigh

Room 214

79
Colleagues 2.0: The MathTwitterBlogoSphere and Mathematics Teachers’ Professional Learning

Discussion Session
This discussion session introduces the innovative ways mathematics teachers have built professional community through social media. Using the personal experiences of teachers active on blogs and Twitter, we explore some of the possibilities and pitfalls of online teacher communities and their implications for professional learning.

Ilana S. Horn
Vanderbilt University, Nashville, Tennessee
Nicole Bannister
Clemson University, South Carolina
Annie Fetter
The Math Forum @ Drexel, Philadelphia, Pennsylvania
Shauna Hedgepeth
Lamar County School District, Purvis, Mississippi
Ashli J. Black
Illustrative Mathematics, Mt. Desert, Maine
Justin Lanier
Princeton Learning Cooperative, Princeton, New Jersey
José Vilson
New York City Public Schools, New York

Room 211

80
Context Matters: Findings from Two Experimental Studies of Online Algebra

Research Symposium
This symposium summarizes the context, implementation, and results from two randomized trials that tested the impact of online algebra I for two different purposes and in two different contexts: (1) to broaden access for high-achieving eighth graders, and (2) to provide summer credit recovery for at-risk ninth graders.

Kirk Walters
American Institutes for Research, Washington, D.C.
Jessica Heppen
American Institutes for Research, Washington, D.C.
Nick Sorensen
American Institutes for Research, Washington, D.C.
Suzanne Stachel
American Institutes for Research, Washington, D.C.

Room 215
81
Exploring Relations between Teachers’ Knowledge, Perspectives, and Practice

Research Symposium
Presenters describe the development of two measures of mathematics teachers’ perspectives—vision of high-quality mathematics instruction and views of students’ mathematical capabilities—and report on relationships between those measures, mathematical knowledge for teaching, and instructional quality of 120 middle-grades teachers over four years.

Charles Munter
University of Pittsburgh, Pennsylvania

Richard Correnti
University of Pittsburgh, Pennsylvania

Anne Garrison
Southern Methodist University, Dallas, Texas

Lynsey K. Gibbons
University of Washington, Seattle

Kara Jackson
University of Washington, Seattle

Discussant: Deborah Loewenberg Ball
University of Michigan, Ann Arbor

Room 214

82
Facilitating Teacher Learning to Develop Ambitious Practice in Mathematics

Research Symposium
Supporting the development of ambitious math instruction is complex and requires sophisticated forms of support for teachers’ learning. To understand more about facilitating teachers’ learning of ambitious practice, our symposium investigates high-leverage practices of professional development facilitators across different collaborative settings.

Karen Koellner
Hunter College, New York City, New York

Hilda Borko
Stanford University, California

Megan E Webster
McGill University, Montreal, Canada

Britnie D. Kane
Vanderbilt University, Nashville, Tennessee

Mollie H. Appelgate
Vanderbilt University, Nashville, Tennessee

Jonee Wilson
Vanderbilt University, Nashville, Tennessee

Room 208/209/210
3:30 p.m.–4:45 p.m.

84

Intensive Professional Development to Support Teachers’ Implementation of CCSS

Discussion Session

The key question: “What does it take to enable teachers to change their classroom practice?” We will evaluate a professional development model incorporating a coaching component using a de-privatizing “Math Studio,” designed to give teachers the support they need to fully understand the content and pedagogy necessary to teach effectively.

John C. Mayer  
University of Alabama at Birmingham

Ann M. Dominick  
University of Alabama at Birmingham

Sherry D. Parrish  
University of Alabama at Birmingham

Faye B. Clark  
University of Alabama at Birmingham

JoAnna Laney  
University of Alabama at Birmingham

85

Interactive Paper Session

Presider: Karen Hollebrands  
North Carolina State University, Cary

Enacting Reasoning-and-Proving in Secondary Mathematics Classrooms

After using recently developed materials, teachers overcame some of the challenges of enacting reasoning-and-proving by successfully selecting, modifying and implementing tasks and evaluating student work based on core elements of proof. Learn about the materials, examine classroom artifact packets, and contribute to an online database designed to be educative for teachers.

Michelle S. Switala  
Pine-Richland High School, Pittsburgh, Pennsylvania

Impact of Action Research on High School Teachers’ Professional Development

This session presents the narrative cases of two high-school mathematics teachers as they describe how employing four consecutive years of action research in their classrooms has propelled growth in their practice and leadership. Questions pertaining to the use of action research as a professional development tool will be addressed and discussed.

Michaele F. Chappell  
Middle Tennessee State University, Murfreesboro

Samantha A. Stevens  
Middle Tennessee State University, Murfreesboro

Candace P. Terry  
Middle Tennessee State University, Murfreesboro

Teacher Learning about Culturally Relevant Mathematics Pedagogy

What can high school teachers in urban schools learn in professional development (PD) about culturally relevant mathematics pedagogy? How does this learning translate into practice? Our focus is on identifying and interpreting changes in key instructional practices during participation in a yearlong PD.

AJ Stachelek  
Teachers College, New York, New York

Laurie Rubel  
City University of New York, Brooklyn, New York

Room 207

Room 203/204

Informing Practice

The Editorial Panel of *MTMS* is seeking submissions for its research department, Informing Practice. Articles for this department take research findings and translate them into practical outcomes, strategies, or tips that directly inform teachers’ classroom practice.

Examples of appropriate topics might include teaching linear functions, learning through problem solving, promoting proof in the classroom, addressing the needs of diverse learners, and using manipulatives to foster student understanding. Articles should—

- set up a classroom problem, issue, or question that is both relevant to teachers’ practice and connected to empirical research;
- address topics appropriate to middle-grades math;
- describe the research—possibly including the mathematics education literature base and the author’s findings—in a teacher-friendly voice;
- incorporate examples, student data, illustrations, and diagrams that will bring the research alive; and
- provide recommendations/tips for classroom teachers.

The manuscript should be no more than 2000 words. Send by accessing mtms.msubmit.net. On the tab titled Keywords, Categories, Special Sections, select Informing Practice from the Departments/Calls section.
Interactive Paper Session

_**Presider:** Erica Walker
Teachers College, Columbia University, New York, New York_

_Construct-Driven Fidelity Measurement in Data-Modeling Classrooms_

This paper describes a fidelity measure developed in the context of a Regents Competency Test (RCT) testing the efficacy of the statistics curriculum, Data Modeling. We defined fidelity as the extent to which variability in student-invented methods was used to amplify mathematical practices and concepts.

_**Ryan Seth Jones**
Vanderbilt University, Nashville, Tennessee_

_Initial Validation Efforts for a Classroom Observation Instrument_

The purpose of this session is to present the theoretical framework and initial psychometric evaluation of a mathematics instructional-practice observation instrument. Early analyses indicate promising findings in terms of both scale reliabilities and expected correlational relationships.

_Michele Brown Carney_
Boise State University, Idaho

_Jonathan Brendefur_
Boise State University, Idaho

_Gwyneth Hughes_
Boise State University, Idaho

_Keith Thiede_
Boise State University, Idaho

_Measuring Instructional Practices in Mathematics Using a Daily Log_

The purpose of this session is to introduce an instructional log for gathering data on daily mathematics teaching. We will share the theoretical framework shaping the log, results of an exploratory factor analysis indicating measured constructs, and early evidence of validity and score reliability.

_Elizabeth Greive_
North Carolina State University, Raleigh

_Temple A. Walkowiak_
North Carolina State University, Raleigh

_Carrie W. Lee_
North Carolina State University, Raleigh

87

Reasoning and Sense Making with Technology in Middle School

_Research Symposium_ Technology has long held the promise of supporting reasoning and sense making. Turning this promise into a reality is not straightforward. Presenters will show examples of ways that technology has been used to support the reasoning of middle school students and teachers, and provide guidance for effective classroom use of technology.

_Phil J. Vahey_
SRI International, Menlo Park, California

_Susan Nickerson_
San Diego State University, California

_Charles Patton_
SRI International, Menlo Park, California

_George J. Roy_
University of South Carolina, Chapin

_Teresa Lara-Meloy_
SRI International, Menlo Park, California

_Harriette Stevens_
Consultant, San Francisco, California

Room 219

88

Reasoning Quantitatively with Part, Whole, an Equation, and a Length

_Discussion Session_ The part-whole concept is emphasized in the elementary grades, but recognizing it in a more complex context is not trivial. Using the lens of the CCSSM Standards for Mathematical Practice, we discuss how grade 12 students attend to the structure of an equation and how they reason about the expressed quantities.

_Linda Venenciano_
University of Hawaii, Honolulu

_Hannah Slovin_
University of Hawaii, Honolulu

_Fay Zenigami_
University of Hawaii, Honolulu

_Melfried Olson_
University of Hawaii, Honolulu

_Judith Olson_
University of Hawaii, Honolulu

Room 212
The Smarter Balanced Assessment Consortium Mathematics Reasoning Project

Research Symposium
The Mathematics Reasoning Project is a research study designed to enhance the knowledge base regarding authentic evidence of mathematical reasoning in online environments. The consortium is examining ways for students to incorporate mathematical representations into their responses and evaluating automated processes for scoring new item types.

Shelbi Cole
Smarter Balanced, Olympia, Washington
Eli Luberoff
Desmos, Inc., San Francisco, California
Judy Hickman
CTB, Havana, Florida
Li Cai
University of California, Los Angeles
William McCallum
University of Arizona, Tucson
Kristin Umland
Illustrative Mathematics, Albuquerque, New Mexico
Patrick Callahan
Illustrative Mathematics, Coronado, California

Discussant: Mary P. Truxaw
University of Connecticut, Storrs

A Discursive Analysis of Teachers’ Routines in Contextualized Algebraic Lessons

Poster Session
Our presentation aims to show how two eighth-grade teachers implemented contextualized algebraic tasks. We will identify the patterns of their contextual and non-contextual discourse, and the routines they used for the whole lesson as well as in transitional moments between the two types of discourse.

Sihua Hu
Michigan State University, East Lansing

Aligning Mathematical Tasks to the Standards for Mathematical Practice

Poster Session
How do algebra teachers align mathematical tasks to the CCSSM Standards of Mathematical Practice? Using methods of design-based implementation research, we identified difficulties of alignment to practices and developed strategies identifying high-quality tasks.

Raymond Johnson
University of Colorado Boulder

An Examination of Mathematics Graduate Teaching Assistant Efficacy

Poster Session
Understanding the significance of teacher efficacy in the undergraduate mathematics classroom, the aim of this study is to examine the impact that pedagogical preparation, teaching experience, and career plans have on teaching assistants’ efficacy. This correlational study uses an ex post facto design in order to evaluate the aforementioned variables.

Patrice LaVette Parker
Georgia State University, Atlanta
**An Exploration of Preservice Elementary Teachers' Mathematical Knowledge for Teaching**

**Poster Session**
Mathematical knowledge for teaching is a unique category of knowledge that goes beyond a conceptual understanding of topics taught to students. While critically important, this class of knowledge remains inadequately understood, particularly among preservice teachers. What is the nature of preservice teachers’ mathematical knowledge for teaching?

Michael Jarry-Shore  
*McGill University, Montreal, Canada*

**Cognitive Demand of Teacher Prompting: Engaging Students in Mathematical Discourse**

**Poster Session**
Helping students engage in mathematical ideas and discussions requires teachers to prompt in a way that is more cognitively demanding than typical classroom Q&A sessions. This case study of three secondary teachers explores the types of prompts and cues used to encourage students to have meaningful conversations about mathematical concepts.

Jessica Lynn Jensen  
*University of Iowa, Iowa City*

**Curricular Support for Building on Students’ Partial Understandings**

**Poster Session**
The Learning Mathematics through Representations (LMR) supplemental curriculum encourages teachers to build on students’ partial understandings. The results of this qualitative interview study show that teachers perceived more support for this pedagogical strategy and used it more frequently during LMR lessons than with their “main” curriculum.

Nicole Leveille Buchanan  
*University of California, Berkeley*  
Anna McGee  
*University of California, Berkeley*

**Developing Rapport: Contours of Novice Teachers’ Mathematics Instruction**

**Poster Session**
Using data from a longitudinal study of beginning middle school mathematics teachers, I examine how teacher actions to establish rapport with students shape the experience of doing and learning mathematics. The findings underscore how seemingly nonmathematical actions shape the contours of mathematics instruction and new teacher development.

Enakshi Bose  
*University of Pennsylvania, Philadelphia*

**Does Computer Experience Affect Children’s Geometry Ability? A Cultural Comparison**

**Poster Session**
Our study explores if computer experience affects children’s geometry ability in Singapore and Australia by using a Hierarchy Linear Modeling approach. Results indicated that computer-use experiences affect students’ geometry ability but it also depends on teachers’ instruction. Results vary in two countries indicating culture differences exist.

Jia He  
*Michigan State University, East Lansing*  
Yiling Cheng  
*Michigan State University, East Lansing*

**Examining the Impact of Stereotypes within Mathematical Group Work**

**Poster Session**
This qualitative inquiry examines whether and how stereotypes impact students within the context of collaborative mathematical group work. The poster will share the experiences of one Asian female student and how she contended with various stereotypes from multiple timescales.

Lesley Dookie  
*University of Toronto, Canada*

**Improving Preservice Mathematics Teachers’ Capability for Generic Example Proofs**

**Poster Session**
This study examines the effectiveness of a course on reasoning-and-proving on preservice mathematics teachers’ abilities to recognize and construct generic example proofs. The findings support assertions that such a course can and does change preservice mathematics teachers’ capability with generic example proofs.

Ben Freeburn  
*Pennsylvania State University, University Park*  
Fran Arbaugh  
*Pennsylvania State University, University Park*  
Shiv Karunakaran  
*Pennsylvania State University, University Park*  
Nursen Konuk  
*Pennsylvania State University, University Park*
101
Investigating Teacher Knowledge While Transitioning to the Common Core
Poster Session
Participants from fourteen school districts enrolled in a three-year program that focused on increasing teacher knowledge in preparation for Common Core implementation. During the summer of 2013 the intensive training focused on modeling, functions, and algebra. Quantitative and qualitative data was collected throughout the training to assess change.

Erick B. Hofacker  
University of Wisconsin–River Falls
Kathryn Ernie  
University of Wisconsin–River Falls
Sherrie Serros  
University of Wisconsin–Eau Claire

102
Local and Global Approaches in Coordinating Multiple Mathematical Representations
Poster Session
Strategies for coordinating pairs of canonical mathematical representations (i.e., equation, graph, table) are revealed by analyzing high school student think-aloud data. Strategies are coded and classified as local or global. Strategy use is assessed in relation to effective coordination and as dependent upon the representations presented.

Briana L. Chang  
Temple University, Philadelphia, Pennsylvania
Theodore Wills  
Temple University, Philadelphia, Pennsylvania
Jennifer Cromley  
Temple University, Philadelphia, Pennsylvania

103
Long-Term Effect of Curricula on Mathematics Attitudes: A Qualitative Study
Poster Session
We interviewed twelfth-grade urban students who had used either standards-based or traditional mathematics curricula in middle school. Results indicate that these two types of middle school curricula may have different long-term effects on students’ attitudes and beliefs about the teaching, learning, and nature of mathematics.

John Moyer  
Marquette University, Milwaukee, Wisconsin
Victoria Robison  
Marquette University, Milwaukee, Wisconsin

104
Middle and High School Students’ Conceptions of Equality
Poster Session
Our study examined how middle and high school students interpret equality and the equal sign in the context of arithmetic and algebraic tasks. The results suggest that students’ interpretations are not stable and alternate between operational and comparative computational sameness. Implications for instructional practice are suggested.

Marta T. Magiera  
Marquette University, Milwaukee, Wisconsin
Leigh A van den Kieboom  
Marquette University, Milwaukee, Wisconsin

105
Prospective Elementary Teachers’ Conceptions of Lesson Experiments
Poster Session
This poster will describe an investigation of prospective elementary teachers’ conceptions of learning from teaching. Results suggest that although prospective teachers can learn the skills of lesson study or lesson experiments, they may fail to develop the disposition to systematically study teaching throughout their career.

Christine M. Phelps  
Central Michigan University, Mount Pleasant
Sandy M. Spitzer  
Towson University, Maryland

106
Single-Sex Classes and Middle-Grades Students’ Mathematics Self-Concept
Poster Session
This study examines the relationship between middle-school students’ mathematics self-concept and classroom type (single-sex or coeducational). One significant finding is that students in all-girls classes were more likely to disagree more strongly than all-boys and coeducational classes with the notion that mathematics is a male domain.

Dennis Kombe  
Clemson University, South Carolina
Amber Simpson  
Clemson University, South Carolina
S. Megan Che  
Clemson University, South Carolina
Sources of Self-Efficacy of Middle School Hispanic Students

Students' sources of self-efficacy in a predominantly Hispanic district were examined. Mastery experiences contributed the largest amount of variance followed by social persuasions, vicarious experiences, and physiological state. Mastery experiences and social persuasions contributed unique variance, and the sources shared variance in combination.

Linda Reichwein Zientek  
Sam Houston State University, Huntsville, Texas

Kathleen Cage Mittag  
Retired, University of Texas San Antonio

Bruce Thompson  
Texas A&M University, College Station

Students' Use of Inconsistent, Informal, and Insufficient Language in Geometry

This poster illustrates students' use of language that is inconsistent (with mathematical texts and classroom norms), informal (e.g., using "slanted" to describe angles or sides of shapes), and insufficient (e.g., describing rectangles as shapes with two pairs of equal and parallel sides) while learning geometry through a computer-based curriculum.

Candace Joswick  
The Ohio State University, Columbus

Michael T. Battista  
The Ohio State University, Columbus

Teaching Math in Urban Schools: Future Teachers' Beliefs and Performance

This poster presents results from a case study of three middle school preservice teachers investigating their beliefs regarding teaching mathematics to students in urban schools and their performance revising a task to be culturally relevant. The relation between and progress made in beliefs and performance will be presented.

Heather Gallivan  
University of Delaware, Newark

The Ritual Aspects of Teaching Fractions in a Fifth-Grade Classroom

In order to understand the cultural nature of teaching mathematics, we studied an intern teaching a fifth-grade class about fraction operations. We used the lens of ritual to analyze the classroom observations and interviews collected over the three-week unit. Here we share findings that contribute to a cultural portrait of teaching mathematics.

Andrea McCloskey  
Pennsylvania State University, University Park

Gwen Lloyd  
Pennsylvania State University, University Park

Courtney Lynch  
Pennsylvania State University, University Park

Views of Students' and the Quality of Mathematics Instruction Received

This poster discusses the analyses of teacher interview data and teacher video from a large middle-school mathematics education study (MIST, Vanderbilt) to explore the relationship between teachers' views of students of color and the mathematics instruction those students receive.

Mahtab Nazemi  
College of Education, University of Washington, Seattle

Young Children's Spatial Reasoning as a Springboard for Developing Equity

This case study highlights a unique teacher professional development project exploring the development of young children's spatial reasoning skills. The presentation demonstrates how guided collaborative inquiry offers the possibility of contributing to Cochran-Smith's (2004) six principles of teaching for social justice.

Fatima S. Jaffer  
University of Toronto, Canada

Beverly Caswell  
University of Toronto, Canada
113  
Analyzing Critical Moments in High School Mathematics Classrooms  
Research Symposium  
Teachers are faced with a myriad of impromptu decisions related to disruptions that occur while implementing mathematics lessons. The purpose of this symposium is to bring together several perspectives on analyzing critical moments in high school mathematics classrooms.

Karen Hollebrands  
North Carolina State University, Cary

Shari L. Stockero  
Michigan Technological University, Houghton

Keith R. Leatham  
Brigham Young University, Provo, Utah

Charity Cayton  
East Carolina University, Greenville, North Carolina

Room 216

114  
An Instructional Model to Develop Preservice Teachers' Professional Noticing Skills  
Discussion Session  
This session presents an instructional module designed to develop professional noticing (attending, interpreting, and deciding) skills with preservice elementary teachers in the context of early numeracy. Presenters will facilitate a discussion around methods for teaching and assessing professional noticing, along with research results and goals.

Edna O. Schack  
Morehead State University, Kentucky

Sara Eisenhardt  
Northern Kentucky University, Highland Heights

Molly H. Fisher  
University of Kentucky, Lexington

Cindy Jong  
University of Kentucky, Lexington

Janet L. Tassell  
Western Kentucky University, Bowling Green

Jonathan N. Thomas  
Northern Kentucky University/Kentucky Center for Mathematics, Highland Heights

Room 211

115  
Building Research Communities in Mathematics Education  
Research Symposium  
Three researchers in mathematics education—Dan Chazan, Marta Civil, and Jacqueline Leonard—share insights about how to create research networks within and across institutions and involving faculty, graduate students, and others in order to develop and disseminate research around specific topics.

Erica Walker  
Teachers College, Columbia University, New York, New York

Daniel Chazan  
University of Maryland, College Park

Marta Civil  
University of North Carolina at Chapel Hill

Jacqueline Leonard  
University of Wyoming, Laramie

Room 219

116  
Fostering K–12 Prospective Teachers’ Curricular Noticing  
Research Symposium  
This symposium reports the results of studies of the critical analysis of curriculum materials by K–12 prospective teachers. We introduce a “curricular noticing” framework to describe prospective teachers’ unpacking of mathematical and pedagogical opportunities in curriculum. Shifts in prospective teachers’ curricular noticing will be described.

Leslie Dietiker  
Boston University, Massachusetts

Julie Amador  
University of Idaho, Coeur d’Alene

Darrell Earnest  
University of Massachusetts Amherst

Lorraine M. Males  
University of Nebraska-Lincoln

Micah Stohlmann  
University of Nevada, Las Vegas

Discussant: Corey Drake  
Michigan State University, East Lansing

Room 208/209/210
117
Interactive Paper Session
Presider: Kathryn B Chval
University of Missouri, Columbia

A Multimodal Study of Registers for Doing Proofs in Geometry
We report on a multimodal register analysis of instances of “doing proofs” in high school geometry. The session has two purposes: (1) to provide a systemic semiotic description of different registers for “doing proofs” in geometry, based on video analyses of classroom episodes; and (2) to demonstrate how multimodal register analysis can be used to examine the activity that occurs in mathematics classrooms.

Justin K. Dimmel
University of Michigan, Ann Arbor
Patricio G. Herbst
University of Michigan, Ann Arbor

Students’ and Experts’ Multiple Representations of Rate of Change
The proposed interactive session focuses on novices’ and experts’ use of multiple representations to represent rate of change. The small group discussion will have video excerpts as well as handouts consisting of data excerpts and images from the interviews. The focus of this discussion will be on participants using the excerpts and video to engage in discussion about the proposed framework of schemes for rate of change.

Eric Weber
Oregon State University, Corvallis
Allison Dorko
Oregon State University, Corvallis

Students’ Proof Schemes for Proving and Disproving of Propositions
This proposal presents students’ proof schemes for proving and disproving mathematics propositions using 480 proofs constructed by sixty Singapore students. A seven-level classification for proving and a six-level classification for disproving revealed the cognitive nuances in inferential processes and suggested an interplay found between students’ mathematical knowledge and inferential processes.

KoSze Lee
University of North Florida, Jacksonville

118
Interactive Paper Session
Presider: Michelle Stephan
University of North Carolina at Charlotte

Learning Together: Looking for Learning in Coach-Teacher Interactions
I will present a method for the examination of learning in coach-teacher interactions. Participants will be invited to reflect upon and question the method presented, as well as to share methods that they employ or with which they are familiar. The discussion will lead to greater shared understanding of the study of coach-teacher interactions.

Evra Baldinger
University of California, Berkeley

Novice Teacher Efficacy in Promoting Discussion: The Benefits of Mentoring
This paper discusses a study of novice middle-school mathematics teachers teaching low-income students of color. Teachers focused on developing student discussion by engaging in a reflective-teaching cycle with a mentor. Through mentoring, the teachers negotiated challenges with facilitating discussion. Results may influence novice-teacher support as well as mentoring models.

Emily Joy Yanisko
University of Maryland, College Park

Developing Teacher Learning Opportunities in Mathematics Studio
This study documents how Mathematics Studio, a school-based professional development program similar to lesson study, provided seventh-grade teachers with the knowledge, skills, and resources to engage students in mathematical discussions. An analysis of the role the coach, principal, and teachers played in establishing learning opportunities provides insight into facilitation necessary for sustained, collaborative learning.

Kristin Lesseig
Washington State University Vancouver

119
Massive Open Online Courses for Educators: A Learning Trajectory-Based MOOC
Discussion Session
Implementing the Common Core demands innovative, rapid, and flexible professional development. We developed a MOOC for educators on the Equipartitioning learning trajectory for interpreting the Common Core. In this session, we describe critical course components, instructional design, lessons learned, and findings from research on the course.

Alan P. Maloney
North Carolina State University, Raleigh
Tamar Avineri
North Carolina State University, Raleigh
120
Perspectives on Linking Research and Practice:
Thoughts from the Field

Research Symposium
Current Linking Research and Practice award-winners will discuss ways how to advance a successful research agenda with emphasis on bringing together the research and practitioner communities.

Lynsey Gibbons
University of Washington, Seattle

Kara Jackson
University of Washington, Seattle

Heather Lynn Johnson
University of Colorado Denver

Jonathan N. Thomas
Northern Kentucky University/Kentucky Center for Mathematics, Highland Heights

Discussant: Michael C. Fish
National Council of Teachers of Mathematics, Reston, Virginia

Room 220/221/222

121
Providing Support for Mathematics Teaching to
English Language Learners

Discussion Session
Participants will be invited to share ideas and suggestions for teaching mathematics to English Language Learners (ELLs). Led by the co-PIs of a federal Department of Education Title III research and professional development project, we will include an overview of the theoretical foundation for the research and the most up-to-date findings.

Fabián Torres-Ardila
University of Massachusetts Boston

Michael Gilbert
University of Massachusetts Boston

Room 207

122
Psychometric Methods in Math Education: New
Opportunities and Challenges

Research Symposium
This symposium examines issues of theory and method that researchers have encountered harnessing a range of psychometric models for measuring mathematical knowledge in innovative ways. The presentations will preview four chapters from an upcoming JRME monograph, two focused on unidimensional and multidimensional models and two focused on validity.

Andrew Izsak
University of Georgia, Athens

Nicole Kersting
University of Arizona, Tucson

Chandra Orrill
University of Massachusetts Dartmouth

Room 214

123
Student Perspectives on Learning in Critical
Mathematics Classrooms

Research Symposium
This session draws on three separate but complementary studies that report on student perspectives in critical mathematics classrooms in which students experienced mathematics to study social justice issues in their lives, communities, and world. Researchers share, discuss, and analyze student insights on both what and how they learned.

Patricia M. Buenrostro
University of Illinois at Chicago

Susan Gregson
University of Cincinnati, Ohio

Rodrigo J. Gutierrez
University of Maryland, College Park

Eric (Rico) Gutstein
University of Illinois at Chicago

Room 215

124
What We Talk about When We Talk about Logs

Discussion Session
We demonstrate three pilot instruments for studying how students and teachers conceive of, operate with, and interact around the teaching of logarithms in the secondary advanced algebra or algebra 2 course. Participants will discuss the roles that formal properties of logarithms do or do not play in classroom teaching and student thinking.

Michael K. Weiss
Program in Mathematics Education (PRIME), Michigan State University, East Lansing

Michael Morissette
Program in Mathematics Education (PRIME), Michigan State University, East Lansing

Room 212
124.1
A Practical Theory of Productive Persistence in Mathematics Education

Plenary Session
Advances in the learning sciences and in effective academic effort have implications for mathematics education. We will review motivation theory, attribution theory, and behavioral economics and how they apply to teaching next-generation standards and making the Common Core Standards for Mathematics Practice a normative part of mathematics instruction.

Philip Uri Treisman
Charles A. Dana Center, University of Texas at Austin

Room 208/209/210

125
Are Missing Value Proportional Problems Becoming Out of Touch?

Brief Research Report
Middle school students’ ability to solve missing value proportional problems is often considered indicative of whether they have mastered the topic of ratios and proportions. Our study, however, found that most “successful” students could not recognize the difference between situations that involved proportional relationship and those that did not.

Hartono Tjoe
Pennsylvania State University, Reading

Jimmy de la Torre
Rutgers University, New Brunswick, New Jersey

Room 211

126
Beyond Rise-over-Run: A Design Experiment and Learning Trajectory for Slope

Brief Research Report
Student understanding of slope is often formulaic. To explore how students learn slope in a more robust way, we conducted a design experiment to refine a learning trajectory for slope organized around rates of change. I will present the learning trajectory and the ways that student learning was mediated by context and cultural tools.

Frederick Peck
Freudenthal Institute US, Boulder, Colorado

Room 215

127
Examining Problem-Based Learning in Graduate Statistics for the Social Sciences

Brief Research Report
Problem-Based Learning (PBL) based in constructivist theory was used to investigate: “What is the impact of a PBL approach in teaching graduate statistics in the social sciences?” Results revealed lower average statistics anxiety levels and higher average levels of project management skills for graduate students in PBL versus non-PBL environments.

Carla J. Thompson
University of West Florida, Pensacola

Giang Nguyen
University of West Florida, Pensacola

Room 219

128
Influences of Coaching Knowledge on Teacher Change

Brief Research Report
Changes in coaching knowledge are tied to teacher improvement. Study found evidence that improvements in coaches’ knowledge of predominant coaching literature are related to improvements in teachers’ MKT and that improvements in coaches’ self assessment of coaching skills are related to improvements in teachers’ MKT, practice, and self-efficacy.

John Sutton
sutton@rmcdenver.com
RMC Research Corporation, Denver, Colorado

David A. Yopp
University of Idaho, Moscow

Room 206

129
Initiating Students into Mathematical Discourse Internationally

Brief Research Report

David Clarke
University of Melbourne, Carlton, Australia

Room 216
130
Interactions among Learning Trajectories for Length, Area, and Volume Measurement

Brief Research Report
Our research team will characterize the concept and strategy growth in spatial measurement for eight case study children over four years using hypothetical learning trajectories (LTs). Our results illustrate interactions among LTs for length, area, and volume measurement (Sarama and Clements 2009) across pre-K to grade 5.

Cheryl L. Eames
Illinois State University, Normal
Jeffrey E. Barrett
Illinois State University, Normal
Julie Sarama
University of Denver, Colorado

Room 203/204

131
Leveraging Simultaneous Renewal in an Era of Mathematics Education Reform

Brief Research Report
We will present a study of the teachers at a K–5 school who participated in a professional development program that included a course that doubled as a preservice methods course. Thus, preservice and in-service teachers were studying the same methods together, and in effect, mentoring each other in their learning.

Damon L. Bahr
Brigham Young University, Provo, Utah
Eula E. Monroe
Brigham Young University, Provo, Utah

Room 208/209/210

132
Middle-School and Secondary Teachers’ Transformative Learning of Center

Brief Research Report
This study investigates how dilemma, critical reflection, and rational discourse affect middle-school and secondary teachers’ reasoning about center. Framed by transformation theory, the study highlights how teachers’ engagement with PD activities focused on these elements can enhance teachers’ understandings of traditionally problematic content.

Susan A. Peters
University of Louisville, Kentucky

Room 212

133
Professional Development Integrating Math and Language Supports for English Learners

Brief Research Report
Session will overview a study of professional development for middle-grades math teachers of English learners that is focused on language support strategies and use of visual representations. We will share emergent findings about teachers’ increased focus on developing academic language and discuss these findings and implications with participants.

Jill M. Neumayer DePiper
Education Development Center, Waltham, Massachusetts
Johannah Nikula
Education Development Center, Waltham, Massachusetts
Mark J. Driscoll
Education Development Center, Waltham, Massachusetts

Room 220/221/222

134
Teacher Practices for Orchestrating Discussions about Mathematical Definitions

Brief Research Report
We examine how one teacher supported a class of sixth-grade students to make sense of, reason about, and author definitions about polygons, triangles, and related properties. We describe seven teaching practices for orchestrating such discussions and illustrate how the teacher’s practices shifted in relation to the students’ emergent needs.

Marta Kobiela
McGill University, Montreal, Canada
Richard Lehrer
Vanderbilt University, Nashville, Tennessee

Room 205

135
Understanding Specialized Content Knowledge at the Middle School Level

Brief Research Report
This work investigates middle school teachers’ specialized content knowledge. A model of mathematics knowledge for teaching was explored through confirmatory factor analysis on a nationally representative dataset of middle school mathematics knowledge for teaching. Middle school mathematics teachers were then selected for a follow-up study.

Lauren E. Provost
University of New Hampshire, Durham

Room 207
12:30 p.m.–1:00 p.m.

136
Ways to Elicit Reasoning: Hunt-then-Fish vs. Anticipatory Tasks

Brief Research Report
Based on how the students empirically or reflectively abstracted, we found two different ways tasks were implemented to elicit generalizing and justifying. Students needed to attend to a technical handle in order to justify analytically, but what enabled this was markedly different between the two task implementation types.

Robert Ely
University of Idaho, Moscow
Anne E. Adams
University of Idaho, Moscow
Veronica Blackham
University of Idaho, Moscow

1:15 p.m.–2:30 p.m.

137
Assessing the Eliciting and Interpreting of Students’ Mathematical Thinking

Discussion Session
In many professions, there is a shared awareness of the skills that beginners bring to initial professional training. This is less true in teaching. This discussion session focuses on the practices of eliciting and interpreting children’s mathematical thinking and examines what is involved in assessing novices’ entering skills.

Meghan M. Shaughnessy
University of Michigan, Ann Arbor
Timothy Boerst
University of Michigan, Ann Arbor
Deborah Loewenberg Ball
University of Michigan, Ann Arbor

138
Centering Instruction on Students: Mathematics Teacher Education for Equity

Research Symposium
Student-centered instruction as a means for attending to equity in mathematics classrooms is explored through three studies of professional development. Teacher education researchers and pre-K–12 classroom teachers will discuss their programs and practices, and they will provide insight into multiple approaches to student-centered instruction.

Anita A. Wager
University of Wisconsin–Madison
Laurie Rubel
City University of New York, Brooklyn, New York

1:15 p.m.–2:30 p.m.

139
Exploring and Explaining Trends in NAEP Mathematics Performance

Discussion Session
This session will start with a brief presentation of results from the Main and Long-Term Trend mathematics NAEP assessments and then move into discussion of why there are such varying interpretations of the results. Participants will be encouraged to speculate on why we see the trends that we do and what the trends mean for curriculum, teaching, and policy.

Peter Kloosterman
Indiana University, Bloomington
Doris Mohr
University of Southern Indiana, Evansville
Crystal Walcott
Indiana University-Purdue University, Columbus
Arnulfo Perez
Indiana University, Bloomington
Michael Roach
Indiana University, Bloomington
Frank K. Lester
Indiana University, Bloomington
Kathryn Essex
Indiana University-Purdue University, Columbus
Michael Daiga
Indiana University, Bloomington
140
How Should the Enacted Mathematics Curriculum Be Conceptualized and Studied?

Research Symposium
In this session participants will consider approaches to studying the enacted mathematics curriculum. The session presents several research approaches that focus on different grade levels, use different methodological techniques, and consider different aspects of enactment, including the role of the teacher, students, and the curricular resources.

Janine Remillard
University of Pennsylvania, Philadelphia
Joshua Taton
University of Pennsylvania, Philadelphia
Kara Jackson
University of Washington, Seattle
Indigo Esmonde
University of Toronto, Canada
Anne Garrison Wilhelm
Southern Methodist University, Dallas, Texas
Discussant: Mary Kay Stein
University of Pittsburgh, Pennsylvania

141
Interactive Paper Session
Presider: Karen Hollebrands
North Carolina State University, Cary

Preservice Elementary Teachers’ Understanding of Fraction Multiplication
One hundred sixty-four preservice teachers were asked to write a story problem and interpret drawn diagrams for fraction multiplication. Types of interpretations of multiplication of fractions used in the problems written, its relationship with the ability to interpret drawn diagrams, and the presentation of fraction multiplication in K–12 textbooks will be discussed.

Jihwa Noh
University of Northern Iowa, Cedar Falls
Karen Sabey
University of Northern Iowa, Cedar Falls

Missing the Core: Classroom Representations of Fraction Multiplication
We present an analysis of visual models of fraction multiplication constructed in five fifth-grade classes. We describe the ways in which the CCSSM were and were not reflected in the representations.

Corey Webel
University of Missouri, Columbia
Erin Krupa
Montclair State University, New Jersey
Jason McManus
Montclair State University, New Jersey

Iceberg Synthesis of Fraction Learning Related to Manipulatives Use
This study used an iceberg learning trajectory to synthesis data collected comparing learning differences related to virtual and physical manipulative equivalent fraction intervention instruction with fifth-grade Tier II students. Clusters and subconcepts were identified in which the affordances of one manipulative favored instruction over the other manipulative.

Arla Westenskow
Utah State University, Logan
Patricia S. Moyer-Packenham
Utah State University, Logan

Room 211

142
Interactive Paper Session
Presider: Jeffrey J. Wanko
School of Education, Health, and Society, Miami University, Oxford, Ohio

Covariation and Correspondence Relationships in Elementary Schooling
We focus on development of students’ early expression of covariation and correspondence (functional) relationships through instructional tasks supporting generalization of pattern relationships. We present a teaching experiment conducted in a fifth-grade classroom, and we explore students’ expressions of those relationships. Implications for CCSSM implementation and research are also discussed.

Nicole Panorkou
North Carolina State University, Raleigh

Implementing Elementary Mathematics Materials
Can district-led elementary mathematics improvement efforts increase student achievement? We describe a mixed methods project studying twelve districts’ implementation of K–5 mathematics materials. In light of the Common Core State Standards for Mathematics, this study suggest lessons about how the consistent use of coherent instructional materials paired with implementation supports can improve teacher use of materials and student achievement.

Kristen E Reed
Education Development Center, Waltham, Massachusetts
Jessica M. Young
Education Development Center, Waltham, Massachusetts
June Mark
Education Development Center, Waltham, Massachusetts

Mathematically Gifted Students’ Experiences of Challenge
This study examined the extent that mathematically gifted students were challenged in elementary math classrooms that used a CGI problem-solving approach. An operational definition of mathematical challenge and a framework for measuring it were created and used to suggest that the complexity of the problems should be increased to elevate challenge.

Kim Krusen McComas
University of Arkansas, Fayetteville

Room 219

Room 205
143  
**Mathematics Teacher Educator: Information for Potential Authors**

**Discussion Session**

Members of the Mathematics Teacher Educator editorial board will share information about the journal and the types of manuscripts that are aligned with the journal’s mission. Advice for both authors and reviewers will be provided.

**Margaret Smith**  
pegs@pitt.edu  
University of Pittsburgh, Pennsylvania

**Melissa Boston**  
Duquesne University, Pittsburgh, Pennsylvania

**Denise A. Spangler**  
University of Georgia, Athens

Room 220/221/222

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144  
**Measuring Implementation of Mathematically Productive Teaching Routines in Urban Schools**

**Discussion Session**

In this session we will discuss a three-year PD project on the innovative Math Studio model. The project involves grades 3–5 teachers, principals, and students from a mid-sized urban public school district. A cluster-randomized efficacy design compares two approaches to PD implemented over three years: Studio Classrooms and Best Practices.

**J. Michael Shaughnessy**  
Portland State University, Portland, Oregon

**Eva Thanheiser**  
Portland State University, Portland, Oregon

**Julie Fredericks**  
Teachers Development Group, West Linn, Oregon

**Linda Foreman**  
Teachers Development Group, West Linn, Oregon

Room 206

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145  
**Supporting Fraction Addition and Subtraction Algorithm Development**

**Discussion Session**

Examine framework of instructional routines resulting from research on teacher practice related to number sense–based estimation in support of students developing algorithms for adding and subtracting fractions. Video cases being designed around framework of instructional routines will be shared and discussed.

**Debra I. Johanning**  
debra.johanning@utoledo.edu  
University of Toledo, Ohio

Room 207

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146  
**Technological Tasks, Cognitive Demand in Secondary Classrooms, and Teacher Education**

**Research Symposium**

The goal of this session is to compare and contrast research findings related to factors influencing cognitive demand of technological tasks that employ dynamic geometry in secondary mathematics classrooms, combined with a discussion of implications for teacher educators.

**Charity Cayton**  
caytonc@ecu.edu  
East Carolina University, Greenville, North Carolina

**Milan Sherman**  
Drake University, Des Moines, Iowa

**Allison McCulloch**  
North Carolina State University, Raleigh

**Jennifer Nickell**  
North Carolina State University, Raleigh

**Kayla Chandler**  
North Carolina State University, Raleigh

Room 215

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147  
**The Teacher’s Role in Formative Assessment: Finland, Canada, and U.S.**

**Research Symposium**

Researchers from three countries—Finland, Canada, and the United States—share the use of formative assessment in mathematics classes in their contexts. Each describes perspectives on formative assessment as well as their current research, with particular attention on the role of the teacher. Witness differences and similarities.

**Christine Suurtamm**  
Faculty of Education, University of Ottawa, Canada

**Martha Jane Koch**  
University of Manitoba, Winnipeg, Canada

**Heidi Krzywacki**  
University of Helsinki, Finland

**Denisse R. Thompson**  
University of South Florida, Tampa

Room 208/209/210
148
Writing Research for Teachers: Putting Results into Practice

Research Symposium

NCTM is committed to strengthening connections between classroom practice and research in mathematics education. A key way to build this connection is for researchers to publish research results in the three NCTM school journals. Work with this year’s award-winning authors and journal editors to develop your ideas for articles.

Gregory D. Foley
Ohio University, Athens

And members of the editorial panels of Mathematics Teacher, Mathematics Teaching in the Middle School, and Teaching Children Mathematics

Room 216

149
Characterizing Contexts That Support Understanding of Integer Subtraction

Brief Research Report

This study examines the connection between student difficulties with integer subtraction, specifically subtracting negatives, and the contexts we use to teach the operation. Helpful contexts emphasize the concept of net value, which represents the combination of two distinct and opposite objects.

Christy Pettis
University of Minnesota, St. Paul

Aran W. Glancy
University of Minnesota, St. Paul

Room 211

150
Improving Equation Solving and Equal-Sign Understanding with Nonstandard Equations

Brief Research Report

Students often misinterpret the equal sign as operational. Researchers hypothesize a lack of exposure to nonstandard equations contributes to this misinterpretation. Second-grade students received instruction with standard and nonstandard equations, and equation solving and equal-sign understanding improved with exposure to nonstandard equations.

Sarah Rannells Powell
University of Texas at Austin

Melissa Kypraios Driver
University of Virginia, Charlottesville

Room 205

151
Learning Integers through Argumentation: Mapping a Learning Trajectory

Brief Research Report

Mathematics involving negative numbers is often counterintuitive for students. We asked rising fifth graders to confront difficult questions to do with integers and to make sense of these via argumentation. We describe the learning trajectory that we theorize, drawing on data from a recent teaching experiment.

Ian Whitacre
Florida State University, Tallahassee

Courtney Flack
Florida State University, Tallahassee

Room 203/204

152
Meaningful Discourse in Linguistically Diverse Mathematics Classes

Brief Research Report

This research investigates discourse in linguistically diverse mathematics classrooms. Analysis focuses on flow and function of the verbal exchanges. Results demonstrate that the teacher’s role and specific verbal moves are critical in providing opportunities for English language learners to participate in meaningful mathematical discourse.

Mary P. Truxaw
University of Connecticut, Storrs

Room 214

153
Opportunities for Algebraic Reasoning in the Context of Integers

Brief Research Report

Some students can leverage principles of algebraic reasoning in problem-solving strategies for integer tasks. In this presentation we consider logical necessity and nonequivalent transformations—two ways in which students engaged, successfully and un成功的ly, with algebraic structures and invariant transformations while solving integer problems.

Jessica Pierson Bishop
University of Georgia, Athens

Randolph Philipp
San Diego State University, California

Lisa L. Lamb
San Diego State University, California

Room 220/221/222
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160 Adoption + Adaptation: Compatibility of Different Lesson Studies for U.S. Contexts

Brief Research Report

Different forms of East Asian lesson study provide different benefits for U.S. mathematics teachers. Various forms of Chinese lesson study—including model lessons by master teachers, exemplary lesson development (keli), and teacher research groups—may serve as viable substitutes for (and perhaps even a precursor to) Japanese lesson study.

Thomas E. Ricks
Louisiana State University, Baton Rouge

Yudong Yang
Shanghai Academy of Educational Sciences, Shanghai, China

Room 215

161 Advanced Placement Statistics Teaching Knowledge

Brief Research Report

Research in statistics education is lacking a benchmark that describes the types of teaching knowledge required of Advanced Placement Statistics teachers. To fill in this gap, an Advanced Placement Statistics Teaching Knowledge (APSTK) assessment is created to uncover relationships among assessment scores and teacher characteristic variables.

Brenna J. Haines
The George Washington University, McPherson, Kansas

Room 211

162 Identifying Primary Students in Need of Intervention: Primary Mathematics Assessment

Brief Research Report

There is a need for early identification of students who are experiencing difficulties in math and immediate and targeted intervention to build foundational skills and knowledge. This study demonstrate the effectiveness of the PMA as an early math screener, assessing four comprehensive areas (number, relationships, measurement, and space).

Jonathan Brendefur
Boise State University, Idaho

Michele Brown Carney
Boise State University, Idaho

Keith Thiede
Boise State University, Idaho

Room 212

163 Mathematics Teacher Educators’ Classroom Practices from K–8 Mathematics Content Courses

Brief Research Report

We will present the research findings from analyzing thirty-three classroom videos of five experienced mathematics teacher educators (MTEs) teaching K-8 mathematics content courses. Our findings include specific practices that MTEs employed to support preservice teachers’ development of Pedagogical Content Knowledge and Subject Matter Knowledge.

Aina K. Appova
The Ohio State University, Marion

Cynthia E. Taylor
University of Pennsylvania, Millersville

Room 205

164 Measuring Instruction in Elementary Mathematics Classrooms

Brief Research Report

Introducing a new mathematics instructional measure, the Comprehensive Mathematics Instruction (CMI) Observation Protocol! Six constructs important to attaining student mathematical understanding are measured. The validated protocol and constructs will be discussed.

Sue A. Womack
Utah Valley University, Orem

Sterling C. Hilton
Brigham Young University, Provo, Utah

Room 203/204

165 Preservice Elementary Teachers’ Visions and Enactment of Mathematical Discussions

Brief Research Report

Session focuses on PSTs’ visions of mathematical discussions on problem-solving tasks and how visions and enactments align. Two video clips of PSTs and children discussing problem-solving tasks will be shared and compared against PSTs’ task dialogues, imagined representations of hypothetical student-teacher discussions.

Allyson Hallman-Thrasher
Ohio University, Athens

Room 214
166
Proof and Reasoning in Secondary School Algebra Textbooks

Brief Research Report
This presentation will be on a paper exploring the extent to which the modeling of deductive reasoning and proof-type thinking occurs in secondary school mathematics courses in which students are not explicitly preparing to write formal mathematical proofs.

Philip Dituri
New Design High School, New York, New York

Room 208/209/210

167
Teacher Fidelity Decisions and Their Impact on Lesson Enactment

Brief Research Report
Making appropriate fidelity decisions is important in using curriculum to design instruction. We identify kinds of fidelity decisions that significantly impact the lesson enactment and highlight how such fidelity decisions support or hinder meeting lesson goals through the enacted lessons.

Ok-Kyeong Kim
Western Michigan University, Kalamazoo

Napthalin A. Atanga
Western Michigan University, Kalamazoo

Room 207

168
Teacher Time-Out: Supporting the Collective Learning of Educators

Brief Research Report
This presentation is an analysis of an organizational routine that transformed the interactions between coaches and elementary teachers by allowing for in-the-moment co-problem solving. The routine supported teachers’ collaborative learning as they worked together to refine their understanding of students’ reasoning and develop ambitious practices.

Lynsey K. Gibbons
University of Washington, Seattle

Elizabeth Hartmann
University of Washington, Seattle

Allison Hintz
University of Washington, Bothell

Room 206

169
Teachers’ Problem-Posing Responses to Children’s Mathematical Thinking

Brief Research Report
This study examined the practices of twenty teachers who participated in professional development around children’s mathematical thinking with the intent to generate a developmental trajectory that describes how one specific skill—responding to children’s mathematical thinking through problem posing—progresses in teachers.

Tonia Land
Drake University, Des Moines, Iowa

Andrew Tyminski
Clemson University, South Carolina

Room 216

170
Teachers’ Reasoning about Proportional Relationships as “Variable Parts”

Brief Research Report
We present a perspective on ratios and proportional relationships we call fixed number of variable parts that has been largely overlooked by research. We then report results from an ongoing study of prospective middle grades teachers’ capacities for reasoning about ratios and proportional relationships from this perspective.

Sybilla Beckmann
University of Georgia, Athens

Andrew Izsak
University of Georgia, Athens

Room 220/221/222

171
Three Levels of Units: Necessary for Intensive Quantity, but Insufficient

Brief Research Report
Many ways of reasoning quantitatively require taking three levels of units as given in operating. Yet several significant differences were observed in how students reasoned with three levels of units. The implications of these differences for students’ abilities to reason with proportional relationships and intensive quantities will be discussed.

David R. Liss II
University of Georgia, Athens

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