NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

THE NATION'S PREMIER MATH EDUCATION RESEARCH EVENT

2015 NCTM RESEARCH CONFERENCE

April 13–15 • Boston

Program Book

www.nctm.org/researchconf

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NCTM Research Committee

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Announcements

- The Research Conference will be held at the Westin – Boston Waterfront hotel.
- Registration will be held in Grand Ballroom Foyer. **Registration is required for attendance, and badges must be worn for all sessions.**
  - o Monday, 4:00 p.m.–7:30 p.m.
  - o 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 the Grand Ballroom Foyer from 8:30 p.m. to 10:00 p.m. following the opening session at 7:00 p.m. in Grand Ballroom A/B.
- Two sets of Research Posters Sessions will take place in Grand Ballroom C/D
  - o 5:45 p.m.–6:45 p.m. on Monday
  - o 5:00 p.m.–6:00 p.m. on Tuesday
- The Call for Proposals for the 2016 NCTM Research Conference in San Francisco, California, will be available online by early June 2015.
- The NCTM Bookstore will be open on Wednesday 10:00 a.m. – 7:00 p.m in the Exhibit Hall.

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Invited Sessions

Opening Session

William Penuel and Catherine Martin

Design-Based Implementation Research as a Strategy for Expanding Opportunity to Learn in School Districts (Session 29.1)
Monday, April 7th, 7:00 p.m.–8:15 p.m.
Grand Ballroom A/B

Early Mathematics with Mobile Technology: A Research-Practice Collaboration (Session 31)
Tuesday, April 14, 8:30 a.m. – 9:45 a.m.
Grand Ballroom B

Engaging US Researchers with the International Commission on Mathematical Instruction (Session 40)
Tuesday, April 14, 10:00 a.m. – 11:15 a.m.
Otis

Research on the Digital Revolution in Mathematics Curriculum, Teaching and Learning (Session 45)
Tuesday, April 14, 10:00 a.m. – 11:15 a.m.
Webster

Using Date Mining for Real Time Assessment and Tutoring Inquiry Skills (Session 67)
Tuesday, April 14, 1:15 p.m. – 2:30 p.m.
Faneuil

Grand Challenges in Mathematics Education (Session 81)
Tuesday, April 14, 3:30 p.m. – 4:45 p.m.
Grand Ballroom A

Researchers as Mathematics Teacher Educators: Developing MTE Manuscripts from Research (Session 85)
Tuesday, April 14, 3:30 p.m. – 4:45 p.m.
Faneuil

Research on Mathematical Reasoning in Informal Designed Learning Environments (Session 86)
Tuesday, April 14, 3:30 p.m. – 4:45 p.m.
Webster

Crafting a Dissertation-Based Research Article for JRME (Session 107)
Wednesday, April 15, 8:30 a.m. – 9:45 .a.m.
Grand Ballroom A/B

2015 Linking Research and Practice IPS Session (Session 111)
Wednesday, April 15, 8:30 a.m. – 9:45 a.m.
Otis

Writing Research for Teachers: Putting Results into Practice (Session 113)
Wednesday, April 15, 8:30 a.m. – 9:45 a.m.
Grand Ballroom E

Plenary Session

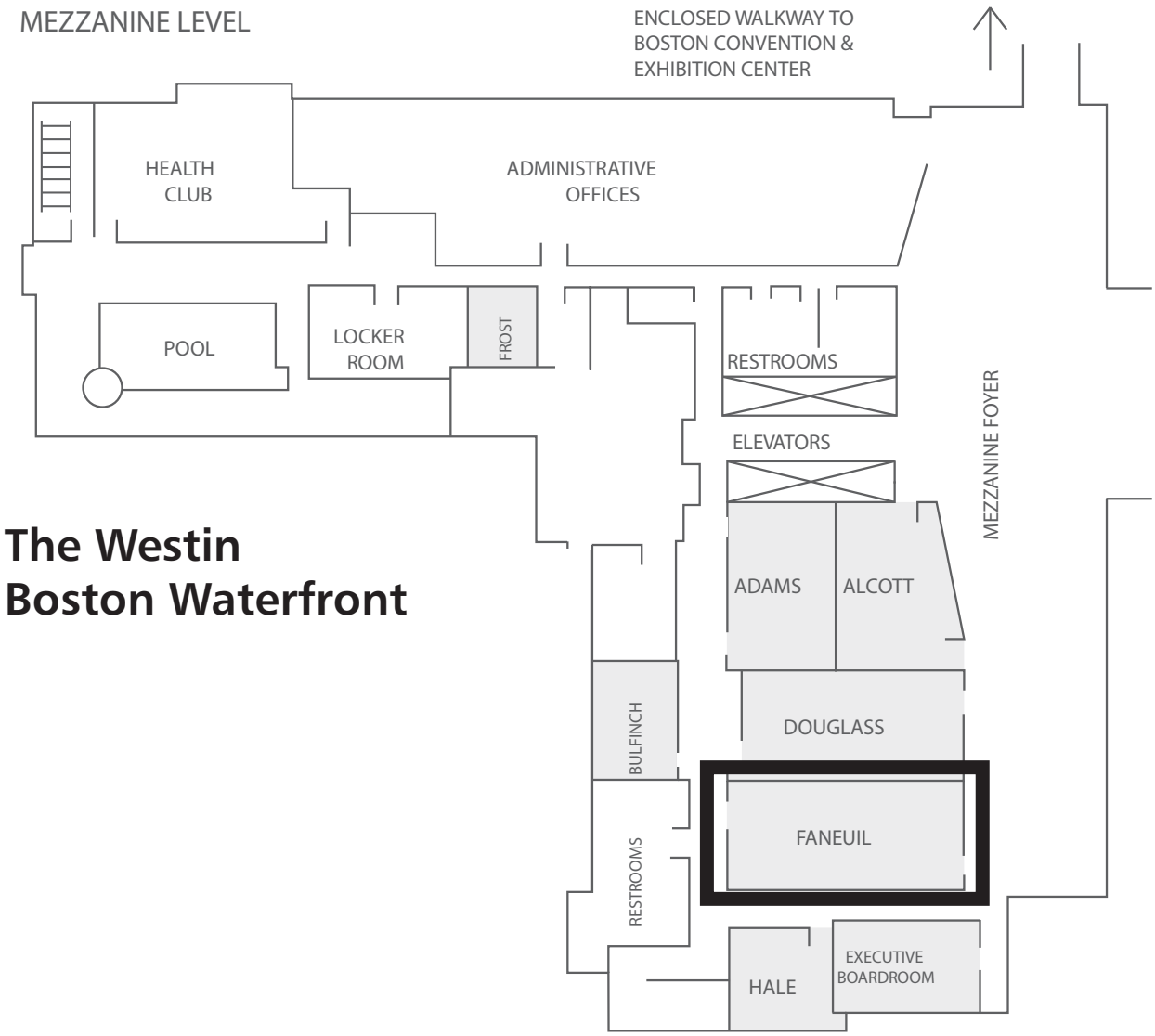
Deborah Loewenberg Ball, Danny B Martin, Dan Meyer, and Steven Leinwand

Turning the Common Core into Reality in Every Math Class (Session 113.1)
Wednesday, April 9th, 10:00 AM – 11:15 AM
Grand Ballroom A/B

Life of a MET Grant: Space for Progressive Math Pedagogy (Session 121)
Wednesday, April 15, 12:30 p.m. – 1:00 p.m.
Commonwealth Ballroom B

National Science Foundation Funding Program Overview and Proposal Writing (Session 122)
Wednesday, April 15, 12:30 p.m. – 1:00 p.m.
Grand Ballroom A/B

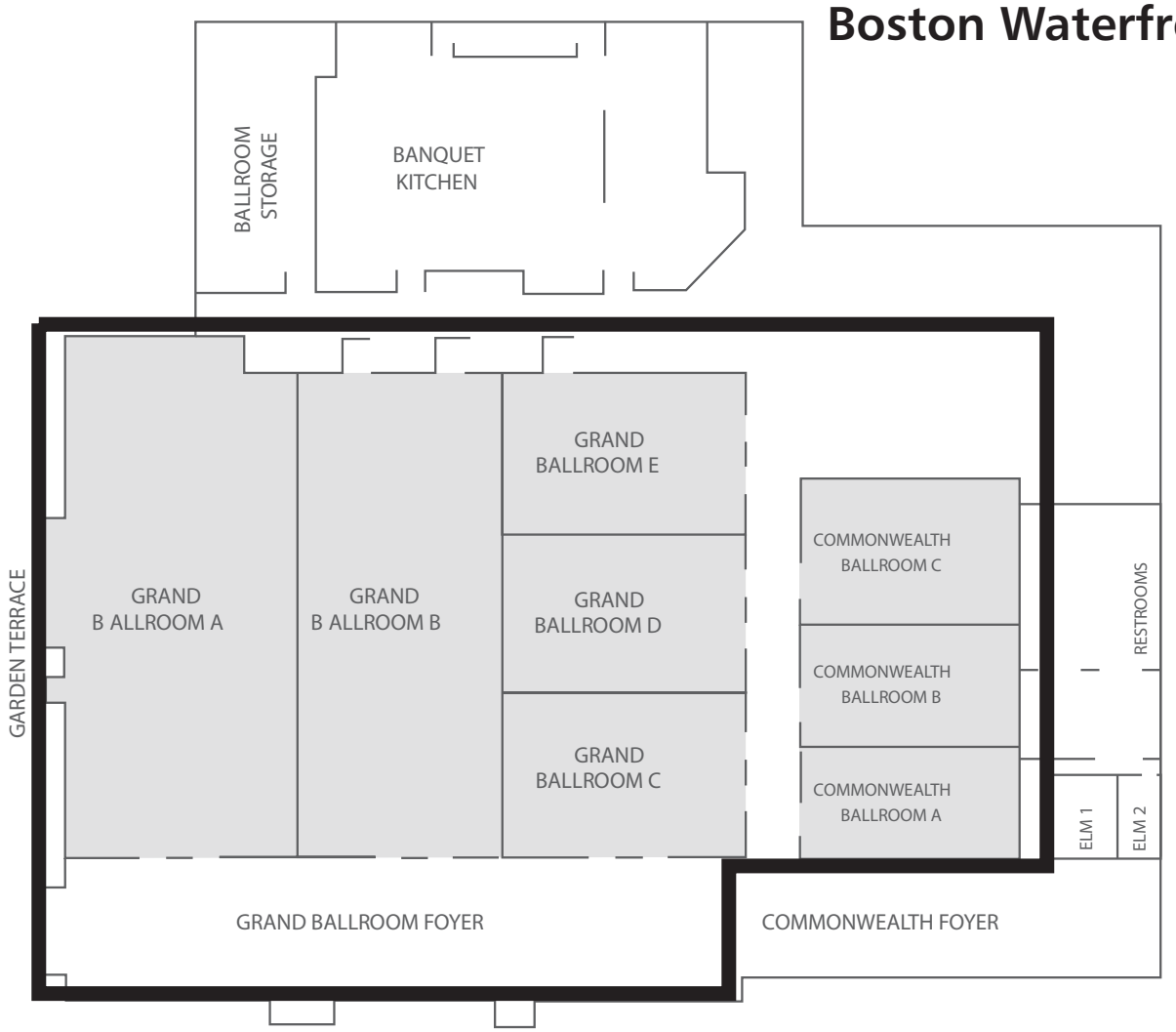
Graduate Student, Junior Faculty, and Researcher Mentoring Session (Session 131)
Wednesday, April 15, 1:15 PM – 2:30 PM
Commonwealth Ballroom C



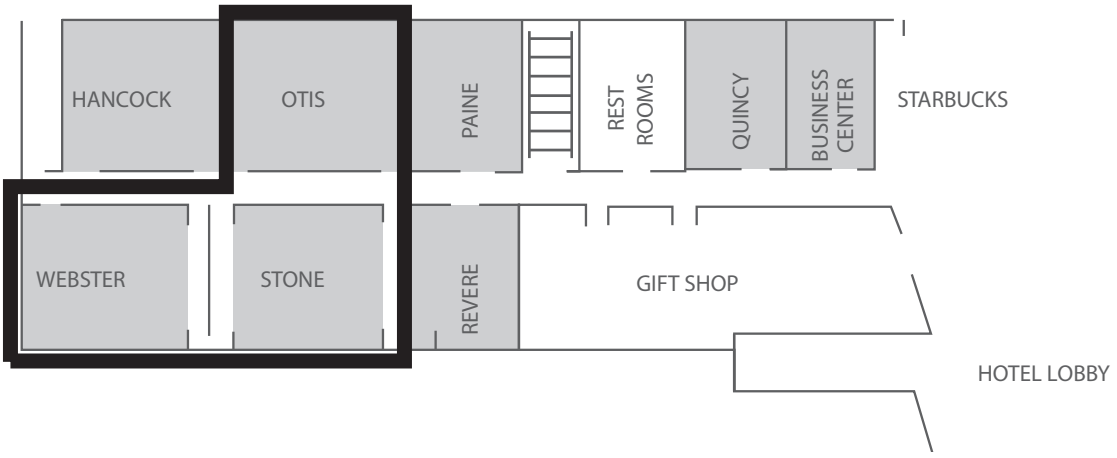
The Westin Boston Waterfront

The Westin Boston Waterfront

CONCOURSE LEVEL



LOBBY LEVEL



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 provides 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 veteran researchers in the field. Finally, it allows the field to capitalize on the collective wisdom available when researchers and practitioners come together to discuss mathematics education and research.

The Research Conference continues to receive many high quality proposals from the community. This year we received 433 proposals and were able to accept 175 sessions for the final program, giving an overall acceptance rate of 40.4%. The conference program also includes several invited sessions highlighting topics and new trends relevant to the field. Additionally, this year we are hosting Meeting Place sessions to encourage more informal networking and interaction.

We would like to thank the members of NCTM's Research Committee, members of the executive board for the SIG/RME, and other 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. We would like to thank all the presenters for their strong proposals and their willingness to share their work. Finally, we would like to thank everyone in attendance, and we hope that you will find the conference stimulating and enjoyable. We are glad you are here.

Sincerely,
Kathryn Chval
NCTM Research Committee, Chair

Paola Sztajn
AERA SIG/RME Co-Chair

Janine Remillard
AERA SIG/RME Co-Chair

Michael Fish
NCTM Research Committee, Staff Liaison

Opening Session—Monday, 7:00 p.m.

William Penuel and Catherine Martin

Design-Based Implementation Research as a Strategy for Expanding Opportunity to Learn in School Districts (Session 29.1)

Monday, April 7th, 7:00 p.m.–8:15 p.m.

Grand Ballroom A/B

5:00 p.m.–5:30 p.m.

1
Critical Mathematics Education through Robotics for Children with Chronic Illnesses

Brief Research Report

I will describe children's mathematical learning and sociopolitical beliefs/constructs (e.g., oppression, power, privilege) for children with cancer. I depict how robotics incited students to connect to political issues and contribute to how, why, and when mathematics is done while making significant conceptual growth across mathematical domains.

Megan L. Nickels
Illinois State University, Normal

Commonwealth Ballroom B

2
Development of Preservice Teacher Noticing through Analysis of Student Work

Brief Research Report

We report on the development of teacher noticing in a math content course for preservice teachers. Participants submitted writing assignments about a mathematical task, followed by analyzing and interpreting student solutions of that task. Results have implications for co-developing teacher noticing with specialized content knowledge for teaching.

Hiroko Kawaguchi Warshauer
Texas State University, San Marcos

Sharon Strickland
Texas State University, San Marcos

Nama Namakshi
Texas State University, San Marcos

Lauren Hickman
University of Michigan, Ann Arbor

Grand Ballroom E

3
Flipping Students' Mathematics Anxieties

Brief Research Report

The purpose of this study was to begin examining differences in instructional delivery methods in the flipped mathematics classroom and their influence on elementary preservice teachers' mathematics anxiety and anxiety about teaching mathematics.

Anthony Michael Dove
Radford University, Radford, Virginia

Faneuil

4
Mixed-Race Learners and the Reification of Mathematical Ability as Genetic

Brief Research Report

Beliefs about the nature of mathematical ability are deeply tied to learners' perceptions of their own potential. The case studies presented here of mathematics learners from mixed-race backgrounds shed light on how racial ideologies reify prevailing perceptions of mathematical ability as innate and fixed.

Niral Shah
Michigan State University, East Lansing

Commonwealth Ballroom A

5
Preservice Teachers' Understanding of Directly and Inversely Proportional Relationships

Brief Research Report

In this study, I discuss preservice middle and secondary grades teachers' determination of the directly and inversely proportional relationships, the types of strategies they used to solve given hands-on and real-world mathematical problems, and the difficulties they faced while working on those problems.

Muhammet Arican
University of Georgia, Athens

Commonwealth Ballroom C

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.

5:00 p.m.–5:30 p.m.

6
Problem Posing in Mathematics Classrooms

Brief Research Report

There is much research on problem solving in mathematics education. There is much less research concerning problem posing. We share findings from three middle-grades classrooms on the kinds of problems students posed and the frequency with which we observed various types of problem posing, and we consider circumstances that support problem posing.

Clayton N. Kitchings
Shorter University, Rome, Georgia

Jessica Pierson Bishop
University of Georgia, Athens

Webster

7
Student-Generated Processes for Developing Mathematical Understanding

Brief Research Report

Students' perspectives can enrich our conceptions of how they understand mathematics. The framework, Student-Generated Processes for Understanding Mathematics, illustrates how students generated and expressed key processes that contributed to their mathematical understanding and empowered them in reforming their identity as mathematical learners.

Janelle McFeetors
University of Alberta, Edmonton, Canada

Otis

8
Student Perceptions of Proof as Communication in an Inquiry-Based Course

Brief Research Report

Research on student-centered approaches to teaching proof can identify practices that support meaningful learning of proof. Undergraduates in an inquiry-based introduction to proof course perceived that communicative activities such as discussion, presentation, and critique of peers' arguments were crucial to developing an understanding of proof.

Jeffrey D. Pair
Middle Tennessee State University, Murfreesboro

Sarah K. Bleiler
Middle Tennessee State University, Murfreesboro

Stone

5:45 p.m.–6:45 p.m.

9
Analyzing Coherence of Teacher's Knowledge Relating Fractions and Ratios

Poster Session

In this study, we use a new analysis tool, Epistemic Network Analysis (Shaffer et al., 2009), to demonstrate and highlight connections among knowledge resources that middle school mathematics teachers evoke while relating fractions and ratios. Patterns emerged in the connections of teachers' knowledge resources that were used to group the teachers.

Travis Weiland
University of Massachusetts Dartmouth

Gal Gili Nagar
University of Massachusetts Dartmouth

Chandra Hawley Orrill
University of Massachusetts Dartmouth

James P. Burke
University of Massachusetts Dartmouth

Grand Ballroom C/D

10
Diagnosing Student Misconceptions about Representing Fractions

Poster Session

Learn about an effort to design, test, and validate open source, diagnostic assessments targeting critical rational number topics. The poster session will provide insight into the qualitative and quantitative analysis efforts as well as give key considerations when designing short diagnostic items and support materials.

Michelle Cerrone
Education Development Center, New York, New York

Margaret (Peggy) Clements
Education Development Center, New York, New York

Grand Ballroom C/D

11
Exploring Mathematical Activity Outdoors and Indoors: An Embodied Intervention

Poster Session

This paper describes a design research study on number sense development for elementary students in an after-school program. The study weaves together Realistic Mathematics Education (RME) and Embodied Cognition (EC) theories to reconsider the role of the human body in mathematical activity.

William J. Campbell
University of Colorado Boulder

Grand Ballroom C/D

12
Factors Affecting Mathematics Teachers' Perspective Toward CCSSM

Poster Session

The purpose of this study is to investigate factors affecting mathematics teachers' understanding and interpretation of the Common Core State Standards for Mathematics and the degree to which these factors are associated. A path analysis will be performed on a survey data and the results will be presented.

Orhan Kaplan
University of Florida, Gainesville

Grand Ballroom C/D

13
Factors That Influence the Solution Strategies That Preservice Teachers Select

Poster Session

This study explores relationships between unpacked learning goals and the ways preservice teachers (PSTs) select strategies for discussions. The results suggest that some strategies prompt PSTs to attend to the learning goals more than others and that unpacked learning goals might not be enough support for PSTs to select strategies productively.

Erin Meikle
University of Delaware, Newark

Grand Ballroom C/D

14
High School Mathematics Teachers' Responses to Professional Development on Discourse

Poster Session

After participating in a professional development course on discourse, high school mathematics teachers reflect on their own practice using the new techniques. This session will share findings from a qualitative study, reporting on these teachers' responses to their own efforts to incorporate powerful and productive discussions in their classes.

Cara M. Goldberg
Lexington Public Schools, Lexington, Massachusetts

Grand Ballroom C/D

15
How Mathematical Knowledge for Teaching Intersects with Teaching Practices

Poster Session

Understanding the relationship of teachers' mathematical knowledge to their actual practice is an important problem for mathematics education research. In this poster, I present research from a study investigating the mathematical knowledge for teaching (MKT) and reasoning entailed in the practices of selecting examples and giving explanations.

Rachel B. Snider
University of Michigan, Ann Arbor

Grand Ballroom C/D

16
Investigating Norms of the Situation of Geometric Calculation in Algebra

Poster Session

The poster presents a research instrument designed to explore the existence of norms in the instructional situation of geometric calculations in algebra. The instrument was piloted with twenty-nine high school mathematics teachers. The data provides evidence that high school mathematics teachers recognize the hypothesized norms targeted by the instrument.

Nicolas Boileau
University of Michigan, Ann Arbor

Grand Ballroom C/D

17
It's Not an Issue in My Class: Noticing Student Participation

Poster Session

This qualitative study of a long-term professional development program on Complex Instruction, investigated the increased level of noticing from the teacher participants as they learned about status and its influence on their students' mathematical participation.

Maggie M. Hackett
Sunnyside Unified School District, Tucson, Arizona

Grand Ballroom C/D

18
Links Between Lab-Based Measures of Numerical Competence and TEMA Scores

Poster Session

Lab-based measures of numerical competence (e.g., number-line estimation) predict performance on formal math assessments. However, developmental psychologists debate the most common explanation of this link. We tested children on number line estimation, visual set comparison, and the Test of Early Mathematics Ability (TEMA) to explore the sources of these links.

Hilary Barth
Wesleyan University, Middletown, Connecticut

Grand Ballroom C/D

5:45 p.m.–6:45 p.m.

19
Mathematical Discourse: Applying Genre Analysis of Narrative to Problem Solving

Poster Session

Language is the principal resource for making meaning through mathematical discourse. However, preservice teachers (PTs) often find the specialized language of mathematics challenging. Using narrative genre analysis, this study reports the ways that language choices of secondary PTs impacted elementary PTs' sense-making of whole number division.

Janet M. Liston
University of Arizona, Tucson

Grand Ballroom C/D

20
Multilevel Analysis of SIMCE 2011: Factors Related to Fourth-Grade Students' Achievement

Poster Session

This poster summarizes a study whose purpose was to find a relationship among economics, school factors, and students' activities that affected the students' mathematics achievement in fourth-grade Chilean students. A two-level cross-sectional analysis was performed using the SIMCE 2011 data set.

Rayen Antillanca
University of Georgia, Athens

Grand Ballroom C/D

21
Preparing Teacher Candidates to Work with English Language Learners

Poster Session

This presentation concerns initial research with mathematics teacher educators, examining reported beliefs and practices related to preparing preservice teachers to work with ELLs. Initial findings hold implications for teacher educators, K–12 teachers, and education personnel who provide professional development for mathematics teachers.–

Linda A. Arnold
Monmouth University, West Long Branch, New Jersey

Grand Ballroom C/D

22
Project-Based Learning in Secondary Mathematics

Poster Session

To make project-based learning a more accessible teaching method, we did a case study of secondary mathematics students using project-based learning to better understand the best practices involved in its success. Attendees will hear the results of the study and related research.

Sarah C. Zierhoffer
Elon University, Elon, North Carolina

Janet Mays
Elon University, Elon, North Carolina

Grand Ballroom C/D

23
Recruiting STEM Majors into Teaching: Findings from an Elective Course

Poster Session

Findings from the study of a one-hour introductory education elective designed to recruit STEM majors into teaching will be discussed. Primary data sources included reflective journals, pre-questionnaires, and end-of-course surveys. Findings indicated the course did influence STEM student decisions to pursue (or not to pursue) teaching.

Jan Yow
University of South Carolina, Columbia

Rebecca Spencer
Ewing Middle School (Cherokee County School District), Gaffney, South Carolina

Grand Ballroom C/D

24
Statistical Content of Elementary Textbooks

Poster Session

This study examined five mathematics textbooks series for grades 1-5 using a coding protocol based on the GAISE framework to discern the statistical content of each series. We report our findings in terms of the location of statistics tasks within each book and the phases of the statistical problem-solving process that are addressed.

Dustin Jones
Sam Houston State University, Huntsville, Texas

Alisha Dunkle
Hood College, Frederick, Maryland

Lindsay Hixon
Sam Houston State University, Huntsville, Texas

Nicole Yoder
Eastern Mennonite University, Harrisonburg, Virginia

Grand Ballroom C/D

5:45 p.m.–6:45 p.m.

25
Task Design to Support English Learners' Geometric Record Keeping

Poster Session

We hypothesize that record keeping supports mathematical problem solving and communication of English learners (ELs) through cognitive off-loading of information and supports for productive struggle. Through iterative task design, interviews, and analysis, we generated and tested principles for designing tasks to promote ELs' record keeping.

Jill Neumayer DePiper
Education Development Center, Waltham, Massachusetts

Daniel Heck
Horizon Research, Inc., Chapel Hill, North Carolina

Anthony Fernandes
University of North Carolina at Charlotte

Grand Ballroom C/D

26
Teachers' Understanding of Ratios and Their Connections to Fractions

Poster Session

The study examined teachers' understanding of the relationship between fractions and ratios. We found that participants hold multiple definitions for ratios; they used specific vocabulary; and they expressed additive strategies rather than multiplicative relationships. These findings have implications for professional development.

Gal Gili Nagar
University of Massachusetts Dartmouth

Travis Weiland
University of Massachusetts Dartmouth

James P. Burke
University of Massachusetts Dartmouth

Chandra Hawley Orrill
University of Massachusetts Dartmouth

Grand Ballroom C/D

27
Teaching Algebra to Students with Mathematical Learning Disabilities

Poster Session

This session addresses the current state of algebra I instruction for students with Mathematical Learning Disabilities (MLD), as identified through a descriptive mixed methods study. Findings of the study will be shared and examined to identify implications for preservice mathematics education courses.

Sararose D. Lynch
Westminster College, New Wilmington, Pennsylvania

Grand Ballroom C/D

28
Teaching and Learning of Algebra through Models and Modeling Cycle

Poster Session

This study examines in what ways the materials developed for a new mathematics course using a modeling approach support high-school students to succeed in a first-year algebra course taken concurrently. The research also looks at how teachers use components of the instructional materials, including technology, in their planning and teaching.

Judith Olson
University of Hawaii, Honolulu

Melfried Olson
University of Hawaii, Honolulu

Fay Zenigami
University of Hawaii, Honolulu

Linda Venenciano
University of Hawaii, Honolulu

Grand Ballroom C/D

29
Testing and "Bubble Students": High School Teachers' Assessment Practices

Poster Session

We describe how the assessment practices of mathematics teachers at an urban high school were influenced by their state's standardized test. We found the language used on "the test" to classify students by their performance (e.g., Unsatisfactory) was utilized to label students and was used in both assessment design and assigning student grades.

Richard S. Kitchen
University of Denver, Denver, Colorado

Joe B. Bolz
University of Denver, Denver, Colorado

Grand Ballroom C/D

29.1
Design-Based Implementation Research as a Strategy for Expanding Opportunity to Learn in School Districts

Opening Session

Design-Based Implementation Research (DBIR) is an approach to research and development that can support district-level efforts to improve teaching and expand opportunities for all students to learn. DBIR is organized around problems of practice, and researchers collaborate with teachers and district leaders to design and test innovations. In this presentation, we will describe the principles of DBIR, and how we are applying them in Denver Public Schools' efforts to expand all students' access to rigorous mathematics tasks and build teacher leadership in the district.

William R. Penuel
University of Colorado Boulder

Catherine Martin
Denver Public Schools

Grand Ballrooms A&B (Combined)

8:30 a.m.–9:45 a.m.

30
Conceptualizing and Designing Responsive Teacher Education Using Activity Theory

Discussion Session

This session will focus on using activity theory to decompose teaching practice and understand school settings that mediate the work. Using examples from two secondary teacher education programs, participants will discuss affordances and drawbacks to this approach and potential contributions to research and design of responsive teacher education.

Matthew P. Campbell
West Virginia University, Morgantown

Commonwealth Ballroom B

31
Early Mathematics with Mobile Technology: A Research-Practice Collaboration

Discussion Session

Learn about an effort to build a collaboration among mathematics education researchers and K–2 educators to bring more research into the classroom and to improve research relevance for practitioners. Efforts to understand how iPads can be harnessed to spur improved mathematics learning and teaching in early grades will also be discussed.

Josephine Louie
Education Development Center, Waltham, Massachusetts

Pam Buffington
Education Development Center, Waltham, Massachusetts

Catherine McCulloch
Education Development Center, Waltham, Massachusetts

Discussant: Jere Confrey
College of Education, North Carolina State University, Raleigh

Discussant: Michael Muir
Auburn School District, Auburn, Maine

Grand Ballroom B

32
Examining Relations Between Mathematics Instructional Practices and Autonomy Support Strategies

Discussion Session

The work focuses on decomposing practice into both mathematics instructional practices and autonomy-supportive strategies in an effort to understand the relations between the two. By analyzing instruction along the two dimensions, insight into integration of the practices to productively support students can be gained.

Calli Shekell
University of Pittsburgh, Pittsburgh, Pennsylvania

Hannah C. Sung
University of Pittsburgh, Pittsburgh, Pennsylvania

Charles Munter
University of Pittsburgh, Pittsburgh, Pennsylvania

Commonwealth Ballroom A

33
Exploring the Role of the Mathematical Horizon for Secondary Teachers

Research Symposium

Studies exploring the role and impact on teaching of secondary teachers' knowledge of the mathematical horizon will be presented; topics include CCSSM, abstract algebra, real analysis, and statistics. Illustrations connected to classroom teaching practices will be examined and implications for mathematics teacher education discussed.

Nicholas H. Wasserman
Teachers College, Columbia University, New York, New York

Julianna Stockton
Sacred Heart University, Fairfield, Connecticut

Keith Weber
Rutgers University, New Brunswick, New Jersey

Joe Champion
Boise State University, Boise, Idaho

Brandie Waid
Teachers College, Columbia University, New York, New York

Andrew Sanfratello
Teachers College, Columbia University, New York, New York

Discussant: William McCallum
University of Arizona, Tucson

Otis

33.1
Meeting Place Session #1

The Meeting Place session brings together facilitators and topics nominated by the mathematics education community. Please see the NCTM conference app for updated information on the facilitators and topics of discussion for this session.

Webster

34
Interactive Paper Session

Presider: Cliff Konold
University of Massachusetts Amherst

Public Perceptions of the (Not) New Mathematics

For decades, attempts to communicate the advantages of reform-based curricula to parents have largely failed. Using phenomenography, we investigate public perceptions of the (not) new mathematics as expressed in responses to recent media coverage as a first phase in a project aimed at learning how to communicate reforms to parents.

Janelle McFeetors
University of Alberta, Edmonton, Canada

Has Reform Shaped Teacher Views on Solving Word Problems without Equations?

We explore how mathematics education reform has influenced what it means to solve word problems in algebra class by analyzing teachers' perceptions on students' solutions that use graphs, tables of values, or numeric considerations instead of equations. The structure of our online media-rich questionnaire and pilot findings will be discussed.

Orly Buchbinder
University of Maryland, College Park

Daniel Chazan
University of Maryland, College Park

Mapping the LANDSCAPE of Districts' Stances on Early Algebra I

This paper reports findings from a national study of U.S. districts' stances—the policies, practices, and rationales—for algebra I enrollment. While many districts offer algebra to select students prior to high school, they proceed cautiously, and few districts are proactively attempting to improve students' readiness for taking algebra "early."

Lindsay M. Keazer
Michigan State University, East Lansing

Joshua Taton
University of Pennsylvania, Philadelphia

Stone

35
Mathematics Methods Classrooms as Sites for Courageous Conversations about Equity

Discussion Session

During this workshop, we will share sample cases prepared for a forthcoming book authored by the presenters. Each case aims to engage prospective mathematics teachers in discussions about privilege and oppression in society and in schools, and in strategies for building inclusive/equitable mathematics classrooms.

Dorothy Y. White
University of Georgia, Athens

Sandra Crespo
Michigan State University, East Lansing

Kristen Bieda
Michigan State University, East Lansing

Julia Aguirre
University of Washington Tacoma

Imani Goffney
University of Houston, Houston, Texas

Marta Civil
University of North Carolina at Chapel Hill

Grand Ballroom E

36
Professional Development on Mathematics Discourse: Investigating Contexts of Enactment

Research Symposium

We examine different enactments of a particular professional development program focused on mathematics classroom discourse in order to better understand its impact on teachers. We explore how aspects of context relate to the findings of our studies.

Beth Herbel-Eisenmann
Michigan State University, East Lansing

Michelle Cirillo
University of Delaware, Newark

Mike Steele
University of Wisconsin–Milwaukee

Jillian M. Cavanna
Michigan State University, East Lansing, Michigan

Faith A. Muirhead
University of Delaware, Newark

Daniel Heck
Horizon Research, Inc., Chapel Hill, North Carolina

Faneuil

37
Structuring Professional Development around a Mathematics Observational Rubric

Research Symposium

By using an observational tool designed to capture features of mathematics instruction, this presentation addresses two open questions regarding professional development and the study designed to answer the questions: What is the optimal level of facilitation in teachers' discussions? How do teachers experience PD when watching their own lessons?

Mary Beisiegel
Oregon State University, Corvallis

Eric Anderson
Harvard Graduate School of Education, Cambridge, Massachusetts

Johanna Barmore
Harvard Graduate School of Education, Cambridge, Massachusetts

Barb Gilbert
Harvard Graduate School of Education, Cambridge, Massachusetts

Rebecca Mitchell
Boston College, Chestnut Hill, Massachusetts

Samantha Rabinowicz
Harvard Graduate School of Education, Cambridge, Massachusetts

Commonwealth Ballroom C

8:30 a. m.–9:45 a.m.

38
The Measurement of Time: Cognition, Instruction, and Curriculum

Research Symposium

This symposium features studies investigating various aspects of the teaching and learning of time. Time has long been a challenging area of measurement, due at least in part to the fact that we can neither see nor touch time. We explore issues related to student cognition, teaching, and curriculum.

Darrell Earnest
University of Massachusetts Amherst

Lorraine M. Males
University of Nebraska–Lincoln

Chepina Rumsey
Kansas State University, Manhattan

Discussant: Richard Lehrer
Vanderbilt University, Nashville, Tennessee

Grand Ballroom A

10:00 a.m.–11:15 a.m.

39
Centering Voices of Marginalized Researchers in Mathematics Education

Discussion Session

Mathematics education is embedded in interlocking systems of privilege and oppression. We share preliminary work guided by principles of critical race theory to expose these systems and provide voice to marginalized groups. Participant discussion will be strongly encouraged as we seek feedback on this work. Danny Martin will serve as discussant.

Jessica Alyce Wilson
University of South Florida, Tampa

Indigo Esmonde
University of Toronto, Toronto, Canada

Ayanna D. Perry
Knowles Science Teaching Foundation, Moorestown, New Jersey

Commonwealth Ballroom B

40
Engaging U.S. Researchers with the International Commission on Mathematical Instruction

Research Symposium

Members of the U.S. National Commission on Mathematics Instruction provide an introduction to the activities of the International Commission on Mathematics Instruction (ICMI), including topic studies, awards, outreach, and the International Congress on Mathematics Education (ICME). This international meeting, convened every four years, brings together researchers from around the world. Presenters will discuss the structure of the congress and encourage U.S. researchers to submit proposals to present work at ICME 13, to be held in Hamburg, Germany, July 24–31, 2016.

Janine Remillard
University of Pennsylvania, Philadelphia

Sybilla Beckman
University of Georgia, Athens

Roger E. Howe
Yale University, New Haven, Connecticut

Gail Burrill
Michigan State University, East Lansing, Michigan

Otis

41
Interactive Paper Session

Presider: Jeffrey J. Wanko
Miami University, Oxford, Ohio

Student Understandings of Mathematical Functions and Key Calculus Concepts

In this interactive paper session, we present data from our study on the relationships between students' ideas about functions and their understandings of key concepts of introductory differential calculus. We will share selected examples of students' work to illustrate students' thinking, and we will discuss the implications of this study's results on teaching calculus at both the high school and undergraduate levels.

Caroline J. Hagen
Tufts University, Medford, Massachusetts

Collaborative Modeling In Elementary Mathematics

This paper examines elementary students engaged in a modeling activity, and it identifies three shifts in thinking that helped students develop a viable model. We argue that encouraging students' collaboration, a teacher can successfully orchestrate a modeling activity that emphasizes the tension between the experienced world and the underlying mathematical idea.

Ying Cao
Tufts University, Medford, Massachusetts

Michelle Wilkerson-Jerde
Tufts University, Medford, Massachusetts

Roger Tobin
Tufts University, Medford, Massachusetts

Alfredo Bautista
Nanyang Technological University, Singapore

Examining Cycles of Mathematical Modeling: A Case of High School Students

This presentation offers findings from a teaching experiment in which high school "repeaters" engaged a sequence of mathematical modeling tasks. By analyzing and extending existing theories about the cyclical nature of modeling, I provide a fine-grained analysis of how model creation occurs within an interactive classroom setting.

Kara Louise Imm
Math in the City, New York, New York

Stone

10:00 a.m.–11:15 a.m.

42
Noticing Transfer across Medias for Future Elementary Teachers

Discussion Session

In this session, teacher educators share findings from a multi-university research project focused on future teacher noticing and its transfer across written and animated medias. Participant discussion will focus on practices that begin to support the transfer of noticing from university coursework into the elementary classroom.

Anne Estapa
Iowa State University, Ames

Julie Amador
University of Idaho, Coeur d'Alene

Zandra U. de Araujo
University of Missouri, Columbia

Tracy L. Weston
Middlebury College, Middlebury, Vermont

Rachael Aming-Attai
University of Indianapolis, Indianapolis, Indiana

Commonwealth Ballroom A

43
Preparing Preservice Teachers to Enact Equitable Instruction in Mathematics

Research Symposium

Our symposium shares unique strategies for helping new teachers develop mathematical knowledge and skills needed to meet complex standards for teaching math in ways that are deliberately responsive and attentive to issues of race, power, culture, language, and social class preparing them for ambitious and equitable teaching.

Imani Goffney
University of Houston, Houston, Texas

Julia Aguirre
University of Washington Tacoma

Jennifer M. Lewis
Wayne State University, Detroit, Michigan

Deborah Loewenberg Ball
University of Michigan, Ann Arbor

Meghan M. Shaughnessy
University of Michigan, Ann Arbor

Lindsey Mann
University of Michigan, Ann Arbor

Monica Gonzalez
University of Houston, Houston, Texas

Mary Q. Foote
Queens College–CUNY, Flushing, New York

Faneuil

44
Research Issues in Curriculum Studies: Evidence-Based Insights and Future Directions

Research Symposium

As methodologies have become more advanced and sophisticated, the curriculum-based research literature has grown significantly in the past decade. The purpose of this symposium is to synthesize the research on curriculum conducted in the past ten years and to offer an in-depth discussion of methodological issues and future directions.

Jinfa Cai
University of Delaware, Newark

James E. Tarr
University of Missouri, Columbia

Discussant: Kathryn B. Chval
University of Missouri, Columbia

Discussant: Daniel Heck
Horizon Research, Inc., Chapel Hill, North Carolina

Commonwealth Ballroom C

45
Research on the Digital Revolution in Mathematics Curriculum, Teaching, and Learning

Discussion Session

Digital tools and environments—such as laptops, mobile devices, websites, and software—are viewed as having potentially profound effects on mathematics education. This digital revolution influences the writing of learning materials, the delivery of those materials to students, the role(s) of teachers, interactions among both teachers and learners, and assessment. Following an overview of the state of the art inspired by the proceedings of an international conference held in November 2014, participants will be split into groups to discuss the extant and possible research in each of these aspects of teaching and learning mathematics in a digital age.

Zalman Usiskin
University of Chicago, Chicago, Illinois

Meg Bates
University of Chicago, Chicago, Illinois

Webster

46
Teacher Learning in Online Environments

Research Symposium

This symposium shares the findings across three constructs regarding the effectiveness of an online M.Ed program for middle grades mathematics and science teachers. The constructs are knowledge and perceptions about equity and social justice, technological pedagogical content knowledge, and teachers' perceptions of learning in online environments.

Jennifer Chauvot
University of Houston, Houston, Texas
Li Sun
University of Houston, Houston, Texas
Karman Kurban
University of Houston, Houston, Texas

Grand Ballroom A

47
Teachers' Reasons for Using and Choosing Different Physical Manipulatives

Discussion Session

Understanding why teachers use specific models in the classroom is an important yet under-researched area of mathematics education. The goal of this session is to engage participants in a discussion about a theory of worthwhile models in mathematics classrooms, focused on the use and choice of physical manipulatives.

Eileen Murray
Montclair State University, Montclair, New Jersey
Michelle Stephan
University of North Carolina at Charlotte

Grand Ballroom E

48
Toward a Theory of Productive Use of Student Mathematical Thinking

Research Symposium

Presentations consider (1) the nature of student mathematical thinking (SMT) available to teachers during instruction, (2) teachers' perceptions of productive use of SMT, and (3) teachers' abilities to recognize and productively respond to SMT. The work will be discussed in the broader context of developing a theory of productive use of SMT.

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

Grand Ballroom B

49
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 K–2 children's understanding of variable 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
Angela Gardiner
TERC, Cambridge, Massachusetts
Katharine B. Sawrey
Tufts University, Medford, Massachusetts

Grand Ballroom E

50
Comparison of Student and Teacher Perceptions of Mathematics Teaching Practices

Brief Research Report

Teachers in a professional development project are becoming skilled in using the NCTM (2014) teaching practices as an instructional framework. In order to evaluate the impact of the project, student and teacher perceptions surveys were developed and administered to assess the implementation of these constructs of mathematics teaching practice.

DeAnn Huinker
University of Wisconsin–Milwaukee
Melissa Hedges
University of Wisconsin–Milwaukee

Faneuil

51
Convincing Arguments? Preservice Teachers' Initial and Post-Course Views

Brief Research Report

Interviews with five preservice elementary teachers elicited their views of nine mathematical arguments at two points in time, near the beginning of a course emphasizing mathematical argumentation and after its completion. Qualitative analysis reveals substantial changes in the arguments they preferred and their reasons for selecting them.

Michael H. Perkowski
University of Missouri, Columbia

Grand Ballroom A

11:30 a.m.–12:00 p.m.

52
Exploring Equitable Practices: Noticing the Student in the Mathematics

Brief Research Report

While reforms stress equitable practices, teachers lack the support to attend to equity. Our purpose was to better understand equitable practices through exploring teacher noticing. Through interview analysis of three secondary math teachers, we found that although they practice equitable teaching, teachers varied in what they attended to.

Janet Mercado
University of California, Irvine
Elizabeth A. van Es
University of California, Irvine
Victoria M. Hand
University of Colorado Boulder

Otis

53
Productive Disciplinary Engagement: Framework for Design

Brief Research Report

This investigation explores the ways in which the four principles of productive disciplinary engagement (Engle and Conant 2002) may be used as a tool for informing the design of the norms, structures, and classroom features that combine to form a learning environment.

Maryellen Williams-Candek
Seneca Valley School District, Wexford, Pennsylvania
Margaret Smith
University of Pittsburgh, Pittsburgh, Pennsylvania

Commonwealth Ballroom A

54
Putting Understanding into Practice: Learning to Implement Formative Assessment

Brief Research Report

This paper reports on middle grades teachers' learning about formative assessment (FA) in FACETS, a two-year professional development program designed to promote an understanding of FA as a comprehensive cycle of instruction and to provide supports for teachers during development of FA classroom practices. Both teacher successes and challenges will be discussed.

Lynn T. Goldsmith
Education Development Center, Inc., Waltham, Massachusetts
Sophia Mansori
Education Development Center, Inc., Waltham, Massachusetts

Commonwealth Ballroom C

55
Teachers' Development of Learning Trajectories: Engaging in Mathematical Practices

Brief Research Report

This session will focus on elementary teachers' development of rational number learning trajectories. We will share observations of their difficulties with setting goals, sequencing the trajectory, selecting appropriate tasks correlated with instances on the trajectory, and discuss supporting them in demonstrating mathematics teaching practices.

Shelby P. Morge
University of North Carolina Wilmington
Kathleen Lynch-Davis
Appalachian State University, Boone, North Carolina
David Pugalee
University of North Carolina at Charlotte

Stone

56
Teachers' Perspectives on Teaching Mathematics for Social Justice

Brief Research Report

This study investigates the perspectives that secondary math teachers committed to teaching math for social justice bring to their work. Interviews with fifteen teachers from urban cities across the U.S. addressed teachers' opportunities and challenges developing critical math pedagogies, as well as their visions for improving math education.

Mary Candace Full
University of California, Los Angeles

Webster

57
The Development of Children's Concept Images and Understandings of Fractions

Brief Research Report

This study investigated how children's concept images and knowledge of 1/2, 1/3, and 1/4 changed as a result of their participation in an instructional intervention based on multiple embodiments of fractions concepts through a mixed methodology.

Xiaofen Zhang
University of Maryland Baltimore County, Baltimore, Maryland

Grand Ballroom B

11:30 a.m.–12:00 p.m.

58
Unveiling Preservice Teachers' Multicultural Mathematics Dispositions

Brief Research Report

We present the Multicultural Mathematics Disposition framework as an assessment tool to evaluate the readiness of preservice teachers to teach diverse students. This framework is defined as a function of three dispositional factors: openness, self-awareness/self-reflectiveness, and commitment to culturally relevant mathematics teaching.

Dario Andres Gonzalez
University of Georgia, Athens

Angel Manuel Carreras-Jusino
University of Georgia, Athens

Dorothy Y. White
University of Georgia, Athens

Claudette Tucker
University of Georgia, Athens

Kanita K. DuCloux
Western Kentucky University, Bowling Green

Commonwealth Ballroom B

1:15 p.m.–2:30 p.m.

59
Assessing Student Ability and Inclination to Use CCSS MP.7 (Structure)

Discussion Session

As Common Core State Standards for Mathematical Practice (SMP) begin to be implemented, assessment of application of the SMP remains an open question. With a focus on SMP.7, we will discuss an instrument that has been designed and piloted and examines not only student ability to use this SMP but also inclination to do so.

Miriam Gates
Education Development Center, Inc., Waltham, Massachusetts

Al Cuoco
Education Development Center, Inc., Waltham, Massachusetts

Jane M. Kang
Education Development Center, Inc., Waltham, Massachusetts

Webster

60
Development of Teachers' Statistical Reasoning and Confidence in Teaching Statistics

Research Symposium

This symposium will engage participants in considering results and implications from three studies about the development of secondary and post-secondary teachers' statistical reasoning and confidence for teaching statistics. The studies arise from teachers' work in a graduate course designed and taught by instructors at two institutions.

Hollylynne Lee
North Carolina State University, Raleigh

Helen M. Doerr
Syracuse University, Syracuse, New York

Bridgette Jacob
SUNY–Onondaga Community College, Syracuse, New York

Tina T. Starling
North Carolina State University, Raleigh

Tyler Pulis
North Carolina State University, Raleigh

Dung Tran
North Carolina State University, Raleigh

Jennifer Nickell
North Carolina State University, Raleigh

Emily Thrasher
North Carolina State University, Raleigh

Grand Ballroom A

61
Discussing Design of Measures of Mathematical Knowledge for Teaching

Discussion Session

Researchers from five assessment projects will discuss their methodological and theoretical choices related to assessment design, and how those choices impact their work to improve student access to quality teaching. The assessments considered are all categorized as measures of mathematical knowledge for teaching but differ in principled ways.

Cameron Byerley
Arizona State University, Tempe

Andrew Izsak
University of Georgia, Athens

Patricio G. Herbst
University of Michigan, Ann Arbor

Mark Hoover
University of Michigan, Ann Arbor

Janine Remillard
University of Pennsylvania, Philadelphia

Stacy Musgrave
Arizona State University, Tempe

Commonwealth Ballroom B

1:15 p.m.–2:30 p.m.

62
High Impact Strategies for Early Mathematics: A Lesson Observation Tool

Discussion Session

High Impact Strategies for Early Mathematics (HIS-EM) is an observation tool that measures quality of mathematics teaching practice across nine dimensions. Learn how HIS-EM has been used for program evaluation in a large, urban district in preschool through third-grade classrooms.

Jeanine O'Nan Brownell
Erikson Institute, Chicago, Illinois

Erin Reid
Erikson Institute, Chicago, Illinois

Bilge Cerezci
Erikson Institute, Chicago, Illinois

Commonwealth Ballroom A

63
Investigations into Mathematics Preservice Teachers' Practice

Discussion Session

This session takes a focused look at two specific high-leverage practices: eliciting student thinking, and managing student responses. We describe the features of preservice teachers' enacting these practices and discuss possible implications for teacher education.

Diana Sherman
University of Michigan, Ann Arbor

Annick Rougee
University of Michigan, Ann Arbor

Grand Ballroom E

64
Multiplicative Structures across the Curriculum

Research Symposium

We will discuss with the audience results of three third-grade classroom intervention studies on topics from the conceptual field of multiplicative structures (Vergnaud, 2009); namely, division, proportionality, and functions. The results we report call for changes in the mathematics curriculum and practice.

Analucia Schliemann
Tufts University, Medford, Massachusetts

David W. Carraher
TERC, Cambridge, Massachusetts

Alina G. Spinillo
Universidade Federal de Pernambuco, Recife - PE, Brazil

Síntria L. Lautert
Universidade Federal de Pernambuco, Recife - PE, Brazil

Grand Ballroom B

65
School-Embedded Professional Development Models to Advance Instructional Practice

Research Symposium

This session investigates two school-embedded professional development models examining critical design features and facilitation structures to foster ongoing teacher learning and improved instruction.

Kristin Lesseig
Washington State University Vancouver

Rebekah Elliott
Oregon State University, Corvallis

Wendy Rose Aaron
Oregon State University, Corvallis

Commonwealth Ballroom C

66
The Ethics of Facilitating and Researching Professional Development

Discussion Session

Three mathematics education researchers share their professional development (PD) models and their underlying assumptions of those models. Our goal is to explore the researcher-facilitator relationship to better understand research-practice dilemmas in doing PD. We use the models to highlight ethical issues involved in the work of PD.

Eva Thanheiser
Portland State University, Portland, Oregon

Beth Herbel-Eisenmann
Michigan State University, East Lansing

Mary Beisiegel
Oregon State University, Corvallis

Otis

67
Using Data Mining for Real-Time Assessment and Tutoring Inquiry Skills

Research Symposium

Inq-ITS (Inquiry-Intelligent Tutoring System) is a virtual environment for science inquiry skills assessment and learning. In Inq-ITS, middle school students use science microworlds (25+) and inquiry widgets to generate a hypothesis, test it, interpret data, warrant claims, and communicate findings—all key science practices (NRC, 2013). We use educational data-mined algorithms and knowledge-engineered rules to: (1) produce performance assessments of students' inquiry skills, which are reported to the teacher in real time, and (2) adaptively tutor students in real time via our pedagogical agent, Rex (a cartoon dinosaur). I will report on the system, its design, and current results.

Janice D. Gobert
Worcester Polytechnic Institute, Worcester, Massachusetts

Michael Sao Pedro
Worcester Polytechnic Institute, Worcester, Massachusetts

Faneuil

69

Examining Student-Centered Instruction in High School Mathematics

Brief Research Report

In this study, we explore student-centered approaches to mathematics instruction in high school, examine the relationship between implementation of these approaches and instructional context, and investigate the relationship between student-centered instruction and student (a) engagement and (b) skill in problem solving.

Toni M. Smith
American Institutes for Research, Washington, D.C.

Kirk Walters
American Institutes for Research, Washington, D.C.

Steven Leinwand
American Institutes for Research, Washington, D.C.

Commonwealth Ballroom C

70

Extending the Empirical Basis of a Length Measurement Learning Trajectory

Brief Research Report

This report focuses on concepts and strategies exhibited by a large sample of elementary, middle, and secondary students using a hypothetical learning trajectory (LT) for length measurement. Results address a critical outstanding question about how an LT for length measurement extends into the middle and secondary grades.

Cheryl L. Eames
Southern Illinois University Edwardsville

David B. Klanderman
Trinity Christian College, Palos Heights, Illinois

Rachel Unverfehrt
Southern Illinois University Edwardsville

Grand Ballroom A

71

Flowcharts to Assess Professional Noticing: Methods for Coding Open-Ended Responses

Brief Research Report

Researchers highlight the development of flowcharts to score video-based assessments of professional noticing capacities to increase coding efficiency and reliability across a large team. The measurement process in this research has potential to refine strategies for assessment of responsive teaching with respect to noticing frameworks and beyond.

Cindy Jong
University of Kentucky, Lexington, Kentucky

Edna O. Schack
Morehead State University, Morehead, Kentucky

Jonathan N. Thomas
Northern Kentucky University, Highland Heights

Molly H. Fisher
University of Kentucky, Lexington

Grand Ballroom E

72

Focusing on Individuals: An Investigation of Student Engagement

Brief Research Report

The MYTEAM project investigated the decline in mathematics engagement and achievement in Australian middle-years students using a series of quantitative and qualitative studies. This presentation tracks one investigative pathway through the five studies that highlights the critical role of individual student differences.

Jennifer A. Way
University of Sydney, Sydney, Australia

Webster

73

High School Students' Academic Language Skills in Narrative Solutions

Brief Research Report

This study examines high school students' (n=18) use of academic language in formal written mathematical solutions. We discuss students' use of linking words, mathematical vocabulary, and syntactic complexity and how these relate to indicators associated with content understanding.

Woong Lim
Kennesaw State University, Kennesaw, Georgia

Lauren Jeneva Moseley
Lee University, Cleveland, Tennessee

Commonwealth Ballroom B

74

How Do Teachers Make Sense of Student Work for Instruction?

Brief Research Report

In this study, we focus on how grades 3–5 teachers make sense of and interpret artifacts of students' multiplicative thinking, namely the written work that students produce on multiplication and division problems.

Caroline B. Ebby
University of Pennsylvania, Philadelphia

Stone

2:45 p.m.–3:15 p.m.

75
Multiple Representations or Algorithms First? The Impact on Student Abilities

Brief Research Report

This study examined the impact of the order of teaching approaches on student abilities. Group 1 (n=22) received multiple representations followed by traditional algorithms. Group 2 (n=21) received these in reverse order. Results indicated ability gains for both groups, but comparisons of effect size found larger growth gains for Group 1.

Mara Alagic
Wichita State University, Wichita, Kansas

Faneuil

76
Responsive Teaching with Fractions

Brief Research Report

We will report on an expert teaching study designed to characterize responsive teaching—instruction that is continually adjusted in response to children's mathematical thinking. We will highlight the teaching moves and decision making involved in responsive teaching when skilled teachers of grades 4–5 engaged with children's fractional thinking.

Victoria Jacobs
University of North Carolina at Greensboro

Susan B. Empson
University of Texas at Austin

Gladys Krause
University of Texas at Austin

D'Anna Pynes
University of Texas at Austin

Otis

77
Teachers' Motivation to Learn

Brief Research Report

We examined teachers' motivation to learn across individual, community, and policy levels. Seven common themes were identified indicating why teachers sought and engaged in professional development (PD). Specific implications will be shared, addressing the work of teacher educators, researchers, PD facilitators, and school/district supervisors.

Aina K. Appova
Ohio State University, Marion

Fran Arbaugh
Pennsylvania State University, University Park

Grand Ballroom B

78
Why Can You Switch the Order When You Multiply?

Brief Research Report

This interview study investigated fourth- through twelfth-grade students' use and understanding of the commutative property of multiplication. Students produced a range of justifications from appeals to authority, to examples, to more analytic justifications. Students' conceptions of the property were classified as either syntactic or structural.

Sarah Lord
University of Wisconsin–Madison

Commonwealth Ballroom A

3:30 p.m.–4:45 p.m.

79
A Hypothetical Learning Trajectory for Preservice Teachers' Knowledge of Argumentation

Discussion Session

The goal of this presentation is to share a hypothetical learning trajectory focused on mathematical argumentation. We introduce the notion of a multilayered HLT that incorporates subject matter knowledge and pedagogical content knowledge of mathematical argumentation.

Ian Whitacre
Florida State University, Tallahassee

Chepina Rumsey
Kansas State University, Manhattan

Commonwealth Ballroom B

80
Are the NAEP and PISA Mathematics Assessments Really That Different?

Discussion Session

Results of a study comparing the National Assessment of Education Progress (NAEP) and the Program for International Student Assessment (PISA) will serve as the launching point for participants to explore the similarities and differences of NAEP and PISA assessment frameworks and item pools. Included in the session will be an opportunity to examine and discuss individual item features across the two assessments.

Kim Gattis
American Institutes for Research, Washington, D.C.

Linda Dager Hall
St. Patrick's Episcopal Day School, Washington, D.C.

Alka Arora
American Institutes for Research, Washington, D.C.

Commonwealth Ballroom A

81
Grand Challenges in Mathematics Education

Research Symposium

Other fields have identified a list of Grand Challenges as a way to prioritize the most pressing problems that research should address. In a recent JRME issue, the NCTM Research Committee wrote a research commentary that argues for initiating this approach for mathematics education. If the field of mathematics education were to identify a list of Grand Challenges, what might the list include? How could we initiate a process to generate that list? What are the associated risks? We invite you to learn about this new NCTM initiative, provide ideas, and engage in a discussion about the future of this endeavor.

Kathryn B. Chval
University of Missouri, Columbia

Cliff Konold
University of Massachusetts Amherst

Michelle Stephan
University of North Carolina at Charlotte

Jeffrey J. Wanko
Miami University, Oxford, Ohio

Marta Civil
University of North Carolina at Chapel Hill

Beth Herbel-Eisenmann
Michigan State University, East Lansing

Trena Wilkerson
Baylor University, Waco, Texas

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

Grand Ballroom A

82
High School Mathematics Teachers' Preparedness to Teach the CCSSM Standards

Research Symposium

To teach the CCSSM standards effectively requires that teachers possess rich and coherent mathematical meanings. We will discuss implications of meanings for function, quantity, structure, and rate of change held by 400 high school mathematics teachers in two regions of the U.S for teachers' preparedness to teach the CCSSM standards.

Patrick W. Thompson
Arizona State University, Tempe

Cameron Byerley
Arizona State University, Tempe

Neil Hatfield
Arizona State University, Tempe

Stacy Musgrave
Arizona State University, Tempe

Hyunkyoung Yoon
Arizona State University, Tempe

Surani Joshua
Arizona State University, Tempe

Discussant: Heather Hill
Harvard University, Cambridge, Massachusetts

Grand Ballroom B

83
Investigating Beginning Mathematics Teaching

Research Symposium

This session is focused on a study of beginning mathematics teaching. Presenters will share the definition and rationale for studying beginning mathematics teaching, take up a central pattern we have found in our data, and present the results and challenges of a quantitative substudy.

Lindsey Mann
University of Michigan, Ann Arbor

Deborah Loewenberg Ball
University of Michigan, Ann Arbor

L. Joy Johnson
University of Michigan, Ann Arbor

Susanna Farmer
University of Michigan, Ann Arbor

Delena Harrison
University of Michigan, Ann Arbor

Mark Hoover
University of Michigan, Ann Arbor

Hyman Bass
University of Michigan, Ann Arbor

Discussant: Suzanne Wilson
University of Connecticut, Storrs

Commonwealth Ballroom C

84
Interactive Paper Session

Presider: Amanda Thomas
Penn State Harrisburg

Black Learners' Persistence with Mathematics: A Qualitative Metasynthesis

In what ways, do black learners, who are successful with mathematics, negotiate their experiences in order to persist with mathematics across time? Using qualitative metasynthesis to interpret patterns across multiple qualitative studies, we found that the answer lies within the ways the learners enacted their sense of agency.

Robert Q. Berry
University of Virginia, Charlottesville

Kateri Thunder
James Madison University, Harrisonburg, Virginia

The Research Divide between Mathematics Education and Special Education

Using a content analysis of a sample of 259 peer-reviewed research reports on PK–12 mathematics published in 2013, this presentation will analyze the current state of mathematics education for those with disabilities, including where research is published, methods used, and underlying theories of pedagogy and dis/ability.

Rachel Lambert
Chapman University, Orange, California

Toward a Socio-Spatial Framework for Urban Mathematics Education Scholarship

The purpose of this presentation is to initiate and forward a new theoretical framing for urban mathematics education scholarship. In the session, we hope to discuss the theoretical elements of the framing and work toward refining it for application in research.

Gregory V. Larnell
University of Illinois at Chicago

Erika C. Bullock
University of Memphis, Memphis, Tennessee

Stone

85

Researchers as Mathematics Teacher Educators: Developing MTE Manuscripts from Research

Research Symposium

This session will focus on how researchers can take ideas from their work and craft them into a manuscript suitable for submission to Mathematics Teacher Educator (MTE). Members of the MTE Editorial Board will describe critical aspects of the review process, and co-authors of an MTE article will describe the process they went through.

Sandra Crespo
Michigan State University, Ann Arbor

Kevin C. Moore
University of Georgia, Athens, Georgia

Jason Silverman
Drexel University School of Education, Philadelphia, Pennsylvania

Margaret Smith
University of Pittsburgh, Pittsburgh, Pennsylvania

Laura R. Van Zoest
Western Michigan University, Kalamazoo

Gladis Kersaint
University of South Florida, Tampa

Faneuil

GET PUBLISHED IN MATHEMATICS TEACHER EDUCATOR

The Editorial Panel of *Mathematics Teacher Educator* is asking for articles that:

- ✓ Describe teacher learning experiences designed based upon NCTM's *Principles to Actions: Ensuring Mathematical Success for All*
- ✓ Provide evidence of how these experiences have enhanced the knowledge, beliefs, or practices of preservice or in-service teachers.

Principles to Actions coalesces and draws attention to many important ideas that mathematics teacher educators have been implementing in their work for decades.

The *Mathematics Teacher Educator* is a journal dedicated to building a professional knowledge base for mathematics teacher educators that stems from, develops, and strengthens practitioner knowledge.

Mathematics Teacher Educator

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

AMTE Association of Mathematics Teacher Educators

Submissions are due before **September 1, 2015.**
For more information visit **www.nctm.org/mte.**

3:30 p.m.–4:45 p.m.

86
Research on Mathematical Reasoning in Informal Designed Learning Environments

Research Symposium

There are many opportunities to engage both adults and children in mathematics outside of school—in museums, libraries, and even farmers' markets. Presenters will discuss the possibilities and challenges of supporting mathematical reasoning in informal environments, based on a range of projects in which they have been involved.

Andee Rubin
TERC, Cambridge, Massachusetts

Toni Dancu
Exploratorium, San Francisco, California

Marlene Kliman
TERC, Cambridge, Massachusetts

Jan Mokros
Maine Math and Science Alliance, Augusta, Maine

Ricardo Nemirovsky
San Diego State University, San Diego, California

Lucera Gallegos
Mingei International Museum, San Diego, California

Webster

86.1
Meeting Place Session #2

The Meeting Place session brings together facilitators and topics nominated by the mathematics education community. Please see the NCTM conference app for updated information on the facilitators and topics of discussion for this session.

Otis

5:00 p.m.–6:00 p.m.

87
An Exploratory Study of "Place Holder Zeroes"

Poster Session

This was an exploratory study focused on investigating a possible gap in students' conceptual understanding of the relationship between "place holder zeroes" and place value in multi-digit multiplication. Survey data suggested that the term "placeholder zero" may be causing a misunderstanding of actual place value within multi-digit multiplication.

Emily Lauren Brennan
University of Massachusetts Amherst

Grand Ballroom C/D

88
Automaticity and the Learning of Meaningful Mathematics

Poster Session

The session highlights results from a study examining the relationship between middle school students' automaticity of basic math facts and their standardized test scores. Addressing principles of access, equity, and assessment, researchers will discuss how the presence of an automaticity intervention treatment impacted student's meaningful math knowledge.

Nancy Blue Williams
University of Georgia, Athens

Cheryll Crowe
Asbury University, Wilmore, Kentucky

Robert Thomas
Eastern Kentucky University, Richmond

Grand Ballroom C/D

89
CCSSM-Aligned Middle Grades Textbooks: How Do They Compare?

Poster Session

In this session, we will share results from an ongoing analysis of CCSSM-aligned middle grades mathematics textbooks with regards to the Geometry and the Ratios and Proportional Relationships domains. These results include similarities and variances in content approach, types of representations used, and what is provided to and required of students in these textbooks.

Shannon Dingman
University of Arkansas, Fayetteville

Dawn Teuscher
Brigham Young University, Provo, Utah

Travis Olson
University of Nevada, Las Vegas

Grand Ballroom C/D

90
Constructing Coordinate Systems: The Case of Morgan and Kaylee

Poster Session

Coordinate systems (CSs) are conventionally used as "representational tools." However, the conventional use does not take students' construction of CSs into account nor how students use their CSs in reasoning. Findings from a teaching experiment with two high school students investigating students' construction of CSs will be presented.

Hwa Young Lee
University of Georgia, Athens

Grand Ballroom C/D

5:00 p.m.–6:00 p.m.

91

Examining the Impact of Schema-Based Instruction on Problem-Solving Performance

Poster Session

This presentation shares findings from a study on the problem-solving performance of second-grade students at risk for mathematical failure. Analysis suggests that schema-based instruction improves problem-solving ability compared to no supplemental instruction. Participants will engage in a discussion concerning implications for classroom practice.

Amy Lingo
University of Louisville, Louisville, Kentucky

Kristin E. Harbour
University of Louisville, Louisville, Kentucky

Grand Ballroom C/D

92

Mathematics Curriculum-Based Assessment and Instruction in Low-Income Preschools

Poster Session

Early childhood math consultants partnered with six low-income preschool programs to improve children's understanding of number and cardinality. A validated curriculum-based measure, which paralleled the game-based curriculum implemented in the classrooms, demonstrated highly significant improvement for children enrolled in the program.

Sally Moomaw
University of Cincinnati, Cincinnati, Ohio

Grand Ballroom C/D

93

Outcomes and Enactment of a Mathematics for Teaching Curriculum

Poster Session

One discourse-driven curriculum that integrates the CCSSM Standards for Mathematical Practice shows promise in developing preservice teachers' mathematical knowledge for teaching. Data from instructors highlight differences in the contextual factors, enactment of the curriculum, and valuing of support materials, which could impact preservice teachers' performance.

Laura Kyser Callis
Boston University, Boston, Massachusetts

Suzanne H. Chapin
Boston University, Boston, Massachusetts

Grand Ballroom C/D

94

Perspectives for Reasoning Quantitatively, Long-Term Effects of a Nonnumeric Approach

Poster Session

Research on quantitative reasoning suggests two interpretations of quantification; assigning a number to describe some amount, and conceiving some amount to compare it against others. This study explores the latter, specifically, how students at grades 5 and 12 negotiate quantitative relationships given in equations and length representations.

Linda Venenciano
University of Hawaii, Honolulu

Fay Zenigami
University of Hawaii, Honolulu

Melfried Olson
University of Hawaii, Honolulu

Judith Olson
University of Hawaii, Honolulu

Grand Ballroom C/D

95

Preparing Preservice Algebra Teachers to Engage in Mathematics Teaching Practices

Poster Session

For this session, we examine data from case studies of three secondary mathematics preparation programs to address a specific question related the Mathematics Teaching Practices of Principles to Actions (NCTM, 2014). In particular, in what ways are these programs preparing future teachers to engage in the practices?

Jeffrey Craig
Michigan State University, East Lansing

Hyunyi Jung
Purdue University, West Lafayette, Indiana

Eryn M. Stehr
Michigan State University, East Lansing

Grand Ballroom C/D

5:00 p.m.–6:00 p.m.

96

Preservice Mathematics Teachers' Lesson Engagement in a Simulated Virtual Classroom

Poster Session

We present findings from a major component of a problem-solving course, the use of Second Life® to simulate a diverse middle grades math classroom. We conducted an exploratory investigation of student and teacher actions during micro-lessons, through an examination of preservice teachers' mathematics instruction performance across 21 indicators.

Trina Davis
Texas A&M University, College Station

Gerald Kulm
Texas A&M University, College Station

Salvatore Enrico Paolo Indiogine
Texas A&M University, College Station

Tugba Oner
Texas A&M University, College Station

Glenn Allen Phillips
Texas A&M University, College Station

Grand Ballroom C/D

97

Preservice Teachers' Perspectives on Language in Latinos' Math Learning

Poster Session

This study examines preservice teachers' teaching practices, knowledge, and beliefs specifically in respect to the role of language in teaching mathematics to Latino English language learners. Study findings and implications for teacher education will be discussed.

Cathery Yeh
University of California, Irvine

Grand Ballroom C/D

98

Screencasts as Proxy Audiences for Students' and their Mathematical Explanations

Poster Session

This session will investigate how screencasts (screen captures of digital devices with audio) served as a proxy audience when elementary students solved multiplication and division story problems. Students took on teacher personas and generated detailed mathematical explanations as they created their screencasts for their potential audience.

Melissa M. Soto
San Diego State University, San Diego, California

Grand Ballroom C/D

99

Special Education Teachers' Understanding and Instructional Application of Visual Representations

Poster Session

This session will present findings from a survey that examined special education teachers' understanding of visual representations (VR) for solving mathematics problems, as well as instructional practices for teaching VRs to students with disabilities. Implications for practice will be presented.

Amy Scheuermann
Minnesota State University, Mankato

Mary Murray
Bowling Green State University, Bowling Green, Ohio

Grand Ballroom C/D

100

STEM Interest, Self-Efficacy, and Achievement Among Middle Levels Students

Poster Session

Preliminary results from a three-year longitudinal study of grades 4–8 students' self-efficacy and interest in STEM, perceptions of mathematics and science instruction, and achievement on state mathematics and science assessments. Findings suggest potential benefits when teachers' instruction attends to students' sources of mathematics self-efficacy.

Joe Champion
Boise State University, Boise, Idaho

Kimberly Moore
Texas A&M University–Corpus Christi

Grand Ballroom C/D

101

Supporting Preservice Teachers in Justifying Equivalence of Ratios

Poster Session

In this session, we will share tasks developed to build a foundation for ratio meanings, representations, and language. By examining sample student work, we will discuss how these tasks can work to support preservice teachers' in justifying the equivalence of ratios and in reasoning proportionally.

Margaret Rathouz
University of Michigan–Dearborn

Rheta Rubenstein
University of Michigan–Dearborn

Grand Ballroom C/D

102

Task Design, Peer Pressure, and Argumentation: The Acceptance of Perceptual Warrants

Poster Session

We explore the development of argumentation in an online, synchronous, dynamic geometry environment. Over time the students provided more and more sophisticated arguments through the prompts, and we explain how the task design supported this, even though certain choices allowed the students to subvert the mathematical possibilities of the task.

Tim Fukawa-Connelly
Drexel University, Philadelphia, Pennsylvania

Jason Silverman
Drexel University, Philadelphia, Pennsylvania

Grand Ballroom C/D

103

Teachers' Visual Representations of a Simulation Approach to Inference

Poster Session

This poster describes a study of teachers' visual representations of their understanding of a simulation approach to inference. The teachers had engaged in many simulation tasks in a graduate-level course on teaching and learning statistics.

Jennifer Nickell
North Carolina State University, Raleigh

Hollylynne Lee
North Carolina State University, Raleigh

Helen M Doerr
Syracuse University, Syracuse, New York

Grand Ballroom C/D

104

Using a Teaching Simulation to Assess Mathematical Knowledge for Teaching

Poster Session

This study examined whether it is possible to assess preservice teachers' mathematical knowledge for teaching (MKT) through their performances on a teaching simulation, focused on eliciting and interpreting a simulated student's thinking. Findings focus on where MKT could be seen and how it could be measured.

Jillian Peterson Mortimer
University of Michigan, Ann Arbor

Timothy Boerst
University of Michigan, Ann Arbor

Grand Ballroom C/D

8:30 a.m.–9:45 a.m.

105
Codesigning for Equity: Tensions That Arise in Formative Intervention Research

Discussion Session

We describe a project aimed at understanding and decreasing the mathematics opportunity gap in discipline-specific terms, and we highlight three tensions that have arisen related to characteristics of formative intervention research: focusing on a problem of practice, stimulating participants to produce innovations, and expanding participants' agency.

Al Cuoco
Education Development Center, Inc., Waltham, Massachusetts

Charles Munter
University of Pittsburgh, Pittsburgh, Pennsylvania

Eden Badertscher
Education Development Center, Inc., Waltham, Massachusetts

Melissa Boston
Duquesne University, Pittsburgh, Pennsylvania

Tracy Johns
Pittsburgh Public Schools, Pittsburgh, Pennsylvania

Cynthia Fisher
Pittsburgh Public Schools, Pittsburgh, Pennsylvania

Toni Murdock
Pittsburgh Public Schools, Pittsburgh, Pennsylvania

Rose Mary Schmitt
Southbrook Middle School, Pittsburgh, Pennsylvania

Discussant: Danny B. Martin
University of Illinois at Chicago

Discussant: Na'ilah Suad Nasir
University of California, Berkeley

Commonwealth Ballroom A

106
Constructing Arguments: What Students in Grades 2–5 Can Do

Discussion Session

In this discussion session, participants will view video clips of structured interviews with elementary students and consider how different learners productively engage in justifying claims and constructing arguments grounded in representation. We will examine how this work connects to Common Core mathematics practices 3, 6, 7, and 8.

Traci Higgins
TERC, Cambridge, Massachusetts

Susan Jo Russell
TERC, Cambridge, Massachusetts

Deborah Schifter
Education Development Center, Inc., Northampton, Massachusetts

Commonwealth Ballroom C

107
Crafting a Dissertation-Based Research Article for JRME

Research Symposium

Learn how to craft a Journal for Research in Mathematics Education Article (JRME) article from dissertation research. Three authors will describe their experiences publishing in JRME and share tips for writing a journal-length article based on a dissertation study.

Cynthia Langrall
Illinois State University, Normal

JRME Editorial Panel
National Council of Teachers of Mathematics, Reston, Virginia

Katherine E. Lewis
University of Washington, Seattle

David Barnes
National Council of Teachers of Mathematics, Reston, Virginia

Kevin C. Moore
University of Georgia, Athens

Grand Ballrooms A&B (Combined)

108
Functions, Teacher Development, and Student Learning

Research Symposium

We discuss an 18-month graduate-level program for teachers (grades 5–9). The program interweaves mathematics and pedagogy through an emphasis on functions. We examine the program's impact on teachers' evolving awareness of students' reasoning, changes in classroom teaching, and students' performance on state-administered standardized tests.

David W. Carraher
TERC, Cambridge, Massachusetts

Montserrat Teixidor-i-Bigas
Tufts University, Medford, Massachusetts

Barbara M. Brizuela
Tufts University, Medford, Massachusetts

Analucia Schliemann
Tufts University, Medford, Massachusetts

Grand Ballroom C

109
Homework in Our Vision of Excellent Mathematics Programs

Discussion Session

This session will examine the potential role and nature of homework within the vision of mathematics education put forth by Principles to Actions (NCTM, 2014) and identify areas for research to establish best homework practices linked to this vision.

Mara Landers
Los Medanos College, Pittsburg, California

Commonwealth Ballroom B

110
Interactive Paper Session

Presider: Trena Wilkerson
Baylor University, Waco, Texas

Identifying Mathematical Knowledge for Teaching to a Learning Progression

A rational analysis was conducted comparing a student learning progression to a set of mathematical knowledge for teaching (MKT) assessment items, each focused on quadratic functions. The result is an annotated learning progression associating teacher knowledge to specific student learning, demonstrating a potentially useful way to link related research on student learning and teacher knowledge.

Heather Howell
ETS, Princeton, New Jersey
Aurora Graf
ETS, Princeton, New Jersey

Evaluating a Learning Map of Integer Understanding Using Test Responses

We will share the results of a study examining the validity of a learning map related to integers. We analyzed responses from 2,846 middle school students to an assessment containing twenty-five items aligned to sixteen skills in a learning map. Participants will discuss the learning map model and implications for professional development and research.

Angela Broaddus
University of Kansas, Lawrence
Anu Sharma
University of Kansas, Lawrence

Studying the Assumptions Teachers Make within Scenario-Based Assessments

We discuss findings from a study of 107 K–12 mathematics teachers' responses to scenario-based assessments to examine teachers' justification of actions. Analysis suggests some items elicit participants to make additional assumptions in order to take a position. We show how we detect those assumptions and how assumptions can be accounted for in terms of the professional obligations of mathematics teaching.

Amanda M. Milewski
University of Michigan, Ann Arbor
Ander Erickson
University of Michigan, Ann Arbor

Stone

111
Interactive Paper Session

Presider: Michelle Stephan
University of North Carolina at Charlotte

Noticing the Other and the Other Noticing: Estimation in a Bilingual Classroom

In this presentation, a bilingual teacher and a mathematics teacher educator will share their experience teaching an estimation unit to a group of fourth-grade bilingual Latino/a students. Although the unit was planned primarily to promote teacher noticing of student ideas (by inspecting student work), soon both teacher and researcher realized the importance of eliciting what students were noticing in the estimation tasks. For example, what appeared to be the students' failure to grasp the rounding technique turned out to be multiple perspectives (elicited through student interviews) that reflected students' logical thinking, selectivity, and sense making. Without this "other noticing" and without "noticing the other," both teacher and students would have ended up feeling frustrated.

Higinio Dominguez
Michigan State University, East Lansing
Melissa Adams
Ridgetop Elementary, Austin, Texas

Standards for Mathematical Practice & Multidimensional Mathematics Teaching

This session uses the teaching practices of a seventh-grade mathematics teacher in a unit on adding and subtracting integers to examine intersections among the NCTM Process Standards, the CCSSM Standards for Mathematical Practice, and characteristics of multidimensional mathematics teaching.

Robert Q. Berry
University of Virginia, Charlottesville
Mark Ellis
California State University, Fullerton

How Partnerships with Teachers Are Core to Linking Research and Practice

Partnerships between researchers and teachers are central to stimulating advancements in my research agenda on supporting students' meaningful learning, connection making, and technology use in algebra. I will share some reflections on how both researchers and teachers may benefit from classroom-based research that aims to address shared problems of practice.

Nicole L. Fonger
University of Wisconsin–Madison

Otis

8:30 a.m.–9:45 a.m.

112
Teachers' Perceptions and Uses of Curriculum Materials in CCSSM Contexts

Research Symposium

Four related studies examine survey data, background interviews, and planning interviews to explore teachers' perceptions and uses of curriculum materials with respect to CCSSM, especially the Standards for Mathematical Practice. The studies further examine instructional supports and the impact of high-stakes assessment and teacher evaluation systems.

Jeffrey Choppin
University of Rochester, Rochester, New York

Jon D. Davis
Western Michigan Avenue, Kalamazoo

Zenon Borys
University of Rochester, Rochester, New York

James Kratky
Western Michigan University, Kalamazoo

Cynthia Carson
University of Rochester, Rochester, New York

Discussant: James E. Tarr
University of Missouri, Columbia

Grand Ballroom D

112.1
Meeting Place Session #3

The Meeting Place session brings together facilitators and topics nominated by the mathematics education community. Please see the NCTM conference app for updated information on the facilitators and topics of discussion for this session.

Webster

113
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.

Wendy S. Bray
University of Central Florida, Orlando

Mathematics Teacher Editorial Panel
National Council of Teachers of Mathematics, Reston, Virginia

Mathematics Teaching in the Middle School Editorial Panel
National Council of Teachers of Mathematics, Reston, Virginia

Teaching Children Mathematics Editorial Panel
National Council of Teachers of Mathematics, Reston, Virginia

Grand Ballroom E

10:15 a.m.–11:15 a.m.

113.1
Turning the Common Core into Reality in Every Math Classroom

Plenary Session

With the release of Principles to Action, NCTM has undertaken a major initiative to define and describe specific teaching practices that are essential for high-quality mathematics education for all students. In addition, NCTM has identified strategic priorities to guide its work (i.e., access and equity; advocacy; curriculum, instruction, and assessment; professional development; research; and technology). In this plenary session, the panel will respond to the Principles to Action publication and make recommendations for moving research forward from their diverse perspectives.

Deborah Loewenberg Ball
University of Michigan, Ann Arbor

Danny B Martin
University of Illinois, Chicago

Dan Meyer
Stanford University, San Francisco

Steven Leinwand
American Institutes for Research, Washington, D.C.

Grand Ballrooms A&B (Combined)

12:30 p.m.–1:00 p.m.

114
An Alternative Mathematics Assessment Mode: Mathematical Modeling

Brief Research Report

This study investigates whether performance on an alternative mode of assessment may provide a means to identify mathematical capabilities that are not captured on conventional measures of mathematics achievement. This alternative mode would identify a broader diversity of talented students who might otherwise be denied access to STEM studies.

Ozgul Kartal
Illinois Institute of Technology, Chicago

Beyza Aksu
University of Illinois at Chicago

Stone

12:30 p.m.–1:00 p.m.

115
Context Matters More for Some Elementary Math Curricula Than Others

Brief Research Report

We examine whether three teacher/classroom characteristics that research has shown influence curriculum implementation also influence curriculum effects. Across the contexts examined, we find one standards-based and one conventional curriculum are equally effective, and either as effective or more effective than the other two curricula studied.

Barbara D Harris
Mathematica Policy Research, Washington, D.C.

Roberto Agodini
Mathematica Policy Research, Princeton, New Jersey

Grand Ballroom D

116
Designing Data Visualizations to Promote Math Learning and Identity Development

Brief Research Report

A researcher and teacher at a diverse urban school partnered to enact a seventh-grade unit where students analyzed and designed visualizations of public city data. We analyze students' engagement with math content and mathematical agency, and we identify the supports that promoted mathematical depth. The talk will include classroom video and student work.

Michelle Wilkerson-Jerde
Tufts University, Medford, Massachusetts

Elsa Head
Cambridge Public School District, Cambridge, Massachusetts

Commonwealth Ballroom A

117
Development of Integer Addition and Subtraction: The Case of Jace

Brief Research Report

This session will report on a student's participation in a twelve-week teaching experiment. This session will focus on how Jace solved open numbers sentences with integer addition and subtraction in four different individual interviews. Results provide more robust descriptions of conceptual models for integers and provide a developmental perspective.

Nicole M. Wessman-Enzinger
Illinois State University, Normal

Commonwealth Ballroom C

118
Dimensions of Curricular Noticing

Brief Research Report

This report uses data from four projects to highlight aspects of curricular noticing, which theorizes how teachers make sense of the complexity of curricular materials. We will engage participants in considering how curricular noticing may support mathematics teacher educators in supporting preservice teachers' engagement with curricular materials.

Julie Amador
University of Idaho, Coeur d'Alene

Darrell Earnest
University of Massachusetts Amherst

Lorraine M. Males
University of Nebraska–Lincoln

Leslie Dietiker
Boston University, Boston, Massachusetts

Webster

119
Examining Students' Algebraic Thinking through Interview Assessments

Brief Research Report

Our presentation will focus on analyses of children's responses to early algebra interview assessments completed in grades 3 and 4, further illuminating the impact of our early algebra intervention on children's algebra readiness as well as highlighting the value of interviewing students to gain insight into their algebraic thinking.

Hannah Kang
University of Wisconsin–Madison

Ana C. Stephens
University of Wisconsin–Madison

Grand Ballroom E

120
Exploring High and Low Instruction Classrooms with High Student Achievement

Brief Research Report

In comparing classrooms with low and high quality instruction where students of color have shown to be successful on state standardized tests, this study asks: what forms of practice seem to be supporting all students' achievement scores, even in classrooms where the quality of instruction is considered poor?

Mahtab Nazemi
College of Education, University of Washington, Seattle

Grand Ballroom C

12:30 p.m.–1:00 p.m.

121
Life of a MET Grant: Space for Progressive Math Pedagogy

Brief Research Report

Modeling a grant and the ensuing research from inception, the session illustrates the process, from submission of the proposal to NCTM's Mathematics Education Trust through the life of the research to the final report with results. The session will acquaint participants with a possible funding source and follow the actual research with awardees.

Johnny W. Lott
Chair, Mathematics Education Trust (MET) Board of Trustees; Missoula, Montana

Joel Amidon
University of Mississippi, University, Mississippi

Virginia Cornelius
Lafayette High School, Oxford, Mississippi

Morgan Trevathan
Lafayette High School, Oxford, Mississippi

Commonwealth Ballroom B

122
National Science Foundation Funding Program Overview and Proposal Writing

Research Symposium

NSF Program Officers will summarize funding opportunities available, including the EHR Core Research program and a discussion of the meaning of fundamental research aligned with Stokes' Pasteur's Quadrant. A discussion on proposal writing aimed at early-career researchers, particularly those interested in submitting to the CAREER program, will follow.

Finbarr Barry Sloane
National Science Foundation (NSF), Arlington, Virginia

Karen D. King
National Science Foundation (NSF), Arlington, Virginia

Margaret Hjalmarson
George Mason University, Fairfax, Virginia

Grand Ballrooms A&B (Combined)

123
Practice-Based Perspectives of Inquiry Teaching of High School Algebra

Brief Research Report

This study investigated inquiry-based teaching of algebra based on the thinking and practice of exemplary mathematics teachers. Findings based on interviews and classroom observations include three inquiry-oriented perspectives that engage students in unique ways of learning algebra and four aspects of teachers' thinking that support these perspectives.

Olive Chapman
University of Calgary, Calgary, Canada

Otis

1:15 p.m.–2:30 p.m.

124
Cognitively Demanding Task Implementation and Discourse with English Learners

Discussion Session

Using cognitively demanding tasks has been identified as a key component of equitable teaching practice, although implementing these tasks is challenging. Attendees will view and analyze vignettes highlighting the intersection of cognitively demanding tasks and language development and discuss implications and directions for research and practice.

Zandra U. de Araujo
University of Missouri, Columbia

Sarah Ann Roberts
University of California, Santa Barbara

Craig J. Willey
Indiana University-Purdue University (IUPUI), Indianapolis

William C. Zahner
San Diego State University, San Diego, California

Grand Ballroom E

125
Designing for Change in Teachers' Practices—Toward Explorative Instruction

Discussion Session

We present initial findings from a study on a professional development program aimed at changing teachers' instructional practices. We view the trajectory of teachers' change as moving from engaging students in "ritual" ways, where the goal is satisfying teachers' authority, towards engaging "exploratively" by mathematizing on their own.

Einat Heyd-Metzuyanim
University of Pittsburgh, Pittsburgh, Pennsylvania

Margaret Smith
University of Pittsburgh, Pittsburgh, Pennsylvania

Victoria L. Bill
Institute For Learning, Pittsburgh, Pennsylvania

Nathan Franz
Syracuse School City District, Syracuse, New York

Lauren Resnick
University of Pittsburgh, Pittsburgh, Pennsylvania

Commonwealth Ballroom A

1:15 p.m.–2:30 p.m.

126
Exploring Different Theoretical Frontiers: Implications for Mathematics Classroom Practice

Research Symposium

In this symposium, panelists discuss how different theoretical traditions available to researchers in the emancipate and/or deconstruct paradigms of inquiry provide new productive ways for researchers, educators, teachers, and policymakers to think and rethink classroom practices, including those outlined in recent policy documents.

David W. Stinson
Georgia State University, Atlanta

Erika C. Bullock
University of Memphis, Memphis, Tennessee

Eric (Rico) Gutstein
University of Illinois at Chicago

Elizabeth de Freitas
Adelphi University, Garden City, New York

Nathalie Sinclair
Simon Fraser University, Burnaby, British Columbia, Canada

Danny B. Martin
University of Illinois at Chicago

Niral Shah
Michigan State University, East Lansing

Indigo Esmonde
University of Toronto, Toronto, Canada

Tesha Sengupta-Irving
University of California, Irvine

Grand Ballrooms A&B (Combined)

127
Interactive Paper Session

Presider: Joel Amidon
University of Mississippi, University, Mississippi

First-Grade Students' Uses of Tables as They Explore Functional Relations

We present first graders' uses of function tables as they explored relationships between quantities, drawing from a design study investigating functional thinking. Findings suggest children used tables as organizational tools, and they looked not just at tables, but also through tables at functional relationships. We take this as evidence that children were using tables as tools to think about functions.

Barbara M. Brizuela
Tufts University, Medford, Massachusetts

Maria Blanton
TERC, Cambridge, Massachusetts

Angela Gardiner
TERC, Cambridge, Massachusetts

Katharine B. Sawrey
Tufts University, Medford, Massachusetts

Ashley Newman-Owens
Tufts University, Medford, Massachusetts

Teacher Responses to Students' Informal Methods of Countable Subtraction

We investigate teacher responses to students' informal methods of subtraction and provide evidence that relatively few teachers in our sample properly interpret what Fuson (1984) has called the cardinal method and furthermore negatively appraise student work of this nature, requesting instead the use of the measurement method. If students are to be supported in their early learning of mathematics, interventions for teacher professional learning may be suggested in the teacher responses.

Kristi Hanby
University of Michigan, Ann Arbor

Patricio G. Herbst
University of Michigan, Ann Arbor

Promoting Preschool Children's Math Learning through Technology Integration

Results from two randomized controlled studies are presented to demonstrate developmentally appropriate ways of integrating technology into preschool classrooms to support math learning. Outcomes include gains in children's math knowledge and teachers' increased comfort and knowledge of early math content and using technology to support learning.

Phil J. Vahey
SRI International, Menlo Park, California

Deborah Rosenfeld
Education Development Center, Inc., New York, New York

Ashley Lewis-Presser
Education Development Center, Inc., New York, New York

Webster

128
Interactive Paper Session

Presider: Sarah K. Bleiler
Middle Tennessee State University, Murfreesboro

Responses to Students' Math Mistakes and Conjectures: A Study of PSTs

This study explored preservice teachers (PSTs) responses to students' mathematics mistakes and conjectures.

Xueying Ji
Michigan State University, East Lansing

Examining Teacher Candidates' Learning and Enactment of Teaching Practices

Using a multiple case study methodology, this research explores secondary mathematics teacher candidates' learning and enactment of three mathematics teaching practices over the course of a thirteen-month postbaccalaureate teacher preparation program. An extended instructional triangle will serve as the conceptual framework.

Dana Lynn Grosser-Clarkson
University of Maryland, College Park

Pedagogies for Enacting Secondary Instructional and Mathematical Practice

Evidence based teacher education designs need to build teacher candidates' capacity with skillful instruction. Research on secondary pedagogies of practice examines tools for developing ambitious instruction and participation of candidate and students in authentic mathematics.

Rebekah Elliott
Oregon State University, Corvallis

Wendy Rose Aaron
Oregon State University, Corvallis

Sasiwan Maluangnont
Oregon State University, Corvallis

Otis

129
Interactive Paper Session

Presider: Polina Sabinin
Bridgewater State University, Bridgewater, Massachusetts

Using Virtual Manipulatives to Generalize and Justify through Discourse

The purpose of this project was to build theory and knowledge about the nature of students' mathematical discourse as they work with various virtual manipulative types. Results and videos of students' discourse will be presented and discussed. The results extend the existing literature on the ways students discuss mathematical ideas while using technology. Instructional implications will also be discussed.

Katie L. Anderson-Pence
University of Colorado Colorado Springs

Patricia S. Moyer-Packenham
Utah State University, Logan

Patterns of Variation and Productive Discourse: An International Comparison

By comparing reform-oriented exemplary lessons developed through lesson study in the U.S. and China, this presentation aims to explore how lessons can maximize student-learning opportunities by appropriately introducing patterns of variation and productive discourse. Using the theory of variation along with funneling and focusing patterns of questioning, we will compare two similar lessons with respect to the Mathematics Teaching Practices.

Kyle Prince
Middle Tennessee State University, Murfreesboro

Angela T. Barlow
Middle Tennessee State University, Murfreesboro

Analyzing Prompts Pressing Students to Write

The math and English language arts Common Core State Standards and related assessments underscore the importance of mathematical writing. We investigated over 1,900 writing prompts found in student editions across nine curriculums. We developed a comprehensive framework to guide an inductive analysis that highlight the features that students are pressed to include in their written responses.

Tutita M. Casa
University of Connecticut, Storrs

Janine M. Firmender
Saint Joseph's University, Philadelphia, Pennsylvania

Madelyn M. Williams
University of Connecticut, Storrs

Kara LaMonica
Woodstock Public Schools, Woodstock, Connecticut

Julie MacSwan
University of Connecticut, Storrs

Stone

130
Learning Lessons from Instruction: A Study of Urban Elementary Classrooms

Research Symposium

We conducted a multiyear, multi-district study to measure and understand effective mathematics teaching in fourth- and fifth-grade classrooms. Using project-developed instruments and video observation, we discuss the nature of instruction, compare instructional features across districts, and examine instruction in statistics and probability lessons.

Heather Hill
Harvard University, Cambridge, Massachusetts

Erica Litke
Harvard University, Cambridge, Massachusetts

Andrea Humez
Boston College, Chestnut Hill, Massachusetts

Claire Gogolen
Harvard University, Cambridge, Massachusetts

Barb Gilbert
Harvard Graduate School of Education, Cambridge, Massachusetts

Katie Lynch
Harvard University, Cambridge, Massachusetts

Discussant: Jal Mehta
Harvard University, Cambridge, Massachusetts

Grand Ballroom D

131
Graduate Student, Junior Faculty, and Researcher Mentoring Session

Presider: Marta Civil
University of North Carolina at Chapel Hill

Finding Faculty Positions in Higher Education

Julia Aguirre
University of Washington Tacoma

Wendy B. Sanchez
Kennesaw State University, Kennesaw, Georgia

Beth Herbel-Eisenmann
Michigan State University, East Lansing

Navigating the Tenure Process

Anthony Fernandes
University of North Carolina at Charlotte

Victoria M. Hand
University of Colorado Boulder

Publishing Dissertation-Based Manuscripts

Higinio Dominguez
Michigan State University, East Lansing

Jessica Pierson Bishop
University of Georgia, Athens

Transitioning from Doctoral Student to Faculty Member

Zandra U. de Araujo
University of Missouri, Columbia

Gregory V. Larnell
University of Illinois at Chicago

Writing Grant Proposals

Mary Q. Foote
Queens College–CUNY, Flushing, New York

Jeffrey Choppin
University of Rochester, Rochester, New York

Commonwealth Ballroom C

132
Teachers' Conceptions, Professional Noticing and Pedagogy of Justification

Research Symposium

We present analyses of three teachers from a two-year project on justification and argumentation in middle school math classrooms. The complementary analyses attend to teachers' conceptions, professional noticing, and pedagogical practices with respect to justification. We conclude by synthesizing across the analyses and discussing implications.

Megan Staples
University of Connecticut, Storrs

Joanna R. Bartlo
Portland State University, Portland, Oregon

Carolyn McCaffrey James
Portland State University, Portland, Oregon

Jill Newton
Purdue University, West Lafayette, Indiana

Discussant: Kristen Bieda
Michigan State University, East Lansing

Grand Ballroom C

133
Using Discourse Analysis to Uncover Student Development of Mathematical Practices

Discussion Session

Participants will view classroom videos with accompanying transcripts to examine student development of structural reasoning in an algebra class (CCSSM MP.7: "Look for and make use of structure"). A particular discourse-analytic method will be applied for its potential to reveal collective mathematical sense making in the classroom context.

Roser A. Gine
Lesley University, Cambridge, Massachusetts

Commonwealth Ballroom B

134
Contrasting Foci and Methods of K–12 Mathematics Curriculum Evaluation

Brief Research Report

This paper reports on two different goal-oriented curriculum evaluations: one focused on developing course materials to prepare non-STEM students for college mathematics, and the other to measure elementary mathematics teachers' content knowledge through their use of five different sets of fourth- and fifth-grade mathematics curriculum materials.

Steven W. Ziebarth
Western Michigan University, Kalamazoo

Grand Ballroom D

135
Examining Coaches' Role in Schoolwide Instructional Improvement

Brief Research Report

How are strong schoolwide professional communities created? This session proposes an empirically grounded theory of action for mathematics coaching in which coaches design ongoing opportunities for collective learning across a school, creating communities that continually strive to improve math instruction and student learning opportunities.

Lynsey Gibbons
University of Washington, Seattle

Grand Ballroom C

136
Examining High-Impact Practices in Graduate Statistics for the Social Sciences

Brief Research Report

This brief research report describes the results of implementing High-Impact Practices (HIP) into graduate statistics for the social sciences utilizing a quasi-experimental two-group research design for comparing graduate students' average statistics efficacy, leadership skills, and research ethics. NCTM's Principles to Actions and HIP are compared.

Carla J. Thompson
University of West Florida, Pensacola

Giang-Nguyen T. Nguyen
University of West Florida, Pensacola

Commonwealth Ballroom C

137
Function Conceptions of AP Calculus Students

Brief Research Report

In this study, I measured AP Calculus students' understandings of functions at the end of the school year, and I compared their understandings to their performance on the AP Calculus exam.

Adam R. Vrabel
Lourdes University, Sylvania, Ohio

Commonwealth Ballroom B

138
Making Mathematical Practices Explicit in Discourse: Experienced and Beginning Instruction

Brief Research Report

Making mathematical practices explicit while still providing students authentic opportunities to engage in these practices can make instruction more equitable. This study compares how experienced and beginning teachers make mathematical practices explicit in discourse and what this might reveal about the knowledge and skills entailed in doing so.

Sarah Kate Selling
University of Michigan, Ann Arbor

Otis

139
Prospective Teachers' Noticings in Videos of Their Own Mathematics Teaching

Brief Research Report

Video usage has grown in teacher preparation programs, but little is known about what prospective teachers really see and focus on when they watch their own teaching videos. This report will present a study where prospective teachers made video observations after a peer microteaching lab experience, and it will provide opportunities for discussion.

Sarah A. Roller
Michigan State University, East Lansing

Commonwealth Ballroom A

140
Teacher Noticing of Relationships between Earlier and Later Learning

Brief Research Report

This study examines what teachers notice about the relationship between their students' earlier and later learning. Interviews with teachers revealed that teachers often notice when students make connections between earlier and later learning, but they do not often notice when students' later learning about a new topic influences their earlier learning.

Charles Hohensee
University of Delaware, Newark

Stone

2:45 p.m.–3:15 p.m.

141
Teachers Beliefs as Portrayed in NCTM's Principles to Actions

Brief Research Report

In this session we will discuss results of a research study designed to investigate the extent to which elementary teachers support the beliefs expressed in NCTM's Principles to Actions and to understand how teachers interpret the statements made by NCTM.

Rick A. Hudson
University of Southern Indiana, Evansville

Lauren J. Rapacki
Indiana University Bloomington

Mi Yeon Lee
Arizona State University, Phoenix

Webster

142
The Development of Preservice Teachers' Visions of Mathematics Instruction

Brief Research Report

The purpose of this study was to examine how preservice elementary teachers' visions of mathematics instruction developed during their teacher preparation program. Nineteen participants were interviewed multiple times. We will share a trajectory of how visions of mathematics instruction developed, and we will discuss implications for teacher educators.

Temple A. Walkowiak
North Carolina State University, Raleigh

Carrie W. Lee
North Carolina State University, Raleigh

Ashley Whitehead
North Carolina State University, Raleigh

Grand Ballroom E

143
Variation in Children's Understandings of Fractions: Preliminary Findings

Brief Research Report

This research targets children's informal strategies and knowledge of fractions through their creation and interpretation of multiple representations when solving fractions tasks. Analyses of clinical interviews with grades 2–6 children suggest variation across models of the whole and conflicts between informal and rule-based knowledge.

Nicole L. Fonger
University of Wisconsin–Madison

Dung Tran
North Carolina State University, Raleigh

Natasha Elliott
North Carolina State University, Raleigh

Grand Ballrooms A&B (Combined)

3:30 p.m.–4:00 p.m.

144
Beyond Numbers: Evaluating Novices' Orientations to Teaching Mathematics

Brief Research Report

A survey with classroom vignettes was developed and used to evaluate novice teachers' orientation to teaching mathematics. Fifty-two teachers from traditional and alternative preparation programs at one university were surveyed. Response patterns reveal opportunities for preparing teachers to engage in productive teaching practices in high need schools.

William C. Zahner
San Diego State University, San Diego, California

Suzanne H. Chapin
Boston University, Boston, Massachusetts

Grand Ballrooms A&B (Combined)

145
Case Studies of Computation and Algebraic Reasoning in K–2 Students

Brief Research Report

We present video clips and analyses of three individual interviews with a kindergarten student, a first-grade student, and a second-grade student working through a function task. These three cases highlight how arithmetic and algebra are mutually supporting ventures in the mathematical education of young students.

Katharine B. Sawrey
Tufts University, Medford, Massachusetts

Grand Ballroom C

146
Culture as Mediator of Mathematics Achievement for African American Students

Brief Research Report

This research examines the relations between co-regulation and self-regulation strategies, help-seeking behaviors, perceptions of teacher support, and the mathematics achievement of African American middle school students (n=440). Structural equation modeling was used to analyze the data.

Morgan Faison
Emory University, Atlanta, Georgia

Patricia Vela
Emory University, Atlanta, Georgia

Grand Ballroom D

147

Interpreting Student Work: What Secondary Teacher Candidates Bring to Preparation

Brief Research Report

This presentation examines preservice secondary teachers' interpretations of student work. Participants reasoned mathematically, pedagogically, and with comparisons to personal solutions. Results showed relationships between the interpretations and mathematics knowledge for teaching (MKT). There are also implications for supporting teachers to implement practices in Principles to Actions.

Erin Baldinger
Arizona State University, Tempe

Otis

148

Investigating Changes in Middle School Students' Motivation Levels in Mathematics

Brief Research Report

This investigation examined German middle school students' changes in motivation to learn mathematics. Student motivation levels were assessed relative to specific psychological needs of students based on the motivational theoretical framework of Self-Determination Theory.

Giang-Nguyen T. Nguyen
University of West Florida, Pensacola

Carla J. Thompson
University of West Florida, Pensacola

Commonwealth Ballroom A

149

Middle School Mathematics Teacher Evaluation: Discipline Specific Feedback

Brief Research Report

This session focuses on qualitative research study examining middle school mathematics teacher evaluation systems with particular attention to the types of feedback given to teachers by administrators with different levels of mathematics education or experience. Findings and implications are shared.

Christine P. Trinter
Virginia Commonwealth University, Richmond

Stone

150

Scholarly Practice in Methods: Examining Revisions of a Task

Brief Research Report

Improving tasks used in methods courses can encourage better development of high-leverage practices among prospective teachers. We examined the effects of modifications to a video-critique task assigned in a methods course. We will present the improvements in student work found as result of the changes and discuss implications for other tasks.

Alyson E. Lischka
Middle Tennessee State University, Murfreesboro

Wendy B. Sanchez
Kennesaw State University, Kennesaw, Georgia

Commonwealth Ballroom B

151

Towards Inclusive Mathematics Education: A Case Study of Professional Learning

Brief Research Report

Students with disabilities continue to lack access to and achievement in rich mathematics. This presentation describes a research project that examined shifts in teacher discourse during a series of professional learning sessions focused on the use of Universal Design for Learning framework in advancing equity in mathematics education

Paulo Tan
Indiana University Bloomington

Kathleen King Thorius
Indiana University-Purdue University (IUPUI), Indianapolis

Webster

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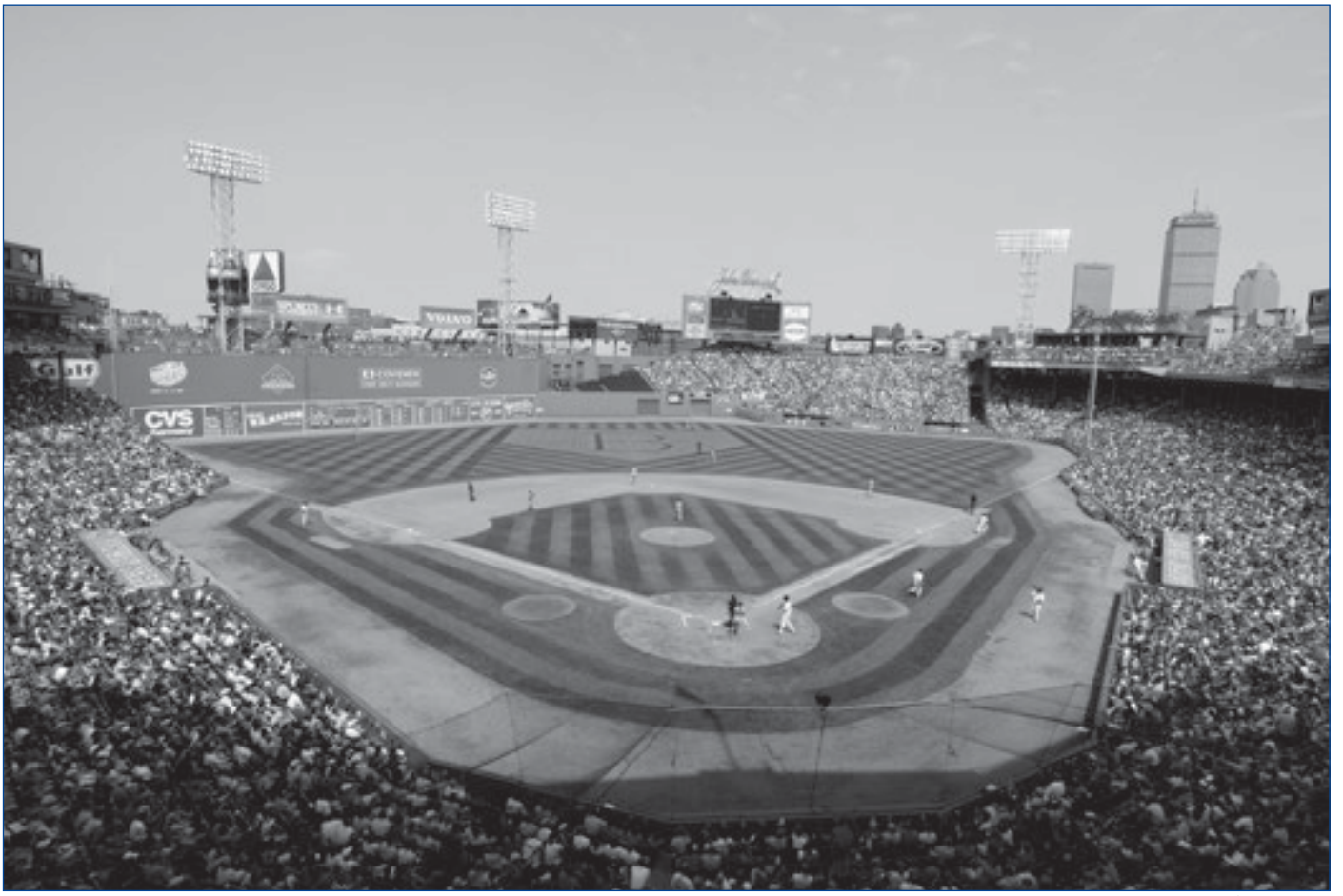

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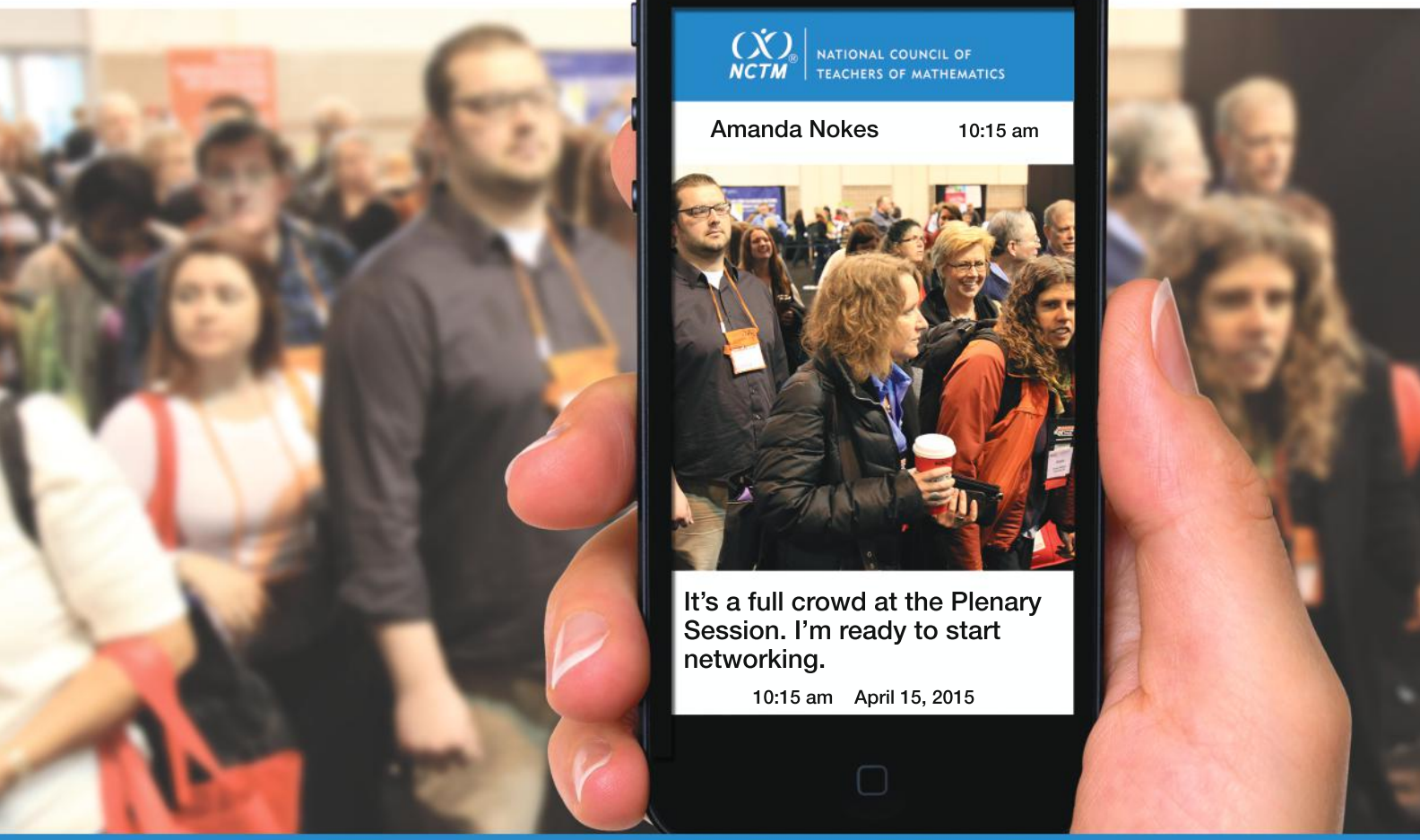

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