



NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

THE NATION'S PREMIER MATH EDUCATION RESEARCH EVENT

**2014 NCTM RESEARCH
CONFERENCE**
April 7-9 • New Orleans

Program Book



www.nctm.org/researchconf

Research Pre-session Planning Committee

NCTM Research Committee

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(2011–2014)

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

University of Virginia

Kathryn B. Chval (2012–2015)

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Denise Spangler, Awards (2012–2014)

University of Georgia

Vanessa Pitts Bannister, Events (2013–
2015)

University of South Florida

Announcements

- The Research Conference will be held at the Ernest N. Morial Convention Center in New Orleans.
- Registration will be held in Lobby A. **Registration is required for attendance, and badges must be worn for all sessions.**
 - o Monday, 4:00 p.m.–7:00 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 Room 220/221/222 from 8:30 p.m. to 10:00 p.m. following the opening session at 7:00 p.m. in Room 208/209/210.
- Two sets of Research Posters Sessions will take place in Room 217/218
 - 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 Papers for the 2015 NCTM Research Conference, April 13–15, Boston, MA, will be available online by mid-June, 2014.
- The NCTM Bookstore will be open on Wednesday 10:00 a.m.–7:00 p.m. in the Exhibit Hall.
- This year the program committee has added brief research reports to the program. These sessions are 30 minutes in duration. The presentation is shared during the first 20 minutes and followed by 10 minutes of questions and audience participation.

Invited Sessions

Opening Session

Arthur Levine

The Coming Transformation of American Education: Implications for Mathematics Education

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

Room 208/209/210

Pursuing and Utilizing the NSF CAREER Award

Tuesday, April 8th, 8:30 a.m.–9:45 a.m.

Room 211

Best Practices from Mathematics Education and Special Education Research

Tuesday, April 8th, 10:00 a.m.–11:15 a.m.

Room 216

The NCTM Research Conference: A Brief History and Future Directions

Tuesday, April 8th, 10:00 a.m.–11:15 a.m.

Room 220/221/222

The Algebra Project: Working for Quality Math Education for Students

Tuesday, April 8th, 10:00 a.m.–11:15 a.m.

Room 208/209/210

Successful Calculus Programs: Two-Year Colleges to Research Universities

Tuesday, April 8th, 1:15 p.m.–2:30 p.m.

Room 219

Writing and Responding to Reviews

Tuesday, April 8th, 1:15 p.m.–2:30 p.m.

Room 216

Graduate Student, Junior Faculty, and Researcher Mentoring Session

Tuesday, April 8th, 3:30 p.m.–4:45 p.m.

Room 220/221/222

Reasoning and Sense Making with Technology in Middle School

Tuesday, April 8th, 3:30 p.m.–4:45 p.m.

Room 219

The Smarter Balanced Assessment Consortium Mathematics Reasoning Project

Tuesday, April 8th, 3:30 p.m.–4:45 p.m.

Room 216

Building Research Communities in Mathematics Education

Wednesday, April 9th, 8:30 a.m.–9:45 a.m.

Room 219

Perspectives on Linking Research and Practice: Thoughts from the Field

Wednesday, April 9th, 8:30 a.m.–9:45 a.m.

Room 220/221/222

Plenary Session

Philip Uri Treisman

A Practical Theory of Productive Persistence in Mathematics Education

Wednesday, April 9th, 10:00 a.m.–11:15 a.m.

Room 208/209/210

How Should the Enacted Mathematics Curriculum be Conceptualized and Studied?

Wednesday, April 9th, 1:15 p.m.–2:30 p.m.

Room 219

Writing Research for Teachers: Putting Results Into Practice

Wednesday, April 9th, 1:15 p.m.–2:30 p.m.

Room 216

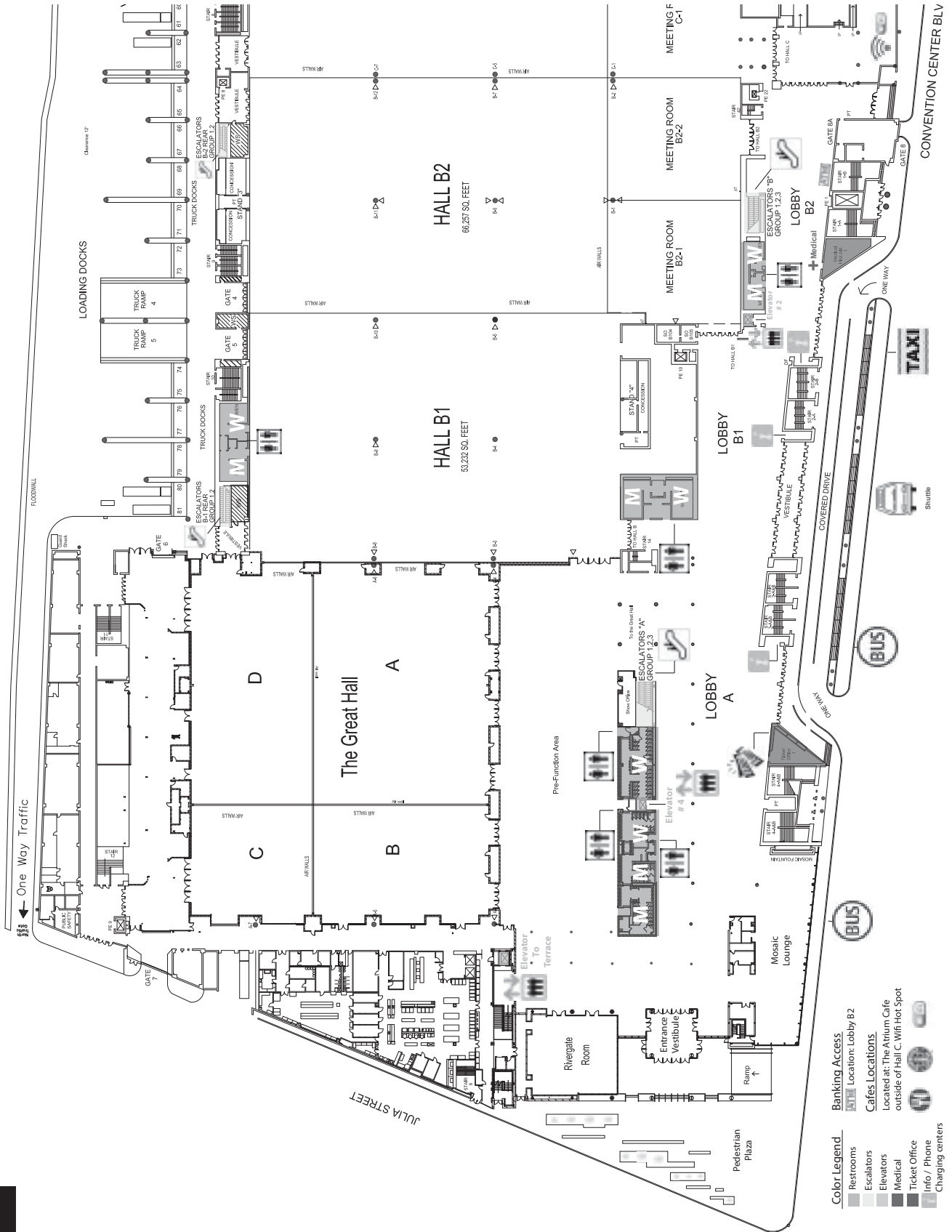
Mathematics Teacher Educator: Information for Potential Authors

Wednesday, April 9th, 1:15 p.m.–2:30 p.m.

Room 220/221/222

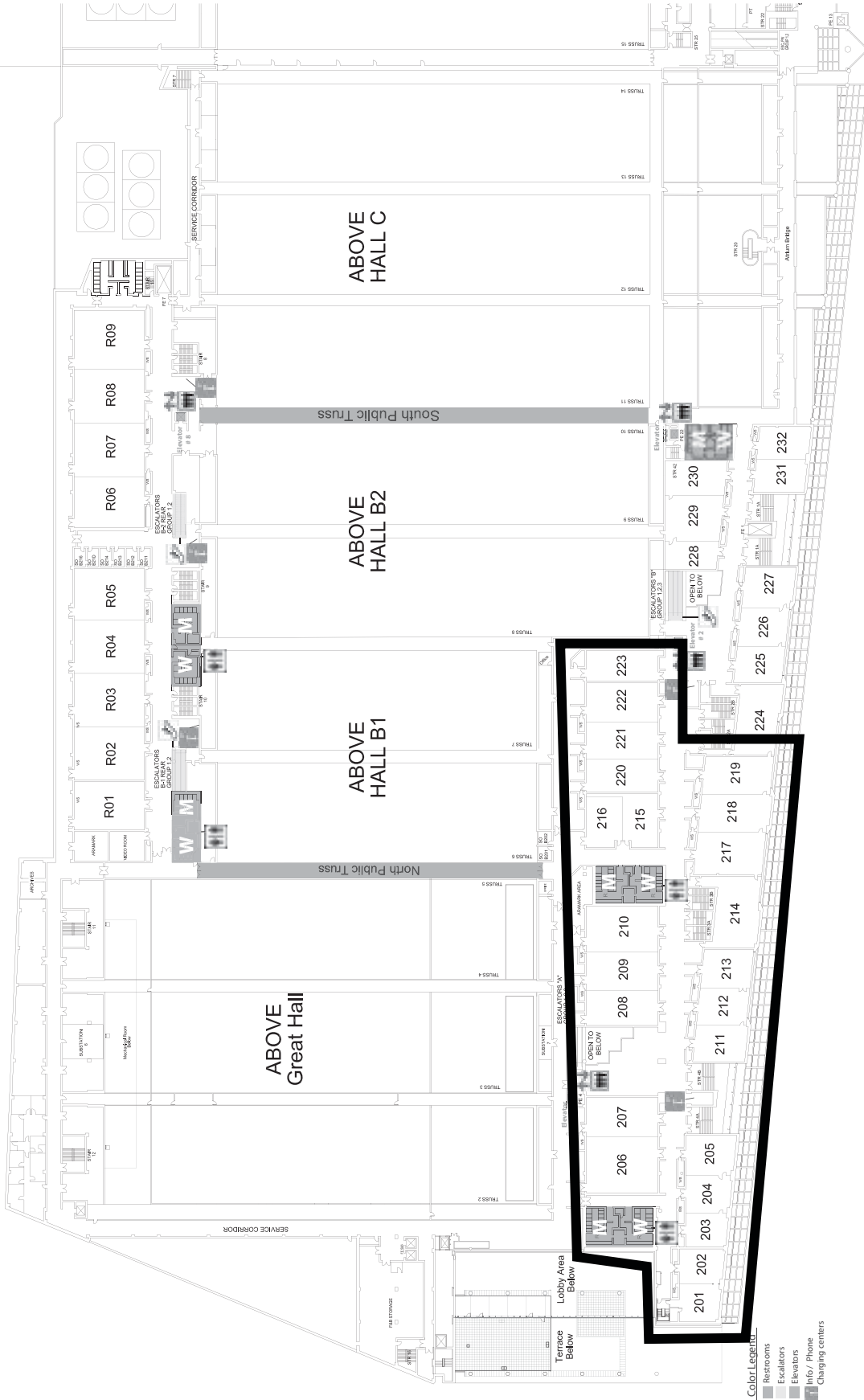
Floor Plans

PHASE I



Floor Plans

PHASE I



Welcome!

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

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

Sincerely,
Karen Hollebrands,
NCTM Research Committee, Chair

Maria Blanton,
AERA SIG/RME Co-Chair

Paola Sztajn
AERA SIG/RME Co-Chair

Michael Fish
NCTM Research Committee, Staff Liaison

Opening Session—Monday, 7:00 p.m.

The Coming Transformation of American Education: Implications for Mathematics Education

Arthur Levine

*Woodrow Wilson National Fellowship Foundation, Princeton,
New Jersey*

Room 208/209/210

See Session #22.1 for full details.



NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

THE NATION'S PREMIER MATH EDUCATION RESEARCH EVENT

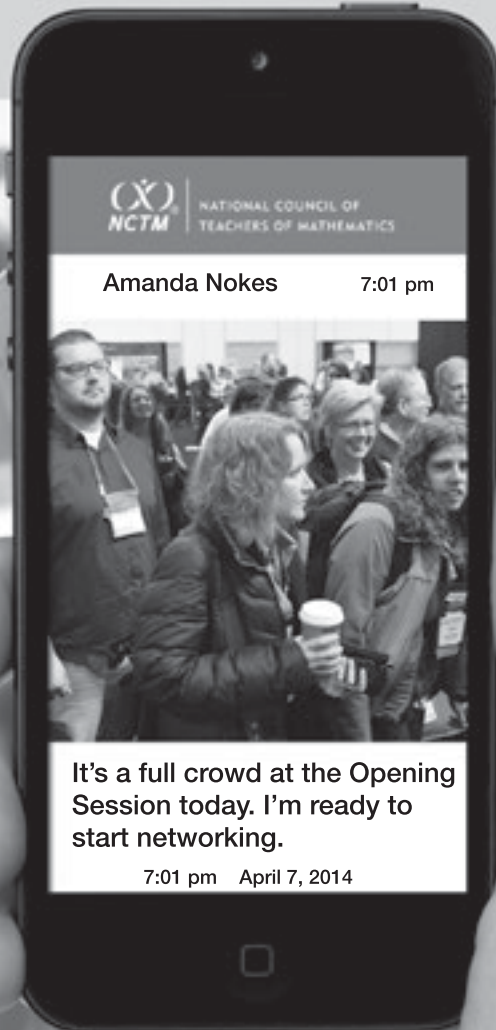
2014 NCTM RESEARCH CONFERENCE

April 7-9 • New Orleans, LA

Introducing the New NCTM Conference App!

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

- View the full agenda
- Keep your finger on the pulse of the conference
- Find trending sessions and topics
- Connect with attendees, view photos and comments.



www.nctm.org/confapp

Monday, April 7th

5:45 p.m.–6:45 p.m.

1

Adopting a Linguistic Approach in the Mathematics Classroom

Poster Session

This paper reports on a study undertaken to develop language-based strategies for use in the mathematics classroom that facilitate cognitive processing and improve mathematical understanding, and it examines the link with elaborated, extended learning conversations. An outcome of the study was identification of Mathematical Linguistic Pedagogy.

Lynette McClellan

Northam Senior High School, Australia

Room 217/218

2

A Linkage among Cognitive Skills in School Mathematics and Science

Poster Session

This study investigates correlations among cognitive skills in mathematics and science (knowing, applying, and reasoning). Findings from this study will enhance our understanding on linkage among cognitive skills commonly used in mathematics and sciences, and the study could be a basis for further research in teaching and learning of STEM.

Kyong Mi Choi

University of Iowa, Iowa City

Jessica Lynn Jensen

University of Iowa, Iowa City

Brian Hand

University of Iowa, Iowa City

Room 217/218

3

Challenging Teachers' Perceptions of Mathematical Smartness

Poster Session

Through the theoretical lens of "smartness," this ethnographic study describes how one teacher perceived what it means for a student to be

smart in mathematics and how perceptions changed through teacher/student learning trajectory-based clinical interviews. Results indicate that perceptions can be questioned and refined to impact instruction.

Megan H. Wickstrom

Illinois State University, Normal

Room 217/218

4

Children's Pairing Schemes in Combinatorial Reasoning

Poster Session

Through the constructivist teaching experiment, the development of children's pairing schemes toward the construction of the multiplicative principle was investigated based on their units-coordinating activities and levels of units-coordination. Factors contributing to the emergence of different schemes were identified and discussed.

Ronnachai Panapoi

The Institute for the Promotion of Teaching Science and Technology, Bangkok, Thailand

Room 217/218

5

Describing vs. Deducing: Characterizing Teachers' Analysis of Student Work

Poster Session

We will report on our work analyzing and characterizing the ways teachers individually and collectively construct the task of examining student thinking. The conversations that were generated by this activity will serve as a starting point for conceptualizing professional development focused on placing student thinking at the center of instruction.

Valerie Klein

The Math Forum @ Drexel, Philadelphia, Pennsylvania

Jason Silverman

Drexel University School of Education, Philadelphia, Pennsylvania

Cheryl Fricchione

Drexel University School of Education, Philadelphia, Pennsylvania

Room 217/218

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.

6 Framework of Social Justice Approaches to Mathematics Education

Poster Session

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

Trevor T. Warburton
University of Utah, Salt Lake City

Room 217/218

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

Poster Session

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

Gregory V. Larnell
University of Illinois at Chicago

Room 217/218

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

Poster Session

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

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

Room 217/218

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

Poster Session

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

Douglas W. Van Dine
University of Denver, Colorado

Douglas H. Clements
University of Denver, Colorado

Julie Sarama
University of Denver, Colorado

Room 217/218

10 Middle School Teachers' Knowledge for Teaching Solids of Revolution

Poster Session

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

Jennifer A. Eli
University of Arizona, Tucson

Gloriana Gonzalez
University of Illinois at Urbana-Champaign, Champaign

Room 217/218, Capacity: 400

11 Persistent and Problematic Errors in Algebra I

Poster Session

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

Julie L. Booth
Temple University, Philadelphia, Pennsylvania

Francie Eyer
Strategic Education Research Partnership Institute, Washington, D.C.

E. Juliana Paré-Blagoev
Strategic Education Research Partnership Institute, Washington, D.C.

Room 217/218

12 Preparing Mathematics Teachers: Does edTPA Assess for Culturally Relevant Pedagogy?

Poster Session

This session will share the results of a study that explores the extent to which the fifteen Secondary Mathematics edTPA rubrics assess for elements of culturally relevant pedagogy. Results indicate that the edTPA assessment shows promise in evaluating mathematics teacher candidates' preparedness to serve the needs of diverse student populations.

Matt Griffin

University of Maryland, College Park

Maria Hyler

University of Maryland, College Park

Roderick Carey

University of Maryland, College Park

Room 217/218

13 Preservice Teachers' Perceptions on the Interaction between Assessment and Engagement

Poster Session

This study looked at three preservice math teachers' perceptions of the interaction between engagement and assessment during an eight-day summer workshop. After descriptive analysis of the data, preliminary findings show that questioning techniques and teacher feedback are topics that preservice teachers relate to both engagement and assessment.

Anneliese E Haines

Rutgers University, Newark, New Jersey

Lina Sanchez Leal

Rutgers University, Newark, New Jersey

Room 217/218

14 Preservice Teachers' Responding Based on Children's Mathematical Understanding

Poster Session

During this poster presentation, I will expose and discuss the background, results and implications of a study designed to examine the preservice teachers' capacity to attend to children's strategies interpret and respond based on children's mathematical understanding in the context of scaffolded activities as they progress in their mathematics methods course.

Mary Njeri Gichobi

Iowa State University, Ames

Room 217/218

15 Problems That Prospective Mathematics Teachers Had While Using Cabri 3D

Poster Session

In the current study, we identified prospective mathematics teachers' problems during their uses of Cabri 3D to solve minimization problems contextualized in three-dimensional geometry.

Samet Okumuş

North Carolina State University, Raleigh

Karen Hollebrands

North Carolina State University, Cary

Room 217/218

16 Survey of Mathematics Education Technology Dissertation Scope and Quality: 1968–2009

Poster Session

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

Robert N. Ronau

University of Louisville, Kentucky

David Pugalee

University of North Carolina at Charlotte

Room 217/218, Capacity: 400

17 Teacher Learning of Learning Trajectories in Professional Development

Poster Session

Our research investigates teachers' learning of mathematics learning trajectories and student-centered instructional practices in a professional development setting. Our poster will share findings of the ways elementary grades teachers' knowledge developed during the professional development and report a conjectured progression of teacher learning.

P. Holt Wilson

University of North Carolina at Greensboro

Paola Sztajn

North Carolina State University, Raleigh

Jared Webb

University of North Carolina at Greensboro

Room 217/218

18

Test Item Analysis and Modification: Implications of Teachers' Perceptions

Poster Session

This session will present qualitative analysis of teachers' perceptions of the value of structured test item analysis. Analysis of the nature and quality of their modifications of items will also be presented, along with a discussion of implications for pre- and in-service teacher development.

Patricia D. Hunsader

University of South Florida, Sarasota-Manatee

Barbara Zorin

University of South Florida, St. Petersburg

Denisse R. Thompson

University of South Florida, Tampa

Room 217/218

19

The Impact of Stereotype Threat on Adolescent Female Math Students

Poster Session

This study found effects of stereotype threat on adolescents' math performance and attitudes. Implicit intelligence theories moderated effects such that girls with an entity view of intelligence had a larger difference between performance in the experimental versus control group compared to girls with an incremental view of intelligence.

Patricia Hale

California State Polytechnic University, Pomona

Bettina Casad

University of Missouri–St. Louis

Room 217/218

20

The Journey of Preservice Teachers Creating Culturally Responsive Mathematics Lessons

Poster Session

This study explores the creation of culturally responsive mathematics lessons. The researcher investigated the process using lesson plans, student reflections, critical feedback from peers, and peer evaluation of the lessons. Findings provide understandings to assist teacher educators to promote creating culturally responsive mathematics lessons.

Rhonda L. Williams

University of Florida, Gainesville

Room 217/218

21

The Problem of Transition from School to University Mathematics

Poster Session

A survey among preservice teachers in Germany shows that the

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

Ingo Witzke

University of Cologne, Germany

Room 217/218

22

Tracking Math Teacher Trajectories: Initial Results of a Longitudinal Study

Poster Session

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

William C. Zahner

Boston University, Massachusetts

Robert Afonso

Boston University, Massachusetts

Room 217/218

7:00 p.m.–8:15 p.m.

22.1

The Coming Transformation of American Education: Implications for Mathematics Education

Opening Session

Six powerful forces have the capacity to transform American education—demographics, the economy, government, technology and learning research, privatization and convergence of knowledge producers. This session discusses the nature of the changes occurring and their potential consequences for education, specifically math education.

Arthur Levine

Woodrow Wilson National Fellowship Foundation, Princeton, New Jersey

Room 208/209/210

8:30 a.m.–9:45 a.m.

23 A New Classroom Observation Instrument for Assessing K–16 Mathematics Classrooms

Discussion Session

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

Jim Gleason

University of Alabama, Tuscaloosa

Tracy L. Weston

University of Alabama, Tuscaloosa

Stefanie D. Livers

University of Alabama, Tuscaloosa

Jeremy Zelkowski

University of Alabama, Tuscaloosa

Room 219

8:30 a.m.–9:45 a.m.

24 Connecting Data and Chance through Modeling

Research Symposium

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

Cliff Konold

University of Massachusetts Amherst

Richard Lehrer

Vanderbilt University, Nashville, Tennessee

Robert DelMas

University of Minnesota, Minneapolis

Discussant: Patrick W. Thompson

Arizona State University, Tempe

Room 214

25 Developing a Theory of Mathematical Knowledge for Equitable Teaching

Discussion Session

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

Imani Goffney

University of Houston, Texas

Jennifer Chauvot

University of Houston, Texas

Room 207

26 Elaborations on the Construction of Quantitative and Algebraic Reasoning

Research Symposium

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

Hwa Young Lee

University of Georgia, Athens

Amy J. Hackenberg

University of Indiana, Bloomington

Amy Ellis

University of Wisconsin–Madison

David R. Liss II

University of Georgia, Athens

Discussant: Heather Lynn Johnson

University of Colorado Denver

Room 208/209/210

27

Interactive Paper Session

President: Robert Q. Berry

University of Virginia, Charlottesville

Children's Mathematics Interactions with Virtual Manipulatives on iPads

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

Patricia S. Moyer-Packenham

Utah State University, Logan

Jessica F. Shumway

Utah State University, Logan

Stephen I. Tucker

Utah State University, Logan

Jennifer Boyer-Thurgood

Utah State University, Logan

Jessica Hunt

Utah State University, Logan

Arla Westenskow

Utah State University, Logan

Emma Bullock

Utah State University, Logan

From Research to Practice: Measuring Length in First Grade

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

Douglas H. Clements

University of Denver, Colorado

Douglas W. Van Dine

University of Denver, Colorado

The Messy Practice of Assessment in Pre-K Mathematics

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

Kelly Harrigan

University of Wisconsin–Madison

Anita A. Wager

University of Wisconsin–Madison

Room 203/204

28

Interactive Paper Session

President: Jami Stone

Black Hills State University, Spearfish, South Dakota

Area Measurement: Non-Square Units and New Connections

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

Amanda L. Miller

Illinois State University, Normal

Challenges Students with and without Disabilities Experience Using Diagrams

This session presents findings and implications for practice from a study that examined challenges students experienced when using a diagram to solve word problems. A total of nine challenges were identified, which students with learning disabilities consistently experienced more than high-achieving peers.

Delinda van Garderen

University of Missouri, Columbia

Amy Scheuermann

Minnesota State University, Mankato

Multiple Representations of Mathematical Concepts through a Semiotic Lens

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

Michael Gilbert

University of Massachusetts Boston

Fabian Torres-Ardilla

University of Massachusetts Boston

Room 205

29

Interactive Paper Session

Presenter: Allyson Hallman-Thrasher
Ohio University, Athens

Example-Based Insights, Viable Arguments, and Technical Handles

Findings from a generative study that develops a framework for communicating example-based viable arguments for generalizations are reported. Identified are three types of technical handles that appear constructive in communicating viable arguments when examples or example-based conceptual insights are expressed.

David A. Yopp
University of Idaho, Moscow

Geometry Teachers' Perspectives about Students' Difficulties Remembering

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

Gloriana Gonzalez
University of Illinois at Urbana-Champaign, Champaign

Remediating Conceptually: A Look at Conceptual and Procedural Growth

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

Rachel M. Bachman
Weber State University, Ogden, Utah

Room 206

30

Measuring Teachers' Fidelity of Implementation to CME Project Algebra 1

Research Symposium

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

Zuzka Blasi
Education Development Center, Waltham, Massachusetts

Mike Steele
University of Wisconsin–Milwaukee

Jess Gropen

Education Development Center, Waltham, Massachusetts

Miriam Gates

Education Development Center, Inc., Waltham, Massachusetts

Mary Beth Piecham

Education Development Center, Inc., Waltham, Massachusetts

Louisa Anastasopoulos

Education Development Center, Waltham, Massachusetts

Josephine Louie

Education Development Center, Waltham, Massachusetts

Mary Wedow

Education Development Center, Waltham, Massachusetts

Room 215

31

Preservice Teachers' Beliefs on Constructing and Critiquing Valid Arguments

Discussion Session

This study investigates preservice teachers' understandings of constructing and critiquing valid arguments and focuses on elements they believe constitute viable arguments. Implications associated with misunderstandings and the actions taken to help preservice teachers support students in constructing mathematical arguments will be discussed.

Cory A. Bennett
Idaho State University, Pocatello

Mary Pat Sjostrom
Chaminade University, Honolulu, Hawaii

Room 212

32

Pursuing and Utilizing the NSF CAREER Award

Research Symposium

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

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

Anna Shusterman
Wesleyan University, Middletown, Connecticut

Luis Saldanha
Arizona State University, Tempe

Laurie Rubel
City University of New York, Brooklyn

Debra I. Johanning
University of Toledo, Ohio

Room 211

33

Theorizing Racism: Unpacking Supremacy, Privilege, and Justice in Mathematics Education

Discussion Session

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

Na'ilah Suad Nasir
University of California, Berkeley

David W. Stinson
Georgia State University, Atlanta

Danny B. Martin
University of Illinois, Chicago

Maxine McKinney de Royston
University of California, Berkeley

Room 220/221/222

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

Jeffrey E. Barrett
Illinois State University, Normal

Jack Smith
Michigan State University, Williamston

Christine Massey
University of Pennsylvania, Philadelphia

Douglas H. Clements
University of Denver, Colorado

Cheryl L. Eames
Illinois State University, Normal

Room 215

34

Best Practices from Mathematics Education and Special Education Research

Research Symposium

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

Rose Vukovic
New York University, New York

Karen D. King
National Science Foundation, Arlington, Virginia

Karen S. Karp
University of Louisville, Kentucky

Amy Lingo
University of Louisville, Kentucky

Barbara J. Dougherty
University of Missouri, Columbia

Diane Bryant
University of Texas at Austin

Discussant: Michelle Stephan
University of North Carolina at Charlotte

Room 216

36

Curriculum Alignment as a Dynamic Process of Selective Interpretation

Discussion Session

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

Yiming Cao
Beijing Normal University, China

Einav Aizikovitch-Udi
Beit Berl Academic College, Gadera, Israel

David Clarke
University of Melbourne, Carlton, Australia

Room 212

37

Developing Common Core Mathematical Practice #7 in an Algebra Classroom

Discussion Session

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

Roser A. Gine
University of Massachusetts Lowell

Room 206

35

Conceptualizing and Supporting Development: Learning Area Measurement in School

Research Symposium

We explore how area measurement develops in elementary curricula,

38 High School Integrated Curricula and College Level Mathematics Performance

Discussion Session

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

Thomas R. Post
University of Minnesota, St. Paul

William Bush
University of Louisville, Kentucky

Robert Reys
University of Missouri, Columbia

Room 207

39 Implementing Mathematical Modeling in the Common Core Era

Research Symposium

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

Michelle Cirillo
University of Delaware, Newark

John A. Pelesko
University of Delaware, Newark

Jinfa Cai
University of Delaware, Newark

Discussant: Christian R. Hirsch
Western Michigan University, Kalamazoo

Discussant: Elizabeth Phillips
Michigan State University, East Lansing

Discussant: Sherry Fraser
Interactive Mathematics Program, Sausalito, California

Room 214

40 Interactive Paper Session

President: Susan Gregson
University of Cincinnati, Ohio

Positioning in Small Groups during Mathematics Problem Solving

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

Carlos A. López Leiva
University of New Mexico, Albuquerque

The Development of Underrepresented Students' Mathematics Identities

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

Alison Marzocchi
University of Delaware, Newark

The Promise of Qualitative Metasynthesis for Mathematics Education

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

Kateri Thunder
James Madison University, Harrisonburg, Virginia

Robert Q. Berry
University of Virginia, Charlottesville

Room 203/204

41

Interactive Paper Session

President: Sandy M. Spitzer
Towson University, Maryland

Correlating Professional Noticing and Mathematics Knowledge for Teaching

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

Molly H. Fisher
University of Kentucky, Lexington

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

Sara Eisenhardt
Northern Kentucky University, Highland Heights

Edna O. Schack
Morehead State University, Kentucky

Cindy Jong
University of Kentucky, Lexington

Janet L. Tassell
Western Kentucky University, Bowling Green

How Various Aspects of Teachers' Mathematical Knowledge Affect Instruction

Following twenty-one in-service teachers enrolled in a master's program for four years, I examined how changes in different aspects of teachers' knowledge corresponded to changes in their practices. Results indicated that teachers' specialized and pedagogical content knowledge corresponded to different aspects of instruction.

Yasemin Copur-Gencturk
University of Houston, Texas

What Knowledge Do Teachers Need for Effective Formative Assessment?

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

Caroline B. Ebby
University of Pennsylvania, Philadelphia

Philip Sirinides
Consortium for Policy Research in Education, Philadelphia, Pennsylvania

Room 205

42

Recognizing Opportunities for Productive Use of Student Thinking**Discussion Session**

Participants will be introduced to and use a framework that considers the significance of student mathematical thinking and the pedagogical opportunities that thinking might create. The affordances and complexities of using the framework to analyze classroom discourse and to support teachers in productively using student thinking will be discussed.

Keith R. Leatham
Brigham Young University, Provo, Utah

Blake E. Peterson
Brigham Young University, Provo, Utah

Shari L. Stockero
Michigan Technological University, Houghton

Laura R. Van Zoest
Western Michigan University, Kalamazoo

Room 211

43

The Algebra Project: Working for Quality Math Education for Students**Research Symposium**

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

Robert P. Moses
The Algebra Project, Cambridge, Massachusetts

Bill Crombie
The Algebra Project, Cambridge, Massachusetts

Andre Hargunani
Augustus Hawkins High School, Los Angeles, California

José Antonio Orozco
Augustus Hawkins High School, Los Angeles, California

Discussant: OneLA- Industrial Areas Foundation
One LA-IAF, Los Angeles, California

Room 208/209/210

44

The NCTM Research Conference: A Brief History and Future Directions

Research Symposium

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

Members of the NCTM Research Committee and Members of the SIG/RME Board of Directors

J. Michael Shaughnessy

Portland State University, Oregon

Patricia Campbell

University of Maryland, College Park

Larry Hatfield

University of Wyoming, Laramie

Judith Sowder

San Diego State University, California

Room 220/221/222

45

A Learning Trajectory for Children's Understanding of Variable

Brief Research Report

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

Maria Blanton

TERC, Cambridge, Massachusetts

Barbara Brizuela

Tufts University, Medford, Massachusetts

Room 205

46

Disrupting Popular Conceptions of Young Mathematicians

Brief Research Report

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

George Gadanidis

University of Western Ontario, London, Canada

Room 208/209/210

47

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

Brief Research Report

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

Lindsay M. Keazer

Michigan State University, East Lansing

Beth Herbel-Eisenmann

Michigan State University, East Lansing

Anne Traynor

Michigan State University, East Lansing

Room 206

48

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

Brief Research Report

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

Samuel L. Eskelson

University of South Florida, Tampa

Margaret Smith

University of Pittsburgh, Pennsylvania

Room 219

49

Findings from Preservice Mathematics Teachers' Thinking in Arguing and Proving

Brief Research Report

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

Lisa Rice

University of Wyoming, Laramie

Room 216

50 Students' Instrumented Activity Using Etoys to Construct Trigonometric Functions

Brief Research Report

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

Anna F. DeJarnette

University of Illinois at Urbana-Champaign, Urbana

Room 211

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

Brief Research Report

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

Michael T. Battista

The Ohio State University, Columbus

Candace Joswick

The Ohio State University, Columbus

Kathryn Battista

The Ohio State University, Columbus

Room 220/221/222

52 Students' Reasoning about Invariance of Volume as a Quantity

Brief Research Report

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

Melike Kara

New York University, New York

Craig J. Cullen

Illinois State University, Normal

Room 214

53 The Impact of Early Colleges on Mathematics Teaching and Learning

Brief Research Report

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

Nina P. Arshavsky

SERVE Center at UNCG, Chapel Hill, North Carolina

Julie Edmunds

SERVE Center at UNCG, Durham, North Carolina

Room 215

54 Toward an Analytical Framework for Contextualized Mathematics Instruction

Brief Research Report

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

Luke T. Reinke

University of Pennsylvania, Philadelphia

Room 212

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

Brief Research Report

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

Oren L. McClain

University of Virginia, Charlottesville

Room 203/204

56 Vacant Lots and Basketball Courts: Civic Engagement through Mathematics

Brief Research Report

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

Vivian Y. Lim

University of Pennsylvania, Philadelphia

Room 207

57

Interactive Paper Session

President: Kathryn B. Chval
University of Missouri, Columbia

Examining the Questions Posed to Elementary Students during Mathematics

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

Temple A. Walkowiak
North Carolina State University, Raleigh

Natalie J. Hawley
Wake County Public Schools, Raleigh

Eileen G. Merritt
University of Virginia, Charlottesville

Sara E. Rimm-Kaufman
University of Virginia, Charlottesville

Improving Teachers' Core: Influence of PD on Teacher Knowledge

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

Erin Krupa
Montclair State University, New Jersey

Corey Webel
University of Missouri, Columbia

Jason McManus
Montclair State University, New Jersey

Supporting Teacher Development in Algebra: Impacts from the DELTA Study

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

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

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

Despina Stylianou
The City College of New York, New York

Room 203/204

58

Interactive Paper Session

President: Michelle Stephan
University of North Carolina at Charlotte

Supporting Mathematics Teachers' Learning in Collaborative Work Groups

We present a research-derived framework for rich discourse in teacher collaborative work groups. Rich discourse involves connecting teaching, students, and mathematics in complex ways. The work stands to contribute to the increasingly widespread practice of teacher collaboration, as well as mathematics coaching and work group facilitation.

Mollie H. Appelgate
Vanderbilt University, Nashville, Tennessee

Ilana S. Horn
Vanderbilt University, Nashville, Tennessee

Britnie D. Kane
Vanderbilt University, Nashville, Tennessee

Jonee Wilson
Vanderbilt University, Nashville, Tennessee

Jason Brasel
Vanderbilt University, Nashville, Tennessee

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

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

Nicole L. Fonger
North Carolina State University, Raleigh

Room 205

59

New Programs, Solicitations, and Specific Evidence Standards: Changes at NSF

Over the last eighteen months NSF's Division of Research on Learning (DRL) has seen some critical changes. Program staff will present these changes and attend to questions from the community as we mutually discuss and unpack implications for the NCTM research community.

Karen D. King
National Science Foundation, Arlington, Virginia

Finbarr Barry Sloane
National Science Foundation, Arlington, Virginia

Joan Ferrini-Mundy
National Science Foundation, Arlington, Virginia

Ferdinand Rivera
National Science Foundation, Arlington, Virginia

Room 211

60 Knowledge for Teaching Informal Line of Best Fit

Research Symposium

Study of the informal line of best fit marks students' introduction to statistical association, a fundamental statistical concept. We will present three research studies concerning the knowledge for teaching informal line of best fit and will engage participants in tasks and discussion concerning statistical knowledge for teaching.

Stephanie Casey

Eastern Michigan University, Ypsilanti

Nicholas H. Wasserman

Teachers College, Columbia University, New York, New York

David C. Wilson

State University of New York Buffalo

Adam Molnar

University of Georgia, Athens

Discussant: J. Michael Shaughnessy

Portland State University, Oregon

Room 207

61 Mathematics Teaching in Urban Classrooms: Perspectives from Teachers and Researchers

Research Symposium

This interactive symposium focuses on discussion with audience members as researchers and teachers share cases of their own practice or the practice of other urban mathematics teachers. The discussion addresses unique challenges in urban classrooms for successful mathematics teaching based on reform efforts, spanning grade levels and settings.

Frances K. Harper

Michigan State University, East Lansing

Aki Murata

University of California, Berkeley

Maribel Triggs

University of California, Berkeley

Kara Kamikawa

Stanford University, California

Room 215

62 Novel Explanations of Developmental Change in Numerical Estimation

Discussion Session

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

Hilary Barth

Wesleyan University, Middletown, Connecticut

Room 212

63 Research on Instructional Interventions: Taking Stock and Moving Forward

Discussion Session

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

Gabriel J. Stylianides

University of Oxford, United Kingdom

Andreas J. Stylianides

University of Cambridge, United Kingdom

Room 206

64 Successful Calculus Programs: Two-Year Colleges to Research Universities

Research Symposium

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

Chris Rasmussen

San Diego State University, California

David Bressoud

Macalester College, St. Paul, Minnesota

Eric Hsu

San Francisco State University, California

Sean Larsen

Portland State University, Oregon

Vilma Mesa

University of Michigan, Ann Arbor

Room 219

65 Using Practice as a Site for Professional Learning for Teaching

Discussion Session

The session examines the use of practice as a context for professional development with a focus on three learning goals: (1) developing mathematical knowledge for teaching; (2) learning to analyze and reason about specific instructional practices and considerations; and (3) improving teachers' actual enactment skills with specific teaching practices.

Deborah Loewenberg Ball
University of Michigan, Ann Arbor

Hyman Bass
University of Michigan, Ann Arbor

Nicole Garcia
University of Michigan, Ann Arbor

Julie McNamara
University of Michigan, Ann Arbor

Michaela Krug O'Neil
University of Michigan, Ann Arbor

Meghan M. Shaughnessy
University of Michigan, Ann Arbor

Room 208/209/210

66 Using Representations of Practice in Survey Research with Mathematics Teachers

Research Symposium

We illustrate and discuss the two research programs' theoretical and methodological efforts to conceptualize, develop, and validate a suit of online, context-based instruments for studying mathematics teachers' beliefs, norms, and obligations. The panel addresses the importance and challenges of researching teacher decision making on large scale.

Daniel Chazan
University of Maryland, College Park

Orly Buchbinder
University of Maryland, College Park

Justin K. Dimmel
University of Michigan, Ann Arbor

Ander Erickson
University of Michigan, Ann Arbor

Kristi Hanby
University of Michigan, Ann Arbor

Discussant: Patricio G. Herbst
University of Michigan, Ann Arbor

Discussant: Randolph Philipp
San Diego State University, California

Room 214

67 Writing and Responding to Reviews

Research Symposium

This session will examine the manuscript review process from the reviewer's and the author's point of view. Using an article recently published in JRME as an example, the session will examine constructive criticisms in the initial reviews and how the author responded.

Jessica Pierson Bishop
University of Georgia, Athens

Cynthia Langrall
Illinois State University, Normal

Discussant: Andrew Izsak
University of Georgia, Athens

Room 216

2:45 p.m.–3:15 p.m.

68 A Transformational Approach to Similarity: Results from the LTG Study

Brief Research Report

The Common Core emphasizes teaching geometric congruence and similarity based on transformations, a stark contrast to most previous standards. In this brief report session, we share findings from research on a professional development program focused on teacher learning needs related to this shift in geometry content.

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

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

Kristen Malzahn
Horizon Research, Inc., Chapel Hill, North Carolina

Room 206

69 Beginning Secondary Teachers' Use of Tasks to Support Equitable Spaces

Brief Research Report

An opportunity to learn frameworks can be used to support equitable classroom spaces. This session presents an opportunity to learn continuum for tasks to help researchers think concretely about how the collection of tasks teachers use support students' opportunities to learn.

Ayanna D. Perry
North Carolina State University, Raleigh

Room 207

70 Characterizing Teachers' Goals for Student Learning

Brief Research Report

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

Frank S. Marfai
Arizona State University, Tempe

Room 219

71 Gender Differences in Self-Efficacy and Mathematical Modeling Tasks

Brief Research Report

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

Anu Sharma
University of Florida, Gainesville

Room 208/209/210

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

Brief Research Report

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

Luis A. Leyva
Rutgers Graduate School of Education, New Brunswick, New Jersey

Room 203/204

73 Mathematics Teacher Educators Supporting Prospective Teachers in Learning about CCSSM

Brief Research Report

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

Corey Drake
Michigan State University, East Lansing

Jill Newton
Purdue University, West Lafayette, Indiana

Denise A. Spangler
University of Georgia, Athens

Room 205

74 Productive Struggle in Teaching and Learning Middle School Mathematics

Brief Research Report

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

Hiroko Kawaguchi Warshauer
Texas State University, San Marcos

Room 216

75 "Purely Ideological" Mathematics: A Case Study of Mathematics and Politics

Brief Research Report

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

Indigo Esmonde
University of Toronto, Canada

Room 220/221/222

76

Reasoning-and-Proving Opportunities for Teachers in Secondary Geometry Textbooks

Brief Research Report

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

Nicholas J. Gilbertson

Michigan State University, East Lansing

Lorraine M. Males

University of Nebraska–Lincoln

Kimberly C. Rogers

Bowling Green State University, Ohio

Samuel Otten

University of Missouri, Columbia

Room 212

77

Relational Understanding: Equivalent Fractions in Two Latino Classrooms

Brief Research Report

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

Higinio Dominguez

Michigan State University, East Lansing

Room 211

78

Unpacking the CCSSM Time and Money with Learning Trajectory

Brief Research Report

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

Dicky N. Ng

Friday Institute, North Carolina State University, Raleigh

Room 214

79

Colleagues 2.0: The MathTwitterBlogoSphere and Mathematics Teachers' Professional Learning

Discussion Session

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

Ilana S. Horn

Vanderbilt University, Nashville, Tennessee

Nicole Bannister

Clemson University, South Carolina

Annie Fetter

The Math Forum @ Drexel, Philadelphia, Pennsylvania

Shauna Hedgepeth

Lamar County School District, Purvis, Mississippi

Ashli J. Black

Illustrative Mathematics, Mt. Desert, Maine

Justin Lanier

Princeton Learning Cooperative, Princeton, New Jersey

José Vilson

New York City Public Schools, New York

Room 211

80

Context Matters: Findings from Two Experimental Studies of Online Algebra

Research Symposium

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

Kirk Walters

American Institutes for Research, Washington, D.C.

Jessica Heppen

American Institutes for Research, Washington, D.C.

Nick Sorensen

American Institutes for Research, Washington, D.C.

Suzanne Stachel

American Institutes for Research, Washington, D.C.

Room 215

81

Exploring Relations between Teachers' Knowledge, Perspectives, and Practice

Research Symposium

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

Charles Munter

University of Pittsburgh, Pennsylvania

Richard Correnti

University of Pittsburgh, Pennsylvania

Anne Garrison

Southern Methodist University, Dallas, Texas

Lynsey K. Gibbons

University of Washington, Seattle

Kara Jackson

University of Washington, Seattle

Discussant: Deborah Loewenberg Ball

University of Michigan, Ann Arbor

Room 214

82

Facilitating Teacher Learning to Develop Ambitious Practice in Mathematics

Research Symposium

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

Karen Koellner

Hunter College, New York City, New York

Hilda Borko

Stanford University, California

Megan E Webster

McGill University, Montreal, Canada

Britnie D. Kane

Vanderbilt University, Nashville, Tennessee

Mollie H. Appelgate

Vanderbilt University, Nashville, Tennessee

Jonee Wilson

Vanderbilt University, Nashville, Tennessee

Room 208/209/210

83

Graduate Student, Junior Faculty, and Researcher Mentoring Session

Presider: Michelle Stephan

University of North Carolina at Charlotte

Discussant: Jeffrey J. Wanko

School of Education, Health, and Society, Oxford, Ohio

Finding Faculty Positions in Higher Education

Denise A. Spangler

University of Georgia, Athens

Randy Phillip

San Diego State University, California

Navigating the Tenure Process

Karen S. Karp

University of Louisville, Kentucky

Kristen Bieda

Michigan State University, East Lansing

Publishing Dissertation-Based Manuscripts

James E. Tarr

University of Missouri, Columbia

Rose Mary Zbiek

Pennsylvania State University, University Park

Transitioning from Doctoral Student to Faculty Member

Megan Wawro

Virginia Tech University, Blacksburg

Michelle Cirillo

University of Delaware, Newark

Writing Grant Proposals

Richard Lehrer

Vanderbilt University, Nashville, Tennessee

Karen D. King

National Science Foundation, Arlington, Virginia

Room 220/221/222

84

Intensive Professional Development to Support Teachers' Implementation of CCSS

Discussion Session

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

John C. Mayer

University of Alabama at Birmingham

Ann M. Dominick

University of Alabama at Birmingham

Sherry D. Parrish

University of Alabama at Birmingham

Faye B. Clark

University of Alabama at Birmingham

JoAnna Laney

University of Alabama at Birmingham

Room 207

85

Interactive Paper Session

Presider: Karen Hollebrands

North Carolina State University, Cary

Enacting Reasoning-and-Proving in Secondary Mathematics Classrooms

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

Michelle S. Switala

Pine-Richland High School, Pittsburgh, Pennsylvania

Impact of Action Research on High School Teachers' Professional Development

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

Michaele F. Chappell

Middle Tennessee State University, Murfreesboro

Samantha A. Stevens

Middle Tennessee State University, Murfreesboro

Candace P. Terry

Middle Tennessee State University, Murfreesboro

Teacher Learning about Culturally Relevant Mathematics Pedagogy

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

AJ Stachelek

Teachers College, New York, New York

Laurie Rubel

City University of New York, Brooklyn, New York

Room 203/204

Informing Practice

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

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

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

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

mathematics
teaching in the MIDDLE SCHOOL

 NATIONAL COUNCIL OF
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CALL FOR MANUSCRIPTS

86

Interactive Paper Session

Presenter: Erica Walker

Teachers College, Columbia University, New York, New York

Construct-Driven Fidelity Measurement in Data-Modeling Classrooms

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

Ryan Seth Jones

Vanderbilt University, Nashville, Tennessee

Initial Validation Efforts for a Classroom Observation Instrument

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

Michele Brown Carney

Boise State University, Idaho

Jonathan Brendefur

Boise State University, Idaho

Gwyneth Hughes

Boise State University, Idaho

Keith Thiede

Boise State University, Idaho

Measuring Instructional Practices in Mathematics Using a Daily Log

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

Elizabeth Greive

North Carolina State University, Raleigh

Temple A. Walkowiak

North Carolina State University, Raleigh

Carrie W. Lee

North Carolina State University, Raleigh

Room 205

87

Reasoning and Sense Making with Technology in Middle School

Research Symposium

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

Phil J. Vahey

SRI International, Menlo Park, California

Susan Nickerson

San Diego State University, California

Charles Patton

SRI International, Menlo Park, California

George J. Roy

University of South Carolina, Chapin

Teresa Lara-Meloy

SRI International, Menlo Park, California

Harriette Stevens

Consultant, San Francisco, California

Room 219

88

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

Discussion Session

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

Linda Venenciano

University of Hawaii, Honolulu

Hannah Slovin

University of Hawaii, Honolulu

Fay Zenigami

University of Hawaii, Honolulu

Melfried Olson

University of Hawaii, Honolulu

Judith Olson

University of Hawaii, Honolulu

Room 212

89

The Smarter Balanced Assessment Consortium Mathematics Reasoning Project

Research Symposium

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

Shelbi Cole

Smarter Balanced, Olympia, Washington

Eli Luberoff

Desmos, Inc., San Francisco, California

Judy Hickman

CTB, Havana, Florida

Li Cai

University of California, Los Angeles

William McCallum

University of Arizona, Tucson

Kristin Umland

Illustrative Mathematics, Albuquerque, New Mexico

Patrick Callahan

Illustrative Mathematics, Coronado, California

Discussant: Mary P. Truxaw

University of Connecticut, Storrs

Room 216

90

The 2012 National Survey of Science and Mathematics Education

Discussion Session

The 2012 National Survey of Science and Mathematics Education provides data about the current status of the K–12 science and mathematics education system. This session will familiarize participants with data available for secondary analysis. It will also provide an opportunity for participants to run analyses of interest to them.

Eric R. Banilower

Horizon Research, Inc., Chapel Hill, North Carolina

Aaron M. Weis

Horizon Research, Inc., Chapel Hill, North Carolina

Room 206

91

A Discursive Analysis of Teachers' Routines in Contextualized Algebraic Lessons

Poster Session

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

Sihua Hu

Michigan State University, East Lansing

Room 217/218

92

Aligning Mathematical Tasks to the Standards for Mathematical Practice

Poster Session

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

Raymond Johnson

University of Colorado Boulder

Room 217/218

93

An Examination of Mathematics Graduate Teaching Assistant Efficacy

Poster Session

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

Patrice LaVette Parker

Georgia State University, Atlanta

Room 217/218

94

An Exploration of Preservice Elementary Teachers' Mathematical Knowledge for Teaching

Poster Session

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

Michael Jarry-Shore

McGill University, Montreal, Canada

Room 217/218

95

Cognitive Demand of Teacher Prompting: Engaging Students in Mathematical Discourse

Poster Session

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

Jessica Lynn Jensen

University of Iowa, Iowa City

Room 217/218

96

Curricular Support for Building on Students' Partial Understandings

Poster Session

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

Nicole Leveille Buchanan

University of California, Berkeley

Anna McGee

University of California, Berkeley

Room 217/218

97

Developing Rapport: Contours of Novice Teachers' Mathematics Instruction

Poster Session

Using data from a longitudinal study of beginning middle school mathematics teachers, I examine how teacher actions to establish

rapport with students shape the experience of doing and learning mathematics. The findings underscore how seemingly nonmathematical actions shape the contours of mathematics instruction and new teacher development.

Enakshi Bose

University of Pennsylvania, Philadelphia

Room 217/218

98

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

Poster Session

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

Jia He

Michigan State University, East Lansing

Yiling Cheng

Michigan State University, East Lansing

Room 217/218

99

Examining the Impact of Stereotypes within Mathematical Group Work

Poster Session

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

Lesley Dookie

University of Toronto, Canada

Room 217/218 100

Improving Preservice Mathematics Teachers' Capability for Generic Example Proofs

Poster Session

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

Ben Freeburn

Pennsylvania State University, University Park

Fran Arbaugh

Pennsylvania State University, University Park

Shiv Karunakaran

Pennsylvania State University, University Park

Nursen Konuk

Pennsylvania State University, University Park

Room 217/218

101

Investigating Teacher Knowledge While Transitioning to the Common Core

Poster Session

Participants from fourteen school districts enrolled in a three-year program that focused on increasing teacher knowledge in preparation for Common Core implementation. During the summer of 2013 the intensive training focused on modeling, functions, and algebra. Quantitative and qualitative data was collected throughout the training to assess change.

Erick B. Hofacker
University of Wisconsin–River Falls

Kathryn Ernie
University of Wisconsin–River Falls

Sherrie Serros
University of Wisconsin–Eau Claire

Room 217/218

102

Local and Global Approaches in Coordinating Multiple Mathematical Representations

Poster Session

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

Briana L. Chang
Temple University, Philadelphia, Pennsylvania

Theodore Wills
Temple University, Philadelphia, Pennsylvania

Jennifer Cromley
Temple University, Philadelphia, Pennsylvania

Room 217/218

103

Long-Term Effect of Curricula on Mathematics Attitudes: A Qualitative Study

Poster Session

We interviewed twelfth-grade urban students who had used either standards-based or traditional mathematics curricula in middle school. Results indicate that these two types of middle school curricula may have different long-term effects on students' attitudes and beliefs about the teaching, learning, and nature of mathematics.

John Moyer
Marquette University, Milwaukee, Wisconsin

Victoria Robison
Marquette University, Milwaukee, Wisconsin

104

Middle and High School Students' Conceptions of Equality

Poster Session

Our study examined how middle and high school students interpret equality and the equal sign in the context of arithmetic and algebraic tasks. The results suggest that students' interpretations are not stable and alternate between operational and comparative computational sameness. Implications for instructional practice are suggested.

Marta T. Magiera
Marquette University, Milwaukee, Wisconsin

Leigh A van den Kieboom
Marquette University, Milwaukee, Wisconsin

Room 217/218

105

Prospective Elementary Teachers' Conceptions of Lesson Experiments

Poster Session

This poster will describe an investigation of prospective elementary teachers' conceptions of learning from teaching. Results suggest that although prospective teachers can learn the skills of lesson study or lesson experiments, they may fail to develop the disposition to systematically study teaching throughout their career.

Christine M. Phelps
Central Michigan University, Mount Pleasant

Sandy M. Spitzer
Towson University, Maryland

Room 217/218

106

Single-Sex Classes and Middle-Grades Students' Mathematics Self-Concept

Poster Session

This study examines the relationship between middle-school students' mathematics self-concept and classroom type (single-sex or coeducational). One significant finding is that students in all-girls classes were more likely to disagree more strongly than all-boys and coeducational classes with the notion that mathematics is a male domain.

Dennis Kombe
Clemson University, South Carolina

Amber Simpson
Clemson University, South Carolina

S. Megan Che
Clemson University, South Carolina

Room 217/218

107

Sources of Self-Efficacy of Middle School Hispanic Students

Poster Session

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

Linda Reichwein Zientek

Sam Houston State University, Huntsville, Texas

Kathleen Cage Mittag

Retired, University of Texas San Antonio

Bruce Thompson

Texas A&M University, College Station

Room 217/218

108

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

Poster Session

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

Candace Joswick

The Ohio State University, Columbus

Michael T. Battista

The Ohio State University, Columbus

Room 217/218

109

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

Poster Session

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

Heather Gallivan

University of Delaware, Newark

Room 217/218

110

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

Poster Session

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

Andrea McCloskey

Pennsylvania State University, University Park

Gwen Lloyd

Pennsylvania State University, University Park

Courtney Lynch

Pennsylvania State University, University Park

Room 217/218

111

Views of Students' and the Quality of Mathematics Instruction Received

Poster Session

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

Mahtab Nazemi

College of Education, University of Washington, Seattle

Room 217/218

112

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

Poster Session

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

Fatima S. Jaffer

University of Toronto, Canada

Beverly Caswell

University of Toronto, Canada

Room 217/218

8:30 a.m.–9:45 a.m.

113 Analyzing Critical Moments in High School Mathematics Classrooms

Research Symposium

Teachers are faced with a myriad of impromptu decisions related to disruptions that occur while implementing mathematics lessons. The purpose of this symposium is to bring together several perspectives on analyzing critical moments in high school mathematics classrooms.

Karen Hollebrands

North Carolina State University, Cary

Shari L. Stockero

Michigan Technological University, Houghton

Keith R. Leatham

Brigham Young University, Provo, Utah

Charity Cayton

East Carolina University, Greenville, North Carolina

Room 216

114 An Instructional Model to Develop Preservice Teachers' Professional Noticing Skills

Discussion Session

This session presents an instructional module designed to develop professional noticing (attending, interpreting, and deciding) skills with preservice elementary teachers in the context of early numeracy. Presenters will facilitate a discussion around methods for teaching and assessing professional noticing, along with research results and goals.

Edna O. Schack

Morehead State University, Kentucky

Sara Eisenhardt

Northern Kentucky University, Highland Heights

Molly H. Fisher

University of Kentucky, Lexington

Cindy Jong

University of Kentucky, Lexington

Janet L. Tassell

Western Kentucky University, Bowling Green

Jonathan N. Thomas

*Northern Kentucky University/Kentucky Center for Mathematics,
Highland Heights*

Room 211

115 Building Research Communities in Mathematics Education

Research Symposium

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

Erica Walker

Teachers College, Columbia University, New York, New York

Daniel Chazan

University of Maryland, College Park

Marta Civil

University of North Carolina at Chapel Hill

Jacqueline Leonard

University of Wyoming, Laramie

Room 219

116 Fostering K–12 Prospective Teachers' Curricular Noticing

Research Symposium

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

Leslie Dietiker

Boston University, Massachusetts

Julie Amador

University of Idaho, Coeur d'Alene

Darrell Earnest

University of Massachusetts Amherst

Lorraine M. Males

University of Nebraska-Lincoln

Micah Stohlmann

University of Nevada, Las Vegas

Discussant: Corey Drake

Michigan State University, East Lansing

Room 208/209/210

117

Interactive Paper Session

President: Kathryn B Chval
University of Missouri, Columbia

A Multimodal Study of Registers for Doing Proofs in Geometry

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

Justin K. Dimmel
University of Michigan, Ann Arbor

Patricio G. Herbst
University of Michigan, Ann Arbor

Students’ and Experts’ Multiple Representations of Rate of Change

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

Eric Weber
Oregon State University, Corvallis

Allison Dorko
Oregon State University, Corvallis

Students’ Proof Schemes for Proving and Disproving of Propositions

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

KoSze Lee
University of North Florida, Jacksonville

Room 203/204

118

Interactive Paper Session

President: Michelle Stephan
University of North Carolina at Charlotte

Learning Together: Looking for Learning in Coach-Teacher Interactions

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

Evra Baldinger
University of California, Berkeley

Novice Teacher Efficacy in Promoting Discussion: The Benefits of Mentoring

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

Emily Joy Yanisko
University of Maryland, College Park

Developing Teacher Learning Opportunities in Mathematics Studio

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

Kristin Lesseig
Washington State University Vancouver

Room 205

119

Massive Open Online Courses for Educators: A Learning Trajectory–Based MOOC**Discussion Session**

Implementing the Common Core demands innovative, rapid, and flexible professional development. We developed a MOOC for educators on the Equipartitioning learning trajectory for interpreting the Common Core. In this session, we describe critical course components, instructional design, lessons learned, and findings from research on the course.

Alan P. Maloney
North Carolina State University, Raleigh

Tamar Avineri
North Carolina State University, Raleigh

Room 206

120

Perspectives on Linking Research and Practice: Thoughts from the Field

Research Symposium

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

Room 214

Lynsey Gibbons

University of Washington, Seattle

Kara Jackson

University of Washington, Seattle

Heather Lynn Johnson

University of Colorado Denver

Jonathan N. Thomas

Northern Kentucky University/Kentucky Center for Mathematics, Highland Heights

Discussant: Michael C. Fish

National Council of Teachers of Mathematics, Reston, Virginia

Room 220/221/222

121

Providing Support for Mathematics Teaching to English Language Learners

Discussion Session

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

Room 215

Fabián Torres-Ardila

University of Massachusetts Boston

Michael Gilbert

University of Massachusetts Boston

Room 207

122

Psychometric Methods in Math Education: New Opportunities and Challenges

Research Symposium

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

Room 212

Andrew Izsak

University of Georgia, Athens

Nicole Kersting

University of Arizona, Tucson

Chandra Orrill

University of Massachusetts Dartmouth

Janine Remillard

University of Pennsylvania, Philadelphia

Erik Daniel Jacobson

Indiana University, Bloomington

Discussant: Jeremy Kilpatrick

University of Georgia, Athens

123

Student Perspectives on Learning in Critical Mathematics Classrooms

Research Symposium

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

Patricia M. Buenrostro

University of Illinois at Chicago

Susan Gregson

University of Cincinnati, Ohio

Rodrigo J. Gutierrez

University of Maryland, College Park

Eric (Rico) Gutstein

University of Illinois at Chicago

124

What We Talk about When We Talk about Logs

Discussion Session

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

Michael K. Weiss

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

Michael Morissette

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

10:00 a.m.–11:15 a.m.

124.1

A Practical Theory of Productive Persistence in Mathematics Education

Plenary Session

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

Philip Uri Treisman

Charles A. Dana Center, University of Texas at Austin

Room 208/209/210

127

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

Brief Research Report

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

Carla J. Thompson

University of West Florida, Pensacola

Giang Nguyen

University of West Florida, Pensacola

Room 219

12:30 p.m.–1:00 p.m.

125

Are Missing Value Proportional Problems Becoming Out of Touch?

Brief Research Report

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

Hartono Tjoe

Pennsylvania State University, Reading

Jimmy de la Torre

Rutgers University, New Brunswick, New Jersey

Room 211

128

Influences of Coaching Knowledge on Teacher Change

Brief Research Report

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

John Sutton

sutton@rmcdenver.com

RMC Research Corporation, Denver, Colorado

David A. Yopp

University of Idaho, Moscow

Room 206

126

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

Brief Research Report

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

Frederick Peck

Freudenthal Institute US, Boulder, Colorado

Room 215

129

Initiating Students into Mathematical Discourse Internationally

Brief Research Report

Advocacy of student mathematical speech in classrooms ignores significant differences in public mathematical discourse and the use of student-to-student mathematical speech in classrooms internationally. Diversity in classroom discourse patterns internationally raises issues for generalized conceptions of quality mathematics teaching.

David Clarke

University of Melbourne, Carlton, Australia

Room 216

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

Brief Research Report

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

Cheryl L. Eames

Illinois State University, Normal

Jeffrey E. Barrett

Illinois State University, Normal

Julie Sarama

University of Denver, Colorado

Room 203/204

131 Leveraging Simultaneous Renewal in an Era of Mathematics Education Reform

Brief Research Report

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

Damon L. Bahr

Brigham Young University, Provo, Utah

Eula E. Monroe

Brigham Young University, Provo, Utah

Room 208/209/210

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

Brief Research Report

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

Susan A. Peters

University of Louisville, Kentucky

Room 212

133 Professional Development Integrating Math and Language Supports for English Learners

Brief Research Report

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

Jill M. Neumayer DePiper

Education Development Center, Waltham, Massachusetts

Johannah Nikula

Education Development Center, Waltham, Massachusetts

Mark J. Driscoll

Education Development Center, Waltham, Massachusetts

Room 220/221/222

134 Teacher Practices for Orchestrating Discussions about Mathematical Definitions

Brief Research Report

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

Marta Kobiela

McGill University, Montreal, Canada

Richard Lehrer

Vanderbilt University, Nashville, Tennessee

Room 205

135 Understanding Specialized Content Knowledge at the Middle School Level

Brief Research Report

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

Lauren E. Provost

University of New Hampshire, Durham

Room 207

12:30 p.m.–1:00 p.m.

136

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

Brief Research Report

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

Robert Ely

University of Idaho, Moscow

Anne E. Adams

University of Idaho, Moscow

Veronica Blackham

University of Idaho, Moscow

Room 214

1:15 p.m.–2:30 p.m.

137

Assessing the Eliciting and Interpreting of Students' Mathematical Thinking

Discussion Session

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

Meghan M. Shaughnessy

University of Michigan, Ann Arbor

Timothy Boerst

University of Michigan, Ann Arbor

Deborah Loewenberg Ball

University of Michigan, Ann Arbor

Room 203/204

138

Centering Instruction on Students: Mathematics Teacher Education for Equity

Research Symposium

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

Anita A. Wager

University of Wisconsin–Madison

Laurie Rubel

City University of New York, Brooklyn, New York

Mary Q. Foote

Queens College-CUNY, Flushing, New York

Kelly Harrigan

University of Wisconsin–Madison

AJ Stachelek

City University of New York, Brooklyn, New York

Kathleen Stoehr

University of Arizona, Tucson

Discussant: Joi Spencer

University of San Diego, California

Room 214

139

Exploring and Explaining Trends in NAEP Mathematics Performance

Discussion Session

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

Peter Kloosterman

Indiana University, Bloomington

Doris Mohr

University of Southern Indiana, Evansville

Crystal Walcott

Indiana University-Purdue University, Columbus

Arnulfo Perez

Indiana University, Bloomington

Michael Roach

Indiana University, Bloomington

Frank K. Lester

Indiana University, Bloomington

Kathryn Essex

Indiana University-Purdue University, Columbus

Michael Daiga

Indiana University, Bloomington

Room 212

140

How Should the Enacted Mathematics Curriculum Be Conceptualized and Studied?

Research Symposium

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

Janine Remillard

University of Pennsylvania, Philadelphia

Joshua Taton

University of Pennsylvania, Philadelphia

Kara Jackson

University of Washington, Seattle

Indigo Esmonde

University of Toronto, Canada

Anne Garrison Wilhelm

Southern Methodist University, Dallas, Texas

Discussant: Mary Kay Stein

University of Pittsburgh, Pennsylvania

Room 219

141

Interactive Paper Session

President: Karen Hollebrands

North Carolina State University, Cary

Preservice Elementary Teachers' Understanding of Fraction Multiplication

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

Jihwa Noh

University of Northern Iowa, Cedar Falls

Karen Sabey

University of Northern Iowa, Cedar Falls

Missing the Core: Classroom Representations of Fraction Multiplication

We present an analysis of visual models of fraction multiplication constructed in five fifth-grade classes. We describe the ways in which the CCSSM were and were not reflected in the representations.

Corey Webel

University of Missouri, Columbia

Erin Krupa

Montclair State University, New Jersey

Jason McManus

Montclair State University, New Jersey

Iceberg Synthesis of Fraction Learning Related to Manipulatives Use

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

Arla Westenskow

Utah State University, Logan

Patricia S. Moyer-Packenham

Utah State University, Logan

Room 211

142

Interactive Paper Session

President: Jeffrey J. Wanko

School of Education, Health, and Society, Miami University, Oxford, Ohio

Covariation and Correspondence Relationships in Elementary Schooling

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

Nicole Panorkou

North Carolina State University, Raleigh

Implementing Elementary Mathematics Materials

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

Kristen E Reed

Education Development Center, Waltham, Massachusetts

Jessica M. Young

Education Development Center, Waltham, Massachusetts

June Mark

Education Development Center, Waltham, Massachusetts

Mathematically Gifted Students' Experiences of Challenge

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

Kim Krusen McComas

University of Arkansas, Fayetteville

Room 205

143

Mathematics Teacher Educator: Information for Potential Authors

Discussion Session

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

Margaret Smith

pegs@pitt.edu

University of Pittsburgh, Pennsylvania

Melissa Boston

Duquesne University, Pittsburgh, Pennsylvania

Denise A. Spangler

University of Georgia, Athens

Room 220/221/222

144

Measuring Implementation of Mathematically Productive Teaching Routines in Urban Schools

Discussion Session

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

J. Michael Shaughnessy

Portland State University, Portland, Oregon

Eva Thanheiser

Portland State University, Portland, Oregon

Julie Fredericks

Teachers Development Group, West Linn, Oregon

Linda Foreman

Teachers Development Group, West Linn, Oregon

Room 206

145

Supporting Fraction Addition and Subtraction Algorithm Development

Discussion Session

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

Debra I. Johanning

debra.johanning@utoledo.edu

University of Toledo, Ohio

Room 207

146

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

Research Symposium

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

Charity Cayton

caytonc@ecu.edu

East Carolina University, Greenville, North Carolina

Milan Sherman

Drake University, Des Moines, Iowa

Allison McCulloch

North Carolina State University, Raleigh

Jennifer Nickell

North Carolina State University, Raleigh

Kayla Chandler

North Carolina State University, Raleigh

Room 215

147

The Teacher's Role in Formative Assessment: Finland, Canada, and U.S.

Research Symposium

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

Christine Suurtamm

Faculty of Education, University of Ottawa, Canada

Martha Jane Koch

University of Manitoba, Winnipeg, Canada

Heidi Krzywacki

University of Helsinki, Finland

Denisse R. Thompson

University of South Florida, Tampa

Room 208/209/210

1:15 p.m.–2:30 p.m.

148

Writing Research for Teachers: Putting Results into Practice

Research Symposium

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

Gregory D. Foley

Ohio University, Athens

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

Room 216

2:45 p.m.–3:15 p.m.

149

Characterizing Contexts That Support Understanding of Integer Subtraction

Brief Research Report

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

Christy Pettis

University of Minnesota, St. Paul

Aran W. Glancy

University of Minnesota, St. Paul

Room 211

150

Improving Equation Solving and Equal-Sign Understanding with Nonstandard Equations

Brief Research Report

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

Sarah Rannells Powell

University of Texas at Austin

Melissa Kypraios Driver

University of Virginia, Charlottesville

Room 205

151

Learning Integers through Argumentation: Mapping a Learning Trajectory

Brief Research Report

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

Ian Whitacre

Florida State University, Tallahassee

Courtney Flack

Florida State University, Tallahassee

Room 203/204

152

Meaningful Discourse in Linguistically Diverse Mathematics Classes

Brief Research Report

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

Mary P. Truxaw

University of Connecticut, Storrs

Room 214

153

Opportunities for Algebraic Reasoning in the Context of Integers

Brief Research Report

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

Jessica Pierson Bishop

University of Georgia, Athens

Randolph Philipp

San Diego State University, California

Lisa L. Lamb

San Diego State University, California

Room 220/221/222

154 Preservice Secondary Teachers' Algebraic Reasoning about Equation Solving

Brief Research Report

Our study focuses on secondary preservice teachers' algebraic reasoning by documenting the choices they made while doing algebra and their reflections on algebraic pedagogy. We will share qualitative results of examining teacher knowledge through preservice teachers' explanations, models, language, and conjectures about student thinking.

Rick A. Hudson

University of Southern Indiana, Evansville

Frances Keating

University of Nebraska, Lincoln

Room 212

155 Preservice Teachers' Use of Fraction Models: Shifts in Thinking

Brief Research Report

As fourteen preservice teachers engaged in a yearlong remedial mathematics skills course, they began to use models to think about the relations embedded in fractions. The results of the embedded case study reveal that modeling was a necessary but not sufficient means for the preservice teachers to understand fractions as meaningful objects.

Wendy Stienstra

The King's University College, Edmonton, Canada

Room 208/209/210

156 Secondary Mathematical Knowledge for Teaching: Challenges in Measurement

Brief Research Report

This study addresses the challenges of developing a measure of secondary mathematical knowledge for teaching (MKT). Through modifying an elementary MKT measure, this study illuminated the difficulty of developing a secondary MKT measure with appropriate levels of difficulty. It also highlighted the need to better conceptualize secondary MKT.

Erin Baldinger

Stanford University, California

Room 216

157 Supporting Middle School Learners' Understanding of Rate and Proportionality

Brief Research Report

This session reports on a curricular activity system used with middle school learners and teachers. Findings document a large and significant effect size for students who were taught using a textbook replacement learning module that integrated dynamic technology and was supported by focused teacher professional development.

George J. Roy

University of South Carolina, Chapin

Vivian Fueyo

University of South Florida St. Petersburg

Phil J. Vahey

SRI International, Menlo Park, California

Room 206

158 Supporting Prospective Elementary Mathematics Teachers' Learning through Book Study

Brief Research Report

In this design study, we explored the extent to which six student teachers used CGI work and the Five Practices to facilitate mathematically rich discussions in grades 3–5 classrooms after participating in a model for teacher learning that involved professional development with their cooperating teachers. Results will be shared.

Gemma F. Mojica

University of North Carolina at Chapel Hill

Stephanie Wright

University of North Carolina at Chapel Hill

Room 215

159 The Impact of a Dynamic Geometry-Centered Teacher Professional Department Program

Brief Research Report

This study investigated the impact of a dynamic-geometry-centered professional development program. Teachers in the experimental group scored higher in a conjecturing and proving test than did teachers in the control group. The students of experimental teachers significantly outperformed those of control teachers in a geometry achievement test.

Zhonghong Jiang

Texas State University, San Marcos

Alexander White

Texas State University, San Marcos

M. Alejandra Sorto

Texas State University, San Marcos

Room 207

160

Adoption + Adaptation: Compatibility of Different Lesson Studies for U.S. Contexts

Brief Research Report

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

Thomas E. Ricks

Louisiana State University, Baton Rouge

Yudong Yang

Shanghai Academy of Educational Sciences, Shanghai, China

Room 215

161

Advanced Placement Statistics Teaching Knowledge

Brief Research Report

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

Brenna J. Haines

The George Washington University, McPherson, Kansas

Room 211

162

Identifying Primary Students in Need of Intervention: Primary Mathematics Assessment

Brief Research Report

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

Jonathan Brendefur

Boise State University, Idaho

Michele Brown Carney

Boise State University, Idaho

Keith Thiede

Boise State University, Idaho

Room 212

163

Mathematics Teacher Educators' Classroom Practices from K–8 Mathematics Content Courses

Brief Research Report

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

Aina K. Appova

The Ohio State University, Marion

Cynthia E. Taylor

University of Pennsylvania, Millersville

Room 205

164

Measuring Instruction in Elementary Mathematics Classrooms

Brief Research Report

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

Sue A. Womack

Utah Valley University, Orem

Sterling C. Hilton

Brigham Young University, Provo, Utah

Room 203/204

165

Preservice Elementary Teachers' Visions and Enactment of Mathematical Discussions

Brief Research Report

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

Allyson Hallman-Thrasher

Ohio University, Athens

Room 214

166

Proof and Reasoning in Secondary School Algebra Textbooks

Brief Research Report

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

Philip Dituri

New Design High School, New York, New York

Room 208/209/210

167

Teacher Fidelity Decisions and Their Impact on Lesson Enactment

Brief Research Report

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

Ok-Kyeong Kim

Western Michigan University, Kalamazoo

Napthalin A. Atanga

Western Michigan University, Kalamazoo

Room 207

168

Teacher Time-Out: Supporting the Collective Learning of Educators

Brief Research Report

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

Lynsey K. Gibbons

University of Washington, Seattle

Elizabeth Hartmann

University of Washington, Seattle

Allison Hintz

University of Washington, Bothell

Room 206

169

Teachers' Problem-Posing Responses to Children's Mathematical Thinking

Brief Research Report

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

Tonia Land

Drake University, Des Moines, Iowa

Andrew Tyminski

Clemson University, South Carolina

Room 216

170

Teachers' Reasoning about Proportional Relationships as "Variable Parts"

Brief Research Report

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

Sybilla Beckmann

University of Georgia, Athens

Andrew Izsak

University of Georgia, Athens

Room 220/221/222

171

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

Brief Research Report

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

David R. Liss II

University of Georgia, Athens

Room 219

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