Research Presession Planning Committee

NCTM Research Committee

Daniel J. Heck (2009–12), Chair
Horizon Research, Inc.

Pat Baltzley (2009–12)
Baltimore County Public Schools

Robert Q. Berry, Board Liaison (2011-14)
University of Virginia

Karen F. Hollebrands (2011-2014)
North Carolina State University

Karen D. King, Staff Liaison
NCTM

Chris L. Rasmussen (2010-2013)
San Diego State University

James E. Tarr (2010-2013)
University of Missouri

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

AERA–SIG/RME Executive Board

Jinfa Cai (2010–12), Co-chair
University of Delaware

Eric Knuth (2011–13), Co-chair
University of Wisconsin

Tonya Gau Bartell (2010–12), Treasurer
University of Delaware

Mary Q. Foote (2011–13), Communications
Queens College, City University of New York

Dan Battey (2011–13), Electronics
Rutgers University

Joanne Lobato (2010-2012), Awards
San Diego State University

Ann Ryu Edwards (2011-2013), Events
University of Maryland

Announcements

- The Research Presession will be held at the Philadelphia Marriott Downtown.
- Registration will be held in the Franklin Hall Foyer. The times are Monday, 4:30 p.m. to 7:00pm, and Tuesday, 7:00 a.m. to 3:00 p.m. Registration is required for attendance, and badges must be worn for all sessions.
- On Wednesday, the Research Presession is open to all registered attendees to 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 Salon I/J/K/L, 8:30 p.m. to 10:00 p.m. following the opening session at 7:00 p.m. in Salon G/H.
- Research posters will be available for viewing and discussing with the presenters in Salon I/J/K/L from 4:45 p.m. to 6:00 p.m. on Tuesday and 1:00 p.m. to 2:30 p.m. on Wednesday.
- The Call for Papers for the next Research Presession, to be held in Denver, CO in 2013 will be available online in June, 2012.
- Be sure to visit the Exhibit Hall for the NCTM Bookstore, which has a special table on research.

Invited Sessions

Opening Session

Monday, April 23rd, 7:00 PM–8:30 PM

Salon G/H

The Mathematics Teacher Educator: A Resource for Your Teaching and Outlet for Your Writing

Tuesday, April 24th, 8:30 AM–10:00 AM

Franklin Hall 4

Graduate Student, Junior Faculty, and Researcher Mentoring Session

Tuesday, April 24th, 8:30 AM–10:00 AM

Franklin Hall 12

Looking for Data in All the Right Places: National, Large-Scale NAEP Data, Free!
Tuesday, April 24th, 10:30 AM–12:00 PM
Franklin Hall 6

Common Core State Standards for Mathematics (CCSSM) Recommendations Session B: Professional Development and Research
Tuesday, April 24th, 10:30 AM–12:00 PM
Franklin Hall 2

Tools of the Trade, Part 3
Tuesday, April 24th, 10:30 AM–12:00 PM
Franklin Hall 5

Common Core State Standards for Mathematics (CCSSM) Recommendations Session A: Curriculum and Assessment
Tuesday, April 24th, 1:00 PM–2:30 PM
Franklin Hall 3

Factors Influencing STEM Preparedness: From Algebra to Calculus
Tuesday, April 24th, 1:00 PM–2:30 PM
Franklin Hall 8

Writing for NCTM Journals: Publishing Your Research in Teacher-Friendly Articles
Tuesday, April 24th, 1:00 PM–2:30 PM
Franklin Hall 12

Working toward Innovative Research: NSF's Role, the Researcher's Role
Tuesday, April 24th, 3:00 PM–4:30 PM
Franklin Hall 3

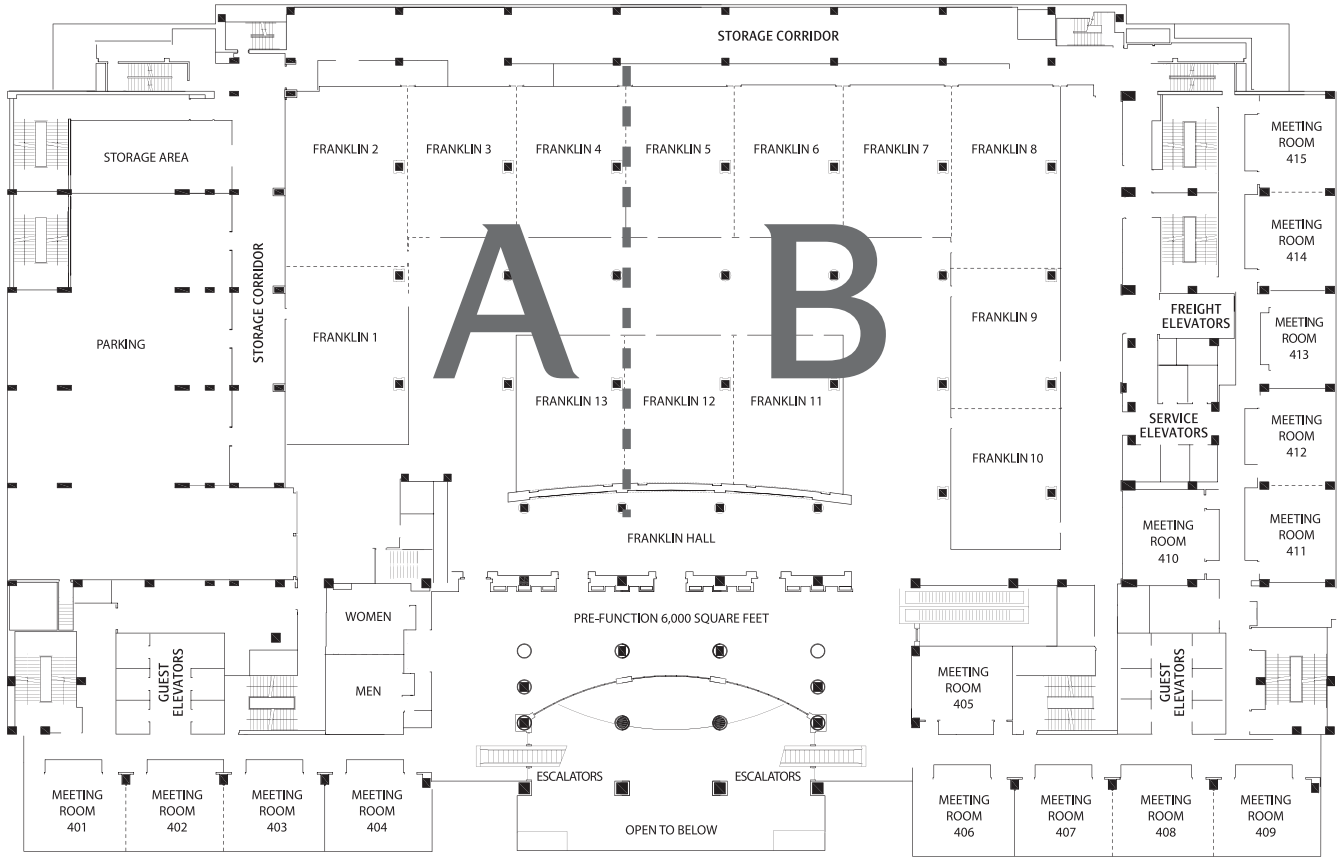
Linking Research and Practice Plenary
Wednesday, April 25th, 8:30 AM–10:00 AM
Salon G/H

Writing for NCTM Practitioner Journals: "Linking Research and Practice" Awards
Wednesday, April 25th, 10:30 AM–12:00 PM
Franklin Hall 10

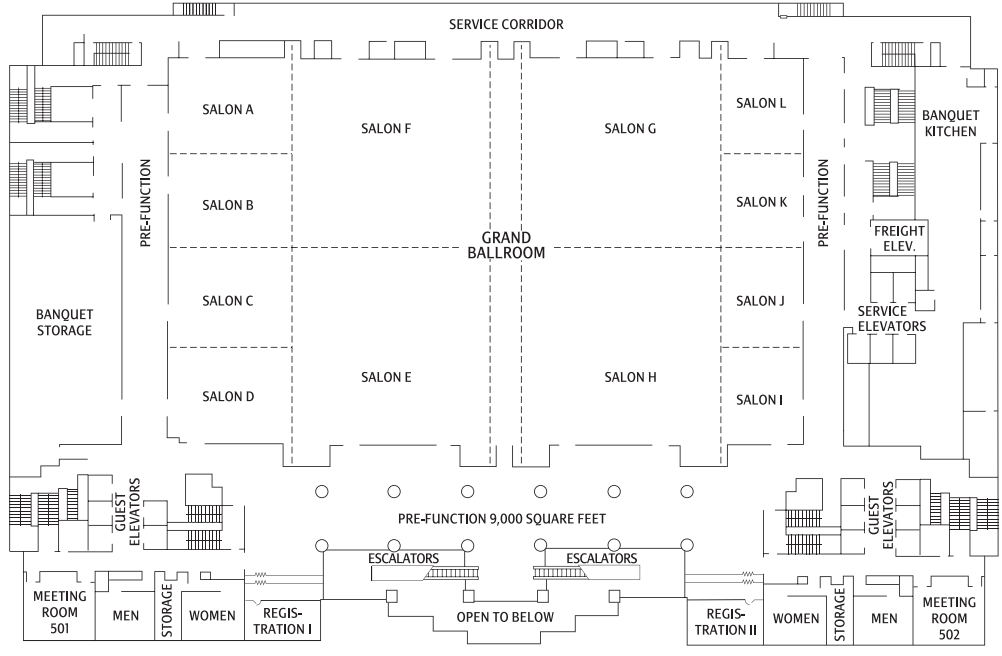
RtI: Mathematics and Special Educators Sharing Responsibility: A Call for Action
Wednesday, April 25th, 3:00 PM–4:30 PM
Franklin Hall 2

Linking Research and Practice: A Focus on Reasoning and Sense Making with Technology
Wednesday, April 25th, 3:00 PM–4:30 PM
Franklin Hall 7

All sessions in Philadelphia Marriott Downtown



Floor Plan: 4th Floor
Philadelphia Marriott



Floor Plan: 5th Floor
Philadelphia Marriott

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 Presession. The Research Presession 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 veteran 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 other members of the research community who served as reviewers. Your work is greatly valued and appreciated. Moreover, we would like to thank the staff at NCTM for helping us with the logistics of the conference, registration, printing the program, and so on. 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,

Daniel J. Heck,
NCTM Research Committee, Chair

Eric Knuth,
AERA SIG/RME Cochair

Karen D. King
NCTM Research Committee, Staff Liaison

Monday, April 23rd

7:00 p.m.-8:30 p.m.

1
Opening Session

Plenary Sessions

Opening Session

M. Kathleen Heid
Pennsylvania State University, State College, Pennsylvania

Salon G/H, Capacity: 1192

Photo by bklphoto.com for PCVB/Miles|Weaver

For your safety and due to fire regulations, only those with seats will be allowed in meeting rooms. To comply with fire codes, it may be necessary to ask any person 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.

Tuesday, April 24th

8:30 a.m.-10:00 a.m.

2
Curriculum Matters: Why Are Some Elementary School Curricula More Effective?

Research Symposium

A new curriculum can improve students' achievement. This symposium will present esults from a large-scale experimental study of four elementary school math curricula. The speakers will discuss why some curricula are more effective, what it takes to implement different types of curricula, and implications for math instruction.

Barbara D. Harris
Mathematica Policy Research, Washington, D.C., District of Columbia

Roberto Agodini
Mathematica Policy Research, Princeton, New Jersey, New Jersey

Karen Fuson
Consultant, Fallbrook, California

Aki Murata
Stanford University, California

Nancy Larson
Nancy Larson Publishers, Old Lyme, Connecticut

Janine Remillard
University of Pennsylvania, Philadelphia, New Mexico

Franklin Hall 2, Capacity: 139

8:30 a.m.-10:00 a.m.

3
Graduate Student, Junior Faculty, and Researcher Mentoring Session

Work Session

Experienced faculty and researchers will provide mentoring on topics such as publishing dissertation-based manuscripts, finding faculty positions in higher education, transitioning from doctoral student to faculty member, grant writing, and navigating the tenure process. Attendees will rotate among topic-focused tables.

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

Karen Hollebrands
North Carolina State University, Raleigh, North Carolina

Session 3 continued

Danny Martin
University of Illinois Chicago, Finding Faculty Positions in Higher Education

Daniel Chazan
University of Maryland, Finding Faculty Positions in Higher Education

Chris Rasmussen
San Diego State University, Navigating the Tenure Process

Edward Silver
University of Michigan Dearborn, Navigating the Tenure Process

Amy Ellis
University of Wisconsin, Publishing Dissertation-Based Manuscripts

Rose Zbiek
Pennsylvania State University, Publishing Dissertation-Based Manuscripts

Kristen Bieda
Michigan State University, Publishing Dissertation-Based Manuscripts

Susan Peters
University of Louisville, Transitioning from Doctoral Student to Faculty Member

Michelle Cirillo
University of Delaware, Transitioning from Doctoral Student to Faculty Member

Karen Marongelle
Portland State University, Writing Grant Proposals

Pat Wilson
University of Georgia/NSF, Writing Grant Proposals

Franklin Hall 12, Capacity: 40

8:30 a.m.-10:00 a.m.

4
Implementing Mathematics Instructional Materials: Examining School-Level Support

Work Session

What are the key dimensions of school-level support for a successful implementation of instructional materials? The audience will work with quantitative and qualitative data from an ongoing study investigating the implementation of mathematics materials, with attention to school-level supports that strengthen the materials' use.

Kristen Reed
Education Development Center, Waltham, Massachusetts

June Mark
Education Development Center, Waltham, Massachusetts

Jessica Young
Education Development Center, Waltham, Massachusetts

Franklin Hall 5, Capacity: 40

5
Interactive Paper Session

Designing Professional Development to Resolve Identified Inconsistencies in Teachers' Math-Related Beliefs

The purpose of this study is to investigate the influence of professional development on resolving the perceived inconsistencies in teachers' beliefs.

Dionne Cross
Indiana University, Bloomington, Indiana

Lauren Rapacki
Indiana University, Bloomington, Indiana

Mathematical Representations: Instructional Challenges and Insights

This session will report the ways in which elementary teachers, engaged in a professional development focused on representation, consider the affordances of representation in teaching mathematics. Common challenges teachers faced when incorporating multiple representations in instruction and implications for teacher educators will be discussed.

Edd Taylor
Northwestern University, Evanston, Illinois

Elizabeth Dyer
Northwestern University, Evanston, Illinois

Special Educators' Movement Toward Reform-Based Mathematics: A Cross-Case Analysis

This case study describes the movement of four special educators toward reform-based mathematics teaching and learning and identifies components within a professional development project affecting that movement. Trend analyses suggest that growth in beliefs, knowledge, and practices occurred in a broad, balanced manner for these participants across the duration of the project.

Eula Monroe
Brigham Young University, Provo, Utah

Damon Bahr
Brigham Young University, Provo, Utah

Joseph Rino
Brigham Young University, Provo, Utah

Presider: Gloriana Gonzalez
University of Illinois at Urbana-Champaign, Illinois

Franklin Hall 1, Capacity: 60

6
Interactive Paper Session

The Effect of Early College High Schools on Mathematics Teaching and Learning

This paper will examine the impact of the Early College High School (ECHS) model on mathematics teaching and student mathematics performance in the 9th through 11th grade. The research questions are: 1. What is the impact of the early college on students' coursetaking and academic performance in mathematics in the 9th through 11th grade? 2. What does mathematics teaching look like in the early college model?

Nina Arshavsky
University of North Carolina at Greensboro, Greensboro, North Carolina

Relations among Mathematical Knowledge for Teaching, Mathematics Instructional Quality, and Students' Achievement in the Responsive Classroom Approach

This study examines the direct and indirect relations between mathematical knowledge for teaching (MKT), mathematics instructional quality [MIQ]), and student mathematics achievement. Further, this study examines impact of the Responsive Classroom® (RC) approach, a social and emotional learning intervention, for strengthening these relations. Participants in this study were 88 third grade teachers and their 1,533 students. Results from multi-group path analyses indicate significant direct effects of MKT on MIQ, and MIQ on student achievement; however, these effects were only evident in the RC group. No direct effects were found linking MKT and achievement in either the intervention or control groups. Results demonstrate the importance of building capacity in teachers and providing supports in the classroom that help teachers translate their mathematical knowledge into high quality mathematics instruction.

Erin Ottmar
University of Richmond, Virginia, Virginia

Sara Rimm-Kaufman
University of Virginia, Charlottesville, Virginia

Ross Larsen
University of Virginia, Charlottesville, Virginia

Effects of Professional Development on Students' Achievement and Teachers' Curricular Implementation

This research provides an account of the impact different components of a professional development have on student achievement in Core-Plus classrooms and on teachers' curricular implementation. This study used a mixed methods design consisting of hierarchical linear modeling, followed by qualitative data analysis to explore teachers' implementation in greater detail.

Erin Elizabeth Krupa
Montclair State University, New Jersey, New Jersey

Jere Confrey
North Caroiina State University, Raleigh, North Carolina

Allison McCulloch
North Caroiina State University, Raleigh, North Carolina

Presider: James Tarr
University of Missouri—Columbia, Columbia, Missouri

Franklin Hall 13, Capacity: 40

8:30 a.m.-10:00 a.m.

7
Interactive Paper Session

Developing a Framework to Teach Mathematics in Depth

How does one teach mathematics in depth? This research developed a framework for teaching mathematics in depth after studying the experience of a fifth grade team's implementation of a southeastern state's standards built on the Curriculum Focal Points. Study results were synthesized with mathematics research literature to create the framework.

Joanne LaFramenta
University of Florida, Gainesville, Florida

Thomasenia Adams
University of Florida, Gainesville, Florida

Mediating Instructional Quality: Relational Interactions in Mathematics Classrooms

This study researched the relationship between relational interactions and the quality of mathematics instruction for four teachers in one urban school. Results indicated varying quality in both instructional and relational quality, but that the two weren't necessarily correlated. This raises important mediating effect of relational interactions on mathematics achievement for further research.

Dan Battey
Rutgers, State University of New Jersey, New Brunswick, New Jersey

Mathematics Instructional Quality: Does Socioeconomic Status of Students Matter?

The purpose of this session is to examine the mathematics instructional quality in two sets of elementary school classrooms. The first set of classrooms primarily has students of low socioeconomic status (SES), defined by their eligibility for free or reduced lunch. The second set of classrooms primarily has students of middle or high SES. Qualitative differences in mathematical tasks and discourse will be shared.

Robert Berry
University of Virginia, Charlottesville, Virginia

Temple Walkowiak
North Carolina State University, Raleigh, North Carolina

Eileen Merritt
University of Virginia, Charlottesville, Virginia

Presider: Robert Berry
University of Virginia, Charlottesville, Virginia

Franklin Hall 6, Capacity: 40

8:30 a.m.-10:00 a.m.

8
Investigating Secondary School Mathematics Teacher PCK across the Professional Continuum

Research Symposium

The presenters will present three research studies, each focused on a different investigation of beginning or experienced secondary mathematics teachers' personal content knowledge (PCK). Participants will discuss each study and the corresponding implications for mathematics teacher education.

John Lannin
University of Missouri—Columbia, Columbia, Missouri

Kathryn B. Chval
University of Missouri—Columbia, Columbia, Missouri

Fran Arbaugh
Penn State University, Pennsylvania, Pennsylvania

Cynthia Taylor
Millersville University, Pennsylvania, Pennsylvania

Matthew Webb
University of Northern Iowa, Cedar Falls, Iowa

Sarah J. Hicks
Rockhurst University, Kansas City, Missouri

Discussant: Cynthia Langrall
Illinois State University, Normal, Illinois

Franklin Hall 3, Capacity: 108

8:30 a.m.-10:00 a.m.

9
Measuring Teachers' Attitudes, Beliefs, and Dispositions Over Time

Work Session

This session describes the development of The Mathematics Experiences and Conceptions Surveys, which support longitudinal study of preservice elementary teachers' conceptions of mathematics teaching and learning. Focuses include instrument construction and implementation, garnering feedback on survey items, and discussing future research.

Rachael Welder
Hunter College—City University of New York, New York, New York

Thomas Hodges
Western Carolina University, Cullowhee, North Carolina

Cindy Jong
University of Kentucky, Lexington, Kentucky

Franklin Hall 10, Capacity: 40

8:30 a.m.-10:00 a.m.

10
Quantitative Reasoning in Secondary School Mathematics: An Avenue to Coherence

Research Symposium

The speakers discuss the role of quantitative reasoning (QR) in engendering coherent mathematical experiences in secondary mathematics. They highlight the emergent, contextual nature of students' QR, address how QR can impact student learning of secondary mathematics, and examine how QR can create foundations for reasoning about calculus concepts.

Kevin Moore
University of Georgia, Athens, Georgia

Heather Lynn Johnson
University of Colorado Denver, Denver , Colorado

Carlos Castillo-Garsow
Kansas State University, Manhattan, Kansas

Discussant: Leslie Steffe
University of Georgia, Athens, Georgia

Discussant: Robert Mayes
Georgia Southern University, Statesboro, Georgia

Franklin Hall 11, Capacity: 113

8:30 a.m.-10:00 a.m.

11
Teachers' Learning of Learning Trajectories

Research Symposium

Recent interest in learning trajectories requires new knowledge from mathematics education researchers about how teachers come to understand and use these trajectories as frameworks for making sense of and responding to students' thinking. IThree different research groups share their findings about teachers' learning of learning trajectories.

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

Jae Baek
Illinois State University, Normal, Illinois

Jeffrey E. Barrett
Illinois State University, Normal, Illinois

Michael Battista
Ohio State University, Columbus, Ohio

Craig Cullen
Illinois State University, Normal, Illinois

Douglas Clements
University at Buffalo, State University of New York, New York

Paola Sztajn
North Carolina State University, Raleigh, North Carolina

Julie Sarama
University at Buffalo, State University of New York, New York

Franklin Hall 7, Capacity: 108

8:30 a.m.-10:00 a.m.

12
The Mathematics Teacher Educator: A Resource for Your Teaching and Outlet for Your Writing

Work Session

Participants will learn about the new journal, The Mathematics Teacher Educator. This will include the scope of the journal, the submission and review process, the possibilities afforded by the online format, and the timeline for the first issue.

Margaret Smith
University of Pittsburgh, Pennsylvania, Pennsylvania

Denise A. Spangler
University of Georgia, Athens, Georgia

Franklin Hall 4, Capacity: 40

13
Treatment of Fractions in Asian Curricula and the CCSS

Research Symposium

The presenters will discuss their findings on how Korean, Chinese, Japanese, and Singapore primary school curricula develop fractions systematically across grade levels, compared to the treatment of fractions in the Common Core State Standards (CCSS).

Janice Grow-Maienza
Truman State University, Kirksville, Missouri

Meixia Ding
University of Nebraska—Lincoln, Lincoln, Nebraska

William Jackson
Scarsdale Public Schools, New York, New Jersey

Mary Pat Sjostrom
Chaminade University, Honolulu, Hawaii

Dan Kitashima
Ka Waihona o ka Na'auao, Public Charter School, Waianae, Hawaii

Discussant: Jinfa Cai
University of Delaware, Newark, Delaware

Franklin Hall 8, Capacity: 138

10:30 a.m.-12:00 p.m.

14
Common Core State Standards for Mathematics (CCSSM) Recommendations Session A: Professional Development and Research

Research Symposium

Project leaders will share implications of their work on professional development systems in the era of the Common Core States Standards for Mathematics and priorities for related research. Discussion will focus on how research on professional development must inform the field as the CCSSM are implemented.

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

Paola Sztajn
North Carolina State University, Raleigh, North Carolina

Karen Marongelle
Portland State University, Oregon, Oregon

Discussant: Patricia Wilson
University of Georgia, Athens, Georgia

Franklin Hall 2, Capacity: 139

10:30 a.m.-12:00 p.m.

15
Elementary School Teachers' Perceptions of Mathematical and Pedagogical Authority

Work Session

Do preservice teachers view themselves and their students as mathematical authorities? The audience will explore this question and the mathematical and pedagogical issues of authority that arise as university students begin the shift to becoming elementary school teachers, and they will review data to explore a framework based on previous research.

Ginger Rhodes
University of North Carolina at Wilmington, Wilmington, North Carolina

Shelby Morge
University of North Carolina at Wilmington, Wilmington, North Carolina

Heidi Higgins
University of North Carolina at Wilmington, Wilmington, North Carolina

Franklin Hall 12, Capacity: 40

16
Interactive Paper Session

Mathematicians and the Role of Examples

Examples can allow one to see the general in the specific but can also limit one's understanding through overgeneralization. To investigate the role of examples, we conducted a microanalysis of interview data with university mathematicians situated in the context of understanding definitions. We report on the mathematician's perspectives in their own work and in their teaching.

Laurie Cavey
Boise State University, Boise, Idaho

Margaret Kinzel
Boise State University, Boise, Idaho

Sasha Wang
Boise State University, Boise, Idaho

Team-Teaching Experiences of a Mathematician and a Math Teacher Educator

In this session, we present an overview of the results from an interpretive phenomenological case study in which we investigated the lived experiences of a mathematician and a mathematics teacher educator as they engaged in a team-teaching collaboration within the context of prospective secondary mathematics teacher preparation.

Sarah Bleiler
University of South Florida, Tampa, Florida

Gladis Kersaint
University of South Florida, Tampa, Florida

Similarities among New Teacher Educators and New Grades K–12 Mathematics Teachers

Data was collected by a national survey to understand the experiences of new university mathematics educators. Survey findings were compared to the results of a meta-analysis of research on the experiences of new K-12 mathematics teachers. Similarities between the groups will be reported to inform preparation of mathematics educators at all levels.

Jennifer Eli
University of Arizona, Tucson, Arizona

Jan Yow
University of South Carolina, Columbia, South Carolina

Rachael Welder
City University of New York—Hunter College, New York, New York

Presider: Chris Rasmussen
San Diego State University, San Diego, California

Franklin Hall 4, Capacity: 40

17
Interactive Paper Session

Mathematics-for-All, Education, Economics, and National Security

I detail empirical economic studies challenging common assumptions that "mathematics for all" is vital for any nation's economic prosperity and national security. I also develop theory for why, when, and how mathematics education enables individual educational access, career advancement, and economic development.

Thomas Ricks
Louisiana State University, Baton Rouge, Louisiana

Data Difficulties: When Research and Policy Meet Practice

Widespread calls to use data to improve instruction requires teachers to gather and analyze evidence systematically in ways that link teaching and learning. A study of teachers engaged in inquiry shows that these requirements are difficult to meet within typical teaching contexts and without the support of widely shared structures and tools.

Robert Wieman
University of Delaware, Newark, Delaware

The Role of Program Theory in Mathematics Education Evaluation Research

A critique of mathematics program evaluations that met The What Works Clearinghouse's methodological standards for inclusion in terms of attention to program theory. For each study, we determined the extent to which the program's underlying theory (of learning and teaching mathematics) influenced the evaluators' research questions, construct measurement and analysis.

Charles Munter
University of Pittsburgh, Pennsylvania, Pennsylvania

Paul Cobb
Vanderbilt University, Nashville, Tennessee

Presider: Jill Newton
Purdue University, West Lafayette, Indianadiana

Franklin Hall 13, Capacity: 40

18
Interactive Paper Session

Connecting Methods Courses with Teachers' Knowledge through Mediated Field Experiences

This study reports how one Secondary Teacher Education program implemented Mediated Field Experiences (MFEs) across content methods courses. We found that MFEs were structured around teacher candidate learning, and that each MFE structure drew on partner teacher knowledge as a way to support candidates in making sense of progressive teaching practice.

Teresa Dunleavy
University of Washington, Seattle, Washington

Sara Sunshine Campbell
Evergreen State College, Olympia, Washington

A Framework for Supporting Preservice Teachers' Mathematics Teacher Identity

This session will (1) present new findings on research on mathematics teacher identity, in particular as related to the complex realities of schooling; (2) share the specific framework and activities used to support mathematics teacher identity work; and (3) engage participants in a discussion of implications for mathematics teacher preparation.

Jill Neumayer DePiper
University of Maryland, College Park, Maryland

Preservice Mathematics Teachers' Design and Implementation of Interactive Geometry Tasks

This session will share information and findings about a study that examined prospective secondary teachers' design and implementation of geometry tasks using The Geometer's Sketchpad with middle school students enrolled in a high school geometry course.

Karen Hollebrands
North Carolina State University, Raleigh, North Carolina

Hollylynne Lee
North Carolina State University, Raleigh, North Carolina

Tina Starling
North Carolina State University, Raleigh, North Carolina

Presider: Patricia Hunsader
University of South Florida, Sarasota-Manatee, Florida

Franklin Hall 1, Capacity: 60

10:30 a.m.-12:00 p.m.

19
Looking for Data in All the Right Places: National, Large-Scale NAEP Data, Free!

Work Session

This session's goal is to introduce several rich datasets related to the National Assessment of Educational Progress (NAEP) that are available for secondary research analyses. NAEP is the largest continuing,nationally representative assessment of what grades 4, 8, and 12 students know and can do in math and a variety of other subjects.

Please bring computers.

NCES Representative
National Center for Educational Statistics and National Assessment of Educational Progress, Washington, District of Columbia

Franklin Hall 6, Capacity: 40

10:30 a.m.-12:00 p.m.

20
Mathematical Habits of Mind: Measuring Teachers' Knowledge and Use

Work Session

This presentation focuses on habits of mind used by mathematicians as an organizing framework for mathematical knowledge for teaching in secondary school. Participants will work with assessment tools and rubrics designed to measure teachers' mathematical habits of mind.

Ryota Matsuura
Saint Olaf College, Northfield,, Minnesota

Sarah Sword
Education Development Center, Newton, Minnesota

Mary Beth Piecham
Education Development Center, Newton, Massachusetts

Glenn Stevens
Boston University, Boston, Massachusetts

Al Cuoco
Education Development Center, Newton, Massachusetts

Franklin Hall 10, Capacity: 40

10:30 a.m.-12:00 p.m.

21
Preservice Teachers' Knowledge for Teaching Algebra: A Preliminary Report

Research Symposium

This symposium describes the first phase of a project to design, develop, and test technology-enriched teacher preparation strategies that address equity in algebra learning. Results indicate that Second Life simulations can be rich settings for prospective teachers to develop mathematics teaching skills and apply their ideas about diversity.

Gerald Kulm
Texas A&M University, College Station, California

Irving Brown
Texas A&M University, College Station, Texas

Song An
Texas A&M University, College Station, Texas

Tingting Ma
Texas A&M University, College Station, Texas

Trina Davis
Texas A&M University, College Station, Texas

Franklin Hall 8, Capacity: 138

10:30 a.m.-12:00 p.m.

22
Studying Reflection and Students' Thinking: Effect on Teaching Quality

Research Symposium

The speakers will discuss an innovative, field-experience approach to fostering preservice teachers' abilities to reflect on practice and develop models of students' thinking. They will share findings from teacher quality measures and discuss the approach's impact on teacher quality during student teaching.

Enrique Galindo
Indiana University, Bloomington, Indiana

Julie Amador
Indiana University, Bloomington, Indiana

Kai-Ju Yang
Indiana University, Bloomington, Indiana

Mi Yeon Lee

Session 22 continued

Indiana University, Bloomington, Indiana

Samuel Tsegai
Indiana University, Bloomington, Indiana

Discussant: Anderson Norton
Virginia Polytechnic and State University, Blacksburg, Virginia

Discussant: Denise A. Spangler
University of Georgia, Athens, Georgia

Franklin Hall 11, Capacity: 113

10:30 a.m.-12:00 p.m.

23
Teachers' Capacity to Use, and Learn from, Innovative Curriculum Resources

Research Symposium

This symposium focuses on three studies that investigate the notion of teacher capacity with respect to the use of innovative curriculum resources. We emphasize the reflexive relationship between teachers' planning and instructional practices and their uptake of curriculum resources to identify high-leverage practices with respect to curriculum use and instruction.

Jeffrey Choppin
University of Rochester, Rochester, New York

Amy Roth McDuffie
Washington State University Tri-Cities, Richland, Washington

Tonia Land
Drake University, Des Moines, Iowa

Corey Drake
Michigan State University, East Lansing, Michigan

Discussant: Karen King
National Council of Teachers of Mathematics, Reston, Virginia

Franklin Hall 3, Capacity: 108

24
Teaching Teachers Mathematics for Social Justice

Research Symposium

The presenters will share their experiences teaching teachers how to teach for social justice. They will share activities and report findings from the studies using those activities, contributing to ongoing research on the question of how to teach mathematics for social justice.

Anita Wager
University of Wisconsin—Madison, Madison, Wisconsin

Courtney Koestler
University of Arizona, Tuscon, Arizona

Lidia Gonzalez
City University of New York—York College, New York, New York

Jacqueline Leonard
University of Colorado Denver, Denver, Colorado

Brian Evans
Pace University, New York, New York

Tonya Gau Bartell
University of Delaware, Newark, Delaware

Discussant: David Stinson
Georgia State University, Atlanta, Georgia

Franklin Hall 7, Capacity: 108

25
Tools of the Trade, Part 3

Work Session

Researchers use a variety of tools to collect data (e.g., observation protocols, assessment instruments, surveys) to address the question that a particular study or set of related studies investigates. This presentation will include presentations from researchers who have created innovative data collection tools.

Robert Berry
University of Virginia, Charlottesville, Virginia

Patricia Campbell
University of Maryland, College Park, Maryland

Melissa Boston
Duquesne University, Pittsburgh, Pennsylvania

Andrew Izsak
University of Georgia, Athens, Georgia

Jere Confrey
North Caroiina State University, Raleigh, North Carolina

Franklin Hall 5, Capacity: 40

Photo courtesy of PCVB

1:00 p.m.-2:30 p.m.

26
Common Core State Standards for Mathematics (CCSSM) Recommendations Session B: Curriculum and Assessment

Research Symposium

The organizers of two conferences will share recommendations that emerged regarding curriculum design and interactions between curriculum and assessment in the era of the Common Core States Standards for Mathematics. Discussion will focus on how research on curriculum and assessment must inform the field as the CCSSM are implemented.

Christian Hirsch
Western Michigan University, Kalamazoo, Michigan

Sol Garfunkel
Consortium for Mathematics and its Applications, Bedford, Massachusetts

Barbara Reys
University of Missouri—Columbia, Columbia, Missouri

Eric Robinson
Ithaca College, Ithaca, New York

Franklin Hall 3, Capacity: 108

1:00 p.m.-2:30 p.m.

27
Designing and Creating Representations of Mathematics Teaching

Research Symposium

The session includes a collection of papers discussing design principles and theoretical approaches for creating representations of teaching in the form of animated stories and video cases. The papers examine how specific elements such as the audience and the goals of the representations of teaching shape decisions about the design.

Gloriana Gonzalez
University of Illinois, Urbana-Champaign, Illinois

Pat Herbst
University of Michigan, Ann Arbor, Michigan

Sandra Crespo
Michigan State University, East Lansing, Michigan

Heather Lynn Johnson
University of Colorado Denver, Denver, Colorado

Discussant: Daniel Chazan
University of Maryland, College Park, Maryland

Franklin Hall 2, Capacity: 139

28
Developing Teachers' Capacity to Support Students' Reasoning and Proof

Work Session

This session will analyze and discuss a set of teacher education materials that develops teachers' capacity to engage their students productively in reasoning and proof. The speakers will present data from pilot studies of teachers' learning, conducted at several sites.

Margaret Smith
University of Pittsburgh, Pennsylvania, Pennsylvania

Fran Arbaugh
Penn State University, Pennsylvania, Pennsylvania

Justin Boyle
University of Pittsburgh, Pennsylvania, Pennsylvania

Michael Steele
Michigan State University, East Lansing, Michigan

Nursen Konuk
Penn State University, Pennsylvania, Pennsylvania

William Fulkerson
Horizon Research, Chapel Hill, North Carolina

Franklin Hall 5, Capacity: 40

Photo by Paul Loftland for PCVB

1:00 p.m.-2:30 p.m.

29
Factors Influencing STEM Preparedness: From Algebra to Calculus

Research Symposium

The presenters will share research methodology and findings from three large-scale studies of students' preparedness to study science, technology, engineering, and mathematics (STEM) as they transition from high school to colleges and careers.

Chris Rasmussen
San Diego State University, San Diego, California

A. Kelly
George Mason University, Fairfax, Virginia

Philip Sadler
Harvard University, Cambridge, Massachusetts

David Bressoud
Macalester College, Saint Paul, Minnesota

Franklin Hall 8, Capacity: 138

1:00 p.m.-2:30 p.m.

30
How Is Students' Mathematics Knowledge Changing? Evidence from NAEP

Research Symposium

This symposium uses main and LTT National Assessment of Education Progress data to describe elementary and middle school items and topics on which there substantial change has occurred in performance over time. Discussion will focus on identified trends in performance and on what those trends mean for teaching and curriculum.

Peter Kloosterman
Indiana University, Bloomington, Indiana

Doris Mohr
University of Southern Indiana, Evansville, Indiana

Crystal Walcott
Indiana University Purdue University Columbus, Columbus, Indiana

Discussant: Linda Wilson
American Association for the Advancement of Science, Washington, District of Columbia

Franklin Hall 11, Capacity: 113

31
Interactive Paper Session

The Evolution of a Conception of Tangency in Geometry Textbooks

This study tracks the evolution of a conception of tangency in 20th century geometry textbooks. Conceptions of the "point of contact" of a tangent line were identified using the conceptions-knowing-concept model. The study sheds light on past and present norms for representing foundational geometry concepts in textbooks.

Justin Dimmel
University of Michigan, Ann Arbor, Michigan

What Is Algebra? Preliminary Findings from a Textbook Analysis Study

To follow up on our 2011 NCTM Research Presession presentation, we provide new findings regarding the algebra strand of commercially available secondary mathematics textbooks that have been developed by the Center for Mathematics Education, CPMP, Glencoe, IMP, and UCSMP. Perspectives from a teacher collaborator will be shared.

Mary Ann Huntley
Cornell University, Ithaca, New York

Jennifer Mayer
Christiana High School, Newark, Delaware

Curricular Treatment of Area of Parallelograms and Triangles

Studies show students' difficulties with area of non-rectangular shapes. This study describes the curricular treatment of area of parallelograms and triangles as an opportunity to learn. I examined how key concepts indicated in the literature were addressed in the curriculum materials.

Funda Gonulates
Michigan State University, East Lansing, Michigan

Presider: Jan Yow
University of South Carolina, Columbia, South Carolina

Franklin Hall 4, Capacity: 40

32
Interactive Paper Session

Improved Mathematical Teaching Learning Using Complex Performance Assessment Tasks

This paper studied the potential of using complex performance tasks to improve teaching practices and students' mathematics performance within and across years. This twelve-year longitudinal analysis across 35 districts shows that use of the MARS tasks improves teachers' pedagogy and students' mathematical learning on performance tasks and statewide assessments.

Pamela Paek
Consultant, Dover, Delaware

David Foster
Silicon Valley Mathematics Initiative, Morgan Hill, California

The Validation Process of Proportional Reasoning Attributes

The speakers will discuss the process of verifying whether the required psychometric properties, commonly known as attributes, were indeed being used by students in solving proportional reasoning problems. It is part of a larger research project on the cognitive diagnosis modeling in the mathematics subject area of proportional reasoning.

Hartono Tjoe
Rutgers, State University of New Jersey, New Brunswick, New Jersey

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

Kristen Lew
Rutgers, State University of New Jersey, New Brunswick, New Jersey

Teachers' Assessment Practice in Diverse Classrooms

In this session, we will describe results of a study that examined eight teachers' assessment practices and teachers' use of curriculum embedded assessment materials in classroom environments with a diverse population of students. We will invite participants to a discussion about the implications of our results.

Anne Marshall
City University of New York—Lehman College, New York, New York

Gabriela Groza
University of Illinois—Chicago, Chicago, Illinois

Presider: Sarah A. Roberts
Iowa State University, Ames, Iowa

Franklin Hall 13, Capacity: 40

33
Interactive Paper Session

Mathematics Engagement in Multiple Spaces: The Role of Academic Communities

This paper draws from a longitudinal, multi-sited study of African American high achievers in mathematics. I describe how academic communities operate to facilitate mathematics engagement and socialization for high school students and mathematicians in multiple sites—within schools, outside of schools, and within "in-between" spaces.

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

Using Photo-Elicitation Interviews to Study Mathematics Teacher Identity

This study explores the use of Photo-Elicitation Interviews (PEI), a research method in which participants introduce their own photographs into the interview, with six 9th-grade mathematics teachers from urban high schools in an exploration of their mathematics teacher identity. We found the PEI promotes professional learning and teacher reflection.

Theodore Chao
University of Texas at Austin, Austin, Texas

Narrativized Identity in Mathematics: Understanding the World of Mathematics from Students' Perspectives

This paper is part of a larger qualitative project aimed at understanding students' narrativized identities in elementary school. I argue that attending to students' narrativized identity is critical for designing learning environment that will help students develop expanded mathematical visions.

Shiuli Mukhopadhyay
California State University, Northridge, California

Presider: Candace Barriteau Pharie
New York University, New York, New York

Franklin Hall 1, Capacity: 60

34
Interactive Paper Session

Supporting African American Students' Learning of Mathematics: A Problem of Practice

In this paper, we report on our review of the mathematics education research literature specific to supporting African American students' participation in mathematics. We describe our findings, which are organized around two central questions: What does research suggest regarding forms of teaching practice that support African American students' participation in rigorous classroom activity? and What does research focused on African American students' experiences suggest for the organization of teaching practice? We then reflect on our findings and set forth a research agenda focused on specifying forms of practice that support African American students' substantial participation in mathematics classrooms that are aimed at rigorous learning goals.

Jonee Wilson
Vanderbilt University, Nashville, Tennessee

Kara Jackson
McGill University, Montreal, Canada

Tiger-Up! Affecting Low-Achieving, Urban Students' Beliefs to Support Persistence

This paper reports findings from a case study of an urban middle school mathematics teacher making pedagogical moves that influenced low-achieving students' beliefs about their intelligence and motivated them to engage in challenging tasks. Analysis reveals specific ways the teacher provided opportunities for the students the feel smart, and draws connections to evidence of increased student engagement.

Sarah Nix
University of California—Berkeley, Berkeley, California

(Re)orienting Thinking about Black Children in a Mathematics Methods Course

There is a need for high quality teachers of Black children. We report on projects conducted by preservice teachers in elementary mathematics methods courses that supported them in identifying Black children's strengths, confronting assumptions held about Black children and their communities, and (re)orienting thinking about Black children which then informed mathematics instruction.

Mary Q. Foote
City University of New York—Queens College, New York, New York

Tonya Gau Bartell
University of Delaware, Newark, Delaware

Corey Drake
Michigan State University, East Lansing, Michigan

Presider: Pat Baltzley
Baltimore County Public Schools, Towson, Maryland

Franklin Hall 6, Capacity: 40

35

Making an Effective Argument in Journal for Research in Mathematics Education (JRME): Supporting Claims with Evidence

Work Session

The presenters will share information on the *JRME review process and characteristics of manuscripts that tend to review well. They will focus on effective ways to support claims with evidence, using published articles as examples. At breakout tables, participants will consider the decisions involved with using evidence effectively.*

M. Kathleen Heid
Pennsylvania State University, University Park, Pennsylvania

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

Cynthia Langrall
Illinois State University, Normal, Illinois

Victoria Jacobs
San Diego State University, San Diego, California

Franklin Hall 10, Capacity: 40

Photo by Paul Loftland for CVB

1:00 p.m.-2:30 p.m.

36
Who's Listening? African American Females' Experiences in the Mathematics Classroom

Research Symposium

This session will explore two studies of African American females in mathematics. The studies address support, classroom interactions, collaboration, mentorship, and self-perceptions in mathematics. The presenters will discuss suggestions on how educators can promote achievement and success in mathematics for African American and other females.

Lanette Waddell
Vanderbilt University, Nashville, Tennessee

Viveka Borum
Wayne State University, Detroit, Michigan

Franklin Hall 7, Capacity: 108

1:00 p.m.-2:30 p.m.

37
Writing for NCTM Journals: Publishing Your Research in Teacher-Friendly Articles

Work Session

Learn how to adapt your research results to school-based journal articles. The Editorial Panels of NCTM's school-based journals present techniques for writing about research for practitioner audiences, followed by a question-and-answer period. Bring specific ideas or manuscripts for discussion in journal-specific, small-group discussion facilitated by Editorial Panel members.

Tyrette Carter
North Carolina Agricultural and Technical State University, Greensboro, North Carolina

Lori Knox
Mount Lebanon School District, Pittsburgh, Pennsylvania

Sarah Schuhl
Centennial High School, Coquitlam, British Columbia, Canada

Franklin Hall 12, Capacity: 40

3:00 p.m.-4:30 p.m.

38
Assessing Preservice Teachers' Enacted Mathematics Teaching Practice through Simulations

Work Session

As mathematics teacher education focuses on practices of teaching, a need to assess preservice teachers' enacted practice emerges. Performance assessment simulations assess practice while addressing challenges of assessing teaching. Participants will analyze and discuss a simulation of eliciting and interpreting students' thinking.

Timothy Boerst
University of MIchigan, Ann Arbor, Michigan

Laurie Sleep
University of MIchigan, Ann Arbor, New York

Meghan Shaughnessy
University of Michigan, Ann Arbor, Michigan

Deborah Ball
University of Michigan, Ann Arbor, Michigan

Franklin Hall 5, Capacity: 40

3:00 p.m.-4:30 p.m.

39
Assessment Standards for Mathematics: Where Are We Seventeen Years Later?

Research Symposium

This symposium revisits the NCTM 1995 Assessment Standards for School Mathematics, reexamines their potential, and presents several research studies that reflect their impact. The presentation of current research studies in assessment in mathematics is bookended by the perspectives of two of the original authors of the assessment standards.

Christine Suurtamm
University of Ottawa, Ontario, Canada

Martha Koch
University of Toronto, Ontario, Canada

David Webb
University of Colorado at Boulder, Boulder, USA

Discussant: Norman Webb
University of Wisconsin—Madison, Madison, Wisconsin

Franklin Hall 8, Capacity: 138

3:00 p.m.-4:30 p.m.

40
A Study of Teachers Engaged in Sustained Professional Development

Research Symposium

A cross-sectional study has shown the value for grades K–3 teachers of sustained professional development focused on children's mathematical thinking. Engage with constructs (knowledge, beliefs, noticing, and responsiveness) and with a trajectory that indicates that teachers develop expertise in some constructs before others.

Randolph Philipp
San Diego State University, San Diego, California

Victoria Jacobs
San Diego State University, San Diego, California

Lisa Lamb
San Diego State University, San Diego, California

Jessica Bishop
San Diego State University, San Diego, California

John Siegfried
San Diego State University and University of California, San Diego, California

Bonnie Schappelle
San Diego State University, San Diego, California

Discussant: James Hiebert
University of Delaware, Newark, Delaware

Franklin Hall 2, Capacity: 139

3:00 p.m.-4:30 p.m.

41
Developing Teachers' Mathematical Knowledge through a University–Grades K–12 Partnership

Research Symposium

A mathematics partnership gave mid-career middle school mathematics teachers opportunities to deepen their content knowledge. Interviews, observations, artifacts, and written assessments were used to describe teachers' development in language, justification, and lesson planning throughout their participation.

Lynda Ginsburg
Rutgers University, New Brunswick, New Jersey

Kathryn Rhoads
Rutgers University, New Brunswick, New Jersey

Iuliana Radu
Rutgers University, New Brunswick, New Jersey

Sunita Vatuk
Rutgers University, New Brunswick, New Jersey

Hanin Rashid
Rutgers University, New Brunswick, New Jersey

Discussant: Keith Weber
Rutgers University, New Brunswick, New Jersey

Franklin Hall 7, Capacity: 108

3:00 p.m.-4:30 p.m.

42
Interactive Diagnostic Assessments for Rational Number Reasoning: LPPSync

Work Session

LPPSync, a next-generation assessment system, uses wireless devices to provide real-time data on students' understanding of an empirically validated learning trajectory on equipartitioning. This hands-on work session includes reports on a teaching experiment in grades 2–4 and detailed information on major constructs and effects on learning.

Jere Confrey
North Caroiina State University, Raleigh, North Carolina

Alan Maloney
North Carolina State University, Raleigh, North Carolina

Kenny Huy Nguyen
Friday Institute for Educational Innovation, North Carolina State University, Raleigh, North Carolina

Andrew Corley
North Carolina State University, Raleigh, North Carolina

Nadia Monrose
North Carolina State University, Raleigh, North Carolina

Zuhal Yilmaz
North Carolina State University, Raleigh, North Carolina

Franklin Hall 10, Capacity: 40

43
Interactive Paper Session

Noticing Equity: Addressing Classroom Equity through a Video Club

Teachers are consequential actors in the promotion of equity with mathematics classrooms by ensuring engagement in mathematical practices and by managing students' differential rates of participation. Such deliberate action by teachers is predicated on teachers' ability to notice the equity of participation as it arises in classroom situations. This session explores how mathematics teachers noticed equitable participation in the context of a video club.

William Day
Two Rivers Public Charter School, Washington, District of Columbia

Mathematical Knowledge for Teaching and Equity: Designing New Opportunities for Developing Equitable Mathematics Teaching Practices

This study explores what constitutes equitable mathematics instruction and describes efforts to design a graduate course to enable mathematics teachers to design and enact equitable teaching practices. The goal of this study extends current work on equitable instruction and helps to further refine a theory for mathematical knowledge for equitable teaching.

Imani Goffney
Consultant, Houston, Texas

Single-Sex Mathematics Classrooms: A Case Study of Instructional Quality

This case study of a middle grades mathematics teacher and her all girls' and all boys' algebra class examines the instructional strategies, mathematics content, management techniques, and classroom discourse of the classes. Findings indicate that a classroom environment can be influenced by ephemeral utterances that communicate gender-based expectations and assumptions.

Stacy Che
Clemson University, South Carolina, South Carolina

Elaine Wiegert
University of South Carolina Upstate, Spartanburg, South Carolina

Presider: Christa Jackson
University of Kentucky, Lexington, Kentucky

Franklin Hall 1, Capacity: 60

44
Interactive Paper Session

Prekindergarten Early Algebra through Measuring Quantities

The paper reports preliminary results of the NSF DR K-12 exploratory project addressing a measurement based approach to preK students' development of quantitative and algebraic reasoning. The purpose of the study is to adapt and refocus the algebraic design and pre-numeric stage of the Elkonin-Davydov elementary curriculum from Russia.

Zaur Berkaliev
California State University, Chico, California

Barbara Dougherty
University of Missouri—Columbia, Columbia, Missouri

Evaluation of a Number Sense Intervention for High-Risk Kindergartners

A disproportionate number of children from low-income families come to kindergarten without number competencies necessary for success in formal mathematics. This study evaluates the effectiveness of a small group number sense intervention in promoting growth in number sense for low income kindergarten children.

Nancy I. Dyson
University of Delaware, Newark, Delaware

Nancy Jordan
University of Delaware, Newark, Delaware

Joe Glutting
University of Delaware, Newark, Delaware

Fraction and Fair-Sharing Concepts: Preschool and Kindergarten Children's Strategies

This paper presents the results of an oral assessment study of 36 pre-school and Kindergarten children's attempts to solve fair sharing tasks involving fractional quantities. Some of the youngest children demonstrated a qualitative understanding of fractional unit but, with increasing grade level; we documented an emerging quantitative understanding.

Julie Cwikla
University of Southern Mississippi Gulf Coast, Long Beach, Mississippi

Jennifer Vonk

University of Southern Mississippi Gulf Coast, Long Beach, Mississippi

Presider: Anita Wager
University of Wisconsin—Madison, Madison, Washington

Franklin Hall 6, Capacity: 40

45
Interactive Paper Session

Developing Students' Understandings of Average Rate of Change

We will present results that show the positive impact of model exploration tasks in a computer simulation environment on students' abilities to interpret dynamic events. We will illustrate improvements in students' understandings of the graphical representations of changing phenomena, as measured by a proposed Rate of Change Concept Inventory.

Helen Doerr
Syracuse University, New York, New York

AnnMarie O'Neil
Marcellus Central School, New York, New York

Understanding Fractions as Magnitudes: A Study Using Interactive Technology

The Common Core State Standards calls for the use of number lines in understanding fractions. We created an Android app to teach naming and locating fractions on number lines which highlights the length aspect of this representation. Results from an initial study provide insights into the challenges of teaching about fractions as magnitudes.

Belinda Thompson
University of California—Los Angeles, Los Angeles, California

Xueying Ji
Michigan State University, East Lansing, Michigan

Multimodal Mathematical Investigations with Fourth Graders

We are investigating the impact of integrating dynamic geometry with haptic devices including the iPad and the Omni Sensible, which allow young children to not only see and manipulate geometric figures on a screen but also feel and touch such objects.

Ryan Robidoux
University of Massachusetts Dartmouth, Dartmouth, Massachusetts

Stephen Hegedus
University of Massachusetts Dartmouth, Dartmouth, Massachusetts

Beste Güçler
University of Massachusetts Dartmouth, Dartmouth, Massachusetts

Presider: Karen Hollebrands
North Carolina State University, Raleigh, North Carolina

Franklin Hall 13, Capacity: 40

46
Interactive Paper Session

A Geometry Teacher's Use of a Metaphor to Make Students Remember Theorems

The paper shows a case of a geometry teacher during a problem-based lesson. The analysis uses Duval's apprehension of diagrams to investigate how a metaphor provided heuristics to apply a set of theorems. The metaphor helped the teacher to remind students about the operations for applying the theorems, but obscured their justification.

Gloriana Gonzalez
University of Illinois at Urbana-Champaign, Champaign, Illinois

Influences on Mathematical Process Use by a Novice Teacher

Our study focused on the use of mathematical processes and products (justifying and justification, defining and definition, representing and representation, generalizing and generalization) in one beginning teacher's personal mathematics and in her classroom mathematics. We identified five themes that permeated her teaching and influenced her classroom use of mathematical processes.

M. Kathleen Heid
Pennsylvania State University, University Park, Pennsylvania

Maureen Grady
Pennsylvania State University, University Park, Pennsylvania

Shiv Karunakaran
Pennsylvania State University, University Park, Pennsylvania

Characterizing Mathematical Knowledge for Teaching Exponents

This case study of a secondary teacher's content knowledge for teaching exponents raises questions about secondary Mathematical Knowledge for Teaching and how it might best be characterized.

Heather Howell
New York University, New York, New York

Presider: Shelton Ford
Fayetteville State University, Fayetteville, North Carolina

Franklin Hall 4, Capacity: 40

3:00 p.m.-4:30 p.m.

47
Teaching and Learning: Stories of Equity in High School Mathematics

Research Symposium

This symposium will discuss identity, positioning, and equity in mathematics education. With surveys, videos, interviews, focus groups, and artifacts that shed new light on who high school students are as learners, the speaker will privilege students' voices in researching teaching and learning mathematics with historically marginalized student populations.

Teresa Dunleavy
University of Washington, Seattle, Washington

Maria Zavala
University of Washington, Seattle, Washington

Rodrigo Gutiérrez
University of Arizona, Tucson, Arizona

Nicole Russell
University of Denver, Colorado, Colorado

Discussant: Filiberto Barajas-López
University of Washington, Seattle, Washington

Franklin Hall 11, Capacity: 113

3:00 p.m.-4:30 p.m.

48
Video Club Professional Development for Secondary School Mathematics: Teachers Learning from Teachers

Work Session

This study investigates the effectiveness of a video club for secondary school mathematics teachers in high-minority, low SES urban school districts. The program (1) increases teachers' reflection on practice by observing video of teachers, (2) increases teachers' collaboration and retention through a professional learning community (PLC), and (3) provides sustainability of a PLC with a Facebook discussion board.

Janna Canzone
Irvine Math Project, Center for Educational Partnerships, University of California Irivine, California

Franklin Hall 12, Capacity: 40

49

Working toward Innovative Research: NSF's Role, the Researcher's Role

Research Symposium

The speakers will share information about funding opportunities, successful proposal writing, and the NSF's efforts encourage innovation in mathematics education. They will raise issues for discussion about the roles and responsibilities of researchers in working toward innovative research and practice.

Patricia Wilson
University of Georgia, Athens, Georgia

Robert Reys
University of Missouri—Columbia, Columbia, Missouri

Franklin Hall 3, Capacity: 108

Photo by Andrea Burolla Photography for PCVB

4:45 p.m.-6:00 p.m.

50
A Conceptual Framework: Investigating Sociocultural Contexts and Mathematics Learning

Poster Session

How do sociocultural contexts influence mathematics learning and achievement when analyzed through lenses of classroom culture, discourses, and relationships? Participants will reflect on the conceptual framework and elaborative documents to give feedback for improvement.

Melva Grant
Old Dominion University, Norfolk, Virginia

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

51
A Framework to Analyze Mathematical Processes in Elementary School Assessments

Poster Session

The speaker will present a framework to analyze the extent to which the assessments accompanying published elementary school mathematics curricula engage students in important mathematical processes. They will share sample items and codes, along with findings from analyzing grades 3–5 items.

Patricia Hunsader
University of South Florida, Sarasota-Manatee, Florida

Barbara Zorin
Consultant, University of South Florida, Tampa, Florida

Denisse Thompson
University of South Florida, Tampa, Florida

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

52
An Analysis of Inverse Relations in U.S. and Chinese Textbooks

Poster Session

A study examined presentations of inverse relations in two U.S. elementary textbook series and one main Chinese series. In general, the U.S. textbooks resembled each other but differed considerably from the Chinese series in types of tasks and representation uses across grades.

Meixia Ding
University of Nebraska—Lincoln, Lincoln, Nebraska

Jinfa Cai
University of Delaware, Newark, Delaware

Kelley Marshall
University of Nebraska—Lincoln, Lincoln, Nebraska

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

53
Analyses of Teaching Equation Solving in Standards-Based and Traditional Curricula

Poster Session

This study compared the approaches to equation solving embedded in two types of middle school curricula—Standards-based (Connected Mathematics Program [CMP]) and traditional. Overall, the CMP curriculum takes a functional approach to teach equation solving, whereas non-CMP curricula take a structural approach.

Bikai Nie
University of Delaware, Newark, Delaware

Jinfa Cai
University of Delaware, Newark, Delaware

John Moyer
Marquette University, Milwaukee, Wisconsin

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

54

An Analysis of Preservice Secondary School Mathematics Teachers' Planned Questions

Poster Session

This presentation describes a case study that analyzed one preservice secondary school mathematics teacher's planned questions for two lessons, to determine how they supported her lesson goals and influenced cognitive demand.

Allyson Hallman
University of Georgia, Athens, Georgia

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

55

Characterizing Prospective Grades K–8 Teachers' Inductive Reasoning in Problem-Solving Contexts

Poster Session

This session will present results of a study of preservice teachers' inductive reasoning in problem solving. The study analyzed written solutions and identified and characterized multiple dimensions of data gathering, pattern finding, and hypothesis generation. The speaker will discuss iImplications for teacher education.

Marta Magiera
Marquette University, Milwaukee, Wisconsin

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

56

Comparing High School Mathematics Practices between Minority and Nonminority Students

Poster Session

To identify what practices teachers use to foster minority students' success, a study on analyzed high school mathematics classroom experiences and their association with performance in college calculus. The speakers will compare minority and nonminority students' occurrences of practices related to variables found to predict performance.

Charity Watson
Clemson University, South Carolina, South Carolina

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

57
Developing Integrated Reasoning about Statistical Variation

Poster Session

A study investigated factors that secondary school teachers claimed deepened their understanding of statistical variation. Framed by transformative theory and perspectives for reasoning about variation, this session will highlight and compare factors for developing reasoning about variation from design, datacentric, and modeling perspectives.

Susan Peters
University of Louisville, Louisville, Kentucky

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

58
Developing Mathematics and Science Literacy through Robotics Systems

Poster Session

Creating a world-class work force for the twenty-first century depends on graduating every student from high school ready for college. This paper presents a short, innovative summer course designed for 37 grade 11 students at an inner-city school, evaluated through students' gains in mathematics and science literacy.

M. Sencer Corlu
Texas A&M University, College Station, Texas

Niyazi Erdogan
Texas A&M University, College Station, Texas

Robert Capraro
Texas A&M University, College Station, Texas

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

59
Effects of and Research in Grades K–8 Mathematics Coaching

Poster Session

This session will present results from a study on the effects of grades K–8 instructional coaching on teaching practice and students' achievement. It focuses on measures, methods, and outcomes of the relationships among mathematics content knowledge, teachers' practice, and alternative methods of analyzing students' achievement data.

John Sutton
RMC Research, Denver, Colorado

David Yopp
Montana State University, Bozeman, Montana

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

60
Examining the Links between Informal and Formal Inferential Reasoning

Poster Session

Introductory statistics students' difficulties with formal inferential reasoning, which requires interpreting confidence intervals and hypothesis tests, have been well documented. Students' informal inferential reasoning is thought to be a precursor to the formal reasoning. This study examines the relationship between the two.

Bridgette Jacob
Onondaga Community College, Syracuse, New York
Helen Doerr
Syracuse University, New York, New York

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

61
From their Eyes: Examining Field Experience and Teachers' Learning

Poster Session

Research advocates designing programs that prepare prospective teachers to learn from teaching, but little work has investigated how the skills develop. This study investigates preservice teachers' experience of fieldwork, curriculum that develops reform mathematics teaching practices, and reflective skills learned from teaching.

Cathery Yeh
University of California, Irvine, California

Rossella Santagata
University of California, Irvine, California

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

62
Graduate Coursework's Influence on Teaching: Changing Teachers' Questioning

Poster Session

The speakers examined graduate study as professional development, for perspective on how it might influence a practicing teacher. They will report on changes that occurred in teachers' questioning during participation in a master's degree program designed to increase teachers' mathematics content and pedagogical knowledge.

Cynthia Langrall
Illinois State University, Normal, Illinois

Elif Safak
Illinois State University, Normal, Illinois

Joshua Hertel
Illinois State University, Normal, Illinois

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

63

Improving the Development of MKT in Elementary School Teacher Education

Poster Session

This presentation will report on a study that examined preservice teachers' development of mathematical knowledge for teaching (MKT) over their final year in a university-based program. The study used a new protocol for coding preservice teachers' mathematics lessons. The speakers will offer suggestions for improvements in teacher education.

Tracy Johnson
University of Cambridge, Cambridge, United Kingdom

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

64

Instructional Practices That Motivate Students with Learning Disabilities

Poster Session

This study examined ability beliefs, value, and anxiety related to fractions for students with learning disabilities in mathematics. Surveys, interviews, and video data suggested that explicit instruction can blend effectively with a focused understanding, strategies, and students' thinking in order to improve these students' motivation.

Kristie Newton
Temple University, Philadelphia, Pennsylvania

Amanda Jansen
University of Delaware, Newark, Delaware

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

65
Making Sense of Double Number Lines in Professional Development

Poster Session

A study used the knowledge-in-pieces framework to consider how middle grades teachers use their existing understanding of proportional reasoning to make sense of double-number-line representations. Five important knowledge pieces emerged, two of which proved productive for understanding the representation.

Chandra Orrill
University of Massachusetts—Dartmouth, Dartmouth, Massachusetts

Rachael Eriksen Brown
Knowles Science Teaching Foundation, Moorestown, New Jersey

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

66
Measurement Club: Filling a Developmental Gap

Poster Session

In a study of students' learning trajectories in measurement, the speakers began to suspect that their students had missed an early, potentially important, phase of development. They instituted an after-school "measurement club" to check the conjecture. This presentation reports their first report activities and findings.

Douglas Clements
University at Buffalo, State University of New York, Buffalo, New York

Julie Sarama
University at Buffalo, State University of New York, Buffalo, New York

Douglas Van Dine
University at Buffalo, State University of New York, Buffalo, New York

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

67
Middle School Preservice Teachers' Mathematical Problem Solving and Posing

Poster Session

A study exploring middle school preservice teachers' mathematical problem solving and posing used a conversion mixed-research design that involved integrating qualitative and quantitative approaches. Results showed preservice teachers performed better in problem solving than in problem posing. Implications will be are discussed.

Roslinda Rosli
Texas A&M University, College Station, Texas

Dianne Goldsby
Texas A&M University, College Station, Texas

Mary Margaret Capraro
Texas A&M University, College Station, Texas

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

68
New Mathematics Educators' Preparation for Academic Careers: An Exploratory Study

Poster Session

A study examined 40 forty new mathematics teacher educators' beliefs about their preparation for a career in academis. Results indicate that participants felt well prepared in research but less so in teaching, mentoring, and service.

Mary Beisiegel
Harvard Graduate School of Education, Cambridge, Massachusetts

Jennifer Eli
University of Arizona, Tucson, Arizona

Andrea McCloskey
Pennsylvania State University, University Park , Pennsylvania

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

69
Opportunities for Teacher Learning in Middle School Curriculum Materials

Poster Session

investigating the content and the voice of teachers' guides, the speaker will describe teachers' opportunities to learn mathematics subject matter, pedagogical content knowledge, and mathematics curricular knowledge related to introduction to variable and geometric transformations in middle school curriculum materials.

Lorraine Males
Michigan State University, East Lansing, Michigan

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

70
Preparing Teachers for Common Core State Standards in Mathematics (CCSSM)

Poster Session

Findings of the Teacher Education and Development Study in Mathematics from 16 countries reveal that U.S. mathematics teacher preparation in the U.S. is not sufficient. The speaker will examine a U.S. sample in this study to see how it compare to those in countries whose students perform well on international mathematics assessments.

Francine Johnson
Johns Hopkins University, Baltimore, Maryland

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

71
Preservice Teacher Development in Learning to Learn from Mathematics Teaching

Poster Session

Using digital video in preservice teacher learning is steadily increasing, but preservice teachers do not gain new insights about practice by video watching alone. This study investigated preservice teachers' development of dispositions, knowledge, and skills for analyzing mathematics teaching in a video-based curriculum.

Janette Jovel
University of California Irvine, Irvine, California

Cathery Yeh
University of California, Irvine, California

Rossella Santagata
University of California, Irvine, California

Salon I/J/K/L 11, Capacity: 600

4:45 p.m.-6:00 p.m.

72
Pre-service Teachers' Perspectives on Teaching in Second Life

Poster Session

This paper explores the experiences of preservice teachers in simulated classrooms in Second Life, a virtual reality platform. Participants revealed both negative and positive experiences with the training tool. The paper discusses the students' responses and presents thoughtful suggestions for future iterations and subsequent applications.

Tingting Ma
Texas A&M University, College Station, Texas

Glenn Phillips
Texas A&M University, College Station, Texas

Kathryn McKenzie
Texas A&M University, College Station, Texas

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

73
Professional Development's Trends of Impact in Middle School Mathematics Education

Poster Session

The presenters will describe an innovative professional development master degree program in middle school mathematics education and report on the data and results of trend analyses documenting the program's effect on participants' mathematics content knowledge, teaching practices, and their students' achievement and dispositions.

Helen Khoury
Northern Illinois University, DeKalb, Illinois

Mary Shafer
Northern Illinois University, DeKalb, Illinois

Balakrishna Hosmane
Northern Illinois University, DeKalb, Illinois

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

74
Quantitative Vocabulary Effects on Kindergarten Students' Vocabulary and Number Sense

Poster Session

Low-income children typically come to school with weak number sense and vocabulary understanding. The speaker will describe an experimental intervention study targeting specific quantitative vocabulary through shared storybook reading, which might increase children's ability to describe and manipulate number concepts.

Brenna Hassinger-Das
University of Delaware, Newark, Delaware

Nancy Jordan
University of Delaware, Newark, Delaware

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

75

Reasoning Based Solely on Concept Images: Middle-School Students and Parallelograms

Poster Session

Students often have difficulty identifying and discriminating between shapes when reasoning with a concept image but without a concept definition. This session gives evidence that this reasoning is common in middle school, is inconsistently applied, and might interfere with general geometry knowledge.

Jessica Masters
Measured Progress- Nimble Innovation Lab, Nimble, California

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

76

Teacher's Talk: Assessing the Depth of Interactions in a Teacher-Initiated PLC

Poster Session

This paper explores a teacher-initiated professional learning community's (PLC) depth of interactions centered on improving instruction in a reform-based curriculum. It identifies multiple routines of interaction that occurred during the PLC meetings and investigates possible factors that influenced the routines' depth.

Samuel Eskelson
University of Pittsburgh, Pennsylvania, Pennsylvania

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

77

Teaching Integers in Middle School: Reflective Teaching Cycles

Poster Session

This study illustrated how reflective teaching cycles influenced two teachers' selection and implementation of tasks to facilitate higher-order thinking. Discussion will focus on teachers' understanding of, and pedagogical strategies for, operations on integers. The speaker will explore implications for professional development.

Eileen Murray
State University of New York—College at New Paltz, New Paltz, New York

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

78
Teaching Mathematics for Social Justice: A Study of Teacher Discourse

Poster Session

This session analyses teachers' learning in a "study group" professional development program. The study group used action research to help participants learn to teach mathematics more equitably. Teachers developed broader understandings of equitable teaching and a common language that moved away from deficit understandings of children.

Indigo Esmonde
Ontario Institute for Studies in Education, University of Toronto, Canada

Lesley Dookie
Ontario Institute for Studies in Education, University of Toronto, Canada

Miwa Takeuchi
University of Toronto, Ontario, Canada

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

79
Trajectories of Three Students' Learning of Area Measurement, Grades 2–5

Poster Session

The speakers will share three students learning trajectories as they developed competencies in area measurement over four years. The study used a hypothetical learning trajectory for area as a diagnostic and analytical tool. The results demonstrate that learning trajectories are useful for designing formative assessments.

Amanda Miller
Illinois State University, Normal, Illinois

Cheryl Eames
Illinois State University, Normal, Illinois

Jeffrey E. Barrett
Illinois State University, Normal, Illinois

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

80

Using PISA to Focus on Algebraic Thinking: The Case of Apples and Recursion

Poster Session

The speakers argue that Programme for International Student Assessment (PISA) mathematics tasks could be resources for enhancing mathematics teaching and learning. They will report preliminary results from work that closely examined students' algebraic thinking in solving a PISA task and discuss their analysis.

Edward Silver
University of Michigan—Dearborn, Dearborn, Michigan

Rachel Snider
University of Michigan, Ann Arbor, Michigan

Heejoo Suh
Michigan State University, East Lansing, Michigan

Salon I/J/K/L, Capacity: 600

4:45 p.m.-6:00 p.m.

81

Virginia Middle School Math Assessments: Why Do Students Make Incorrect Choices?

Poster Session

Analysis generated explanations for why students selected incorrect answers on Virginia Standards of Learning mathematics assessments. These explanations, combined with answer-choice frequencies, revealed students primarily selected incorrectly due to a failure to analyze problem conditions, ineffective self-monitoring, or conceptual errors.

Virginia Lewis
Longwood University, Farmville, Virginia

Salon I/J/K/L, Capacity: 600

Wednesday, April 25th

8:30 a.m.-10:00 a.m.

82

Research Frameworks and Findings: Tools for Investigating and Improving Instructional Practice

Plenary Sessions

Research frameworks and findings provide insights into the nature of teaching and learning and can also serve as tools for supporting teaching learning and lead to improvements in practice. In this session, several frameworks will be discussed in terms of their potential to foster teacher learning and new research.

Margaret Smith
University of Pittsburgh, Pittsburgh, Pennsylvania

Salon G/H, Capacity: 1192

Photo by Andrea Burolla Photography for PCVB

10:30 a.m.-12:00 p.m.

83
Considering the Effect of Dynamic Mathematics Software on Internal Representations

Work Session

Participants will discuss ideas arising from a study connecting technological representations of mathematics with representations existing internally, in the student's mind. Discussion will focus on associated constructs, potential ways of examining such representations, and how practitioners can benefit from the results of such research.

Lauretta Garrett
Tuskegee University, Alabama, Georgia

Franklin Hall 12, Capacity: 40

10:30 a.m.-12:00 p.m.

84
Equity and Participation in School Mathematics

Research Symposium

Complementary views on students' participation will address equity in mathematics education. Conceptualizing equity as opportunities for participation in classroom mathematics attends specifically to factors of race, power, and identity. The presentation will focus on the racialized stuents' participation in mathematics, in different ways at different levels of scale.

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

Victoria Hand
University of Colorado-Boulder, Boulder , Colorado

Indigo Esmonde
Ontario institute for Studies in Edcuation, University of Toronto, Canada

Lesley Dookie
Ontario institute for Studies in Edcuation, University of Toronto, Canada

Scott Monroe
University of California Los Angeles, Los Angeles, California

Franklin Hall 7, Capacity: 108

85
Interactive Paper Session

Diagramming Tense and Temporality: A Social Semiotics, Multimodal Perspective

This paper discusses findings from a three-year qualitative case-study of 12 middle school mathematics teachers participating in a social semiotics lesson study group. The paper focuses on teacher use of gesture and diagrams in exploring, developing and implementing lessons that target complex word problems involving a range of verb tenses and temporal (durational) events.

Elizabeth de Freitas
Adelphi University, Garden City, New York

Adam Zaid
Intermediate School 77, New York City, New York

Betina Andrea Zolkower
City University of New York—Brooklyn College, School of Education, New York, New York

Multiple Representations in a Communication-Enhanced Environment

We report on a cluster randomized trial implementing dynamic algebra software in Algebra 2 classrooms across seven districts in Massachusetts. We discovered that non-honors students can learn more complex mathematical ideas in Algebra 2 particularly related to reasoning across multiple representations.

Sara Dalton
University of Massachusetts—Dartmouth, Kaput Center for Research and Innovation in STEM Education, Dartmouth, Massachusetts

Stephen Hegedus
University of Massachusetts—Dartmouth, Kaput Center for Research and Innovation in STEM Education, Dartmouth, Massachusetts

Kaitlyn Walsh
University of Massachusetts—Dartmouth, Kaput Center for Research and Innovation in STEM Education, Dartmouth, Massachusetts

Exploring Efficacy in Studies of Discourse-Intensive Math Instruction

When controlled studies of discourse-intensive mathematics instruction yield evidence of efficacy, a challenge arises. What aspects of the complex, improvised instruction point to mechanisms that may underlie results? We argue for a mixed-methods approach to transcript analysis of intervention and control conditions, combining content coding and frequency counts with qualitative episodic analysis.

Catherine O'Connor
Boston University, Boston, Massachusetts

Mary Elizabeth Matthews
Boston University, Boston, Massachusetts

Nancy Anderson
Boston University, Boston, Massachusetts

Presider: Diana Cheng
Towson University, Towson, Maryland

Franklin Hall 13, Capacity: 40

10:30 a.m.-12:00 p.m.

86
Interactive Paper Session

Constructing the Mean as a Mathematical Point of Balance

Results will be shared of a teaching experiment designed to examine how middle-grade students come to understand the arithmetic mean as a mathematical balance point.

Rick A. Hudson
University of Southern Indiana, Evansville,, Indiana

The Importance of Incorrect Examples: Helping Individual Students Learn Algebra

An intervention to address common misconceptions about solving equations was tested. The intervention exposed students to both correct and incorrect example problems and required them to explain the steps of the modeled problem. Results show that students receiving both correct and incorrect examples benefited the most, indicating the importance of using incorrect examples in classroom instruction.

Karin Lange
Temple University, Philadelphia, Pennsylvania

Julie Booth
Temple University, Philadelphia, Pennsylvania

Kenneth Koedinger
Carnegie Mellon University, Pittsburgh, Pennsylvania

Graphs of Linear Functions: Making Mathematical Principles Explicit for Fifth Graders

I present results of a tutorial study involving Grade 5 students graphing algebraic functions. The tutorial involved a communication game through which mathematical principles were made explicit. Tutorial students (n=20) showed pre to post test gains compared to a control (n=20). I report on patterns in students' performances during the tutorial.

Darrell Earnest
University of California—Berkeley, Berkeley, California

Presider: George Roy
University of South Florida St.Petersburg, St.Petersburg, Florida

Franklin Hall 6, Capacity: 40

87
Interactive Paper Session

Implementing the Interactive Geometry Approach in Classrooms

This session will report a study that examines the efficacy of an approach to high school geometry that utilizes Dynamic Geometry (DG) software to facilitate instruction. It compares effects of the DG approach with standard instruction that does not make use of computer investigation tools. Data analysis showed significant differences between the treatment and control groups.

Zhonghong Jiang
Texas State University, San Marcos, Texas

Characterizing Discourse in Three Technology-Intensive High School Geometry Classrooms

Teachers' implementation of a dynamic geometry program in high school geometry classes were analyzed to examine how the patterns, types, and modes of mathematical discourse differed when technology was used. The patterns, types, and modes of mathematical discourse differed when teachers were and were not using technology.

Charity Cayton
North Carolina State University, Raleigh, North Carolina

Karen Hollebrands
North Carolina State University, Raleigh, North Carolina

Eric Wiebe
North Carolina State University, Raleigh, North Carolina

Cognitive Demand and Technology Use in High School Teachers' Use of Mathematical Tasks

The effect of technology on student understanding in mathematics is a frequently debated topic. In this case study of three high school mathematics teachers, I examined the relationship between students' use of graphing calculators and CAS technology and cognitive demand at different stages of Stein and colleagues' Mathematical Tasks Framework.

Kyle Schultz
James Madison University, Harrisonburg, Virginia

Presider: Belinda Edwards
Kennesaw State University, Kennesaw , Georgia

Franklin Hall 4, Capacity: 40

88
Interactive Paper Session

Preservice School Teachers' Choice and Sequence of Examples for Comparison of Fractions

Choosing and using examples is an essential part of the mathematical work of teaching. This study examines how PSTs reason about this complex task of selecting and sequencing examples for different purposes to promote student learning. This research session focuses on selecting and sequencing examples for the case of comparison of fractions.

Dicky Ng
Utah State University, Logan, Utah

Examining the Effects of Fraction Instruction on Preservice Elementary School Teachers' Knowledge and Attitudes: A Mixed Analysis

The purpose of this study was to examine the effect of an instructional unit using concrete models on preservice teachers' content knowledge, pedagogical content knowledge, and attitudes towards teaching and learning fractions. A mixed analysis was utilized that involved integrating qualitative and quantitative approaches. Results showed preservice teachers performed better on the post assessment measure and attitudes towards fractions have improved. Implications of the investigation are discussed.

Dianne Goldsby
Texas A&M University, College Station, Texas

Roslinda Rosli
Texas A&M University, College Station, Texas

Mary Margaret Capraro
Texas A&M University, College Station, Texas

Preservice Secondary School Teachers' Pedagogical Content Knowledge during Their Final Year of Preparation

Understanding the pedagogical content knowledge (PCK) of pre-service teachers is essential to informing and improving teacher preparation programs. The main objective of this session is to present the results of a study which documented, tracked, and characterized pre-service teachers' PCK as they completed their senior-year mathematics methods courses and student teaching.

Wendy O'Hanlon
Illinois Central College, East Peoria, Illinois

Presider: Heather Howell
New York University, New York, New York

Franklin Hall 9, Capacity: 40

89
Interactive Paper Session

Investigating the Effect of a Tier-2 Intervention in Kindergarten Classrooms

This presentation describes a recent efficacy trial involving ROOTS, a Tier-2 intervention that focuses on building early knowledge of whole number concepts and skills for kindergarten students at risk for math difficulties. We share results of the study and discuss implications for using a multi-tiered approach to early mathematics instruction.

Christian Doabler
University of Oregon, Center on Teaching and Learning, Eugene, Oregon

Benjamin Clarke
University of Oregon, Center on Teaching and Learning, Eugene, Oregon

Scott Baker
University of Oregon, Center on Teaching and Learning, Eugene, Oregon

Screening Kindergarten Math Skills and Developing Interventions with the Number-Sense Brief

Participants will be introduced to the Number Sense Brief (NSB), a reliable research-based kindergarten assessment tool aligned with the Common Core State Standards for kindergarten mathematics. The NSB has shown to be predictive of mathematics achievement through the third grade and identifies children needing support in foundational number competencies

Nancy Jordan
University of Delaware, Newark, Delaware

Nancy Dyson
University of Delaware, Newark, Delaware

Casey Irwin
University of Delaware, Newark, Delaware

Teaching a Mathematics Methods Course to Special Education Teachers

The purpose of the presentation is to examine the effectiveness of a course designed to teach teachers the foundational strategies and concepts for teaching mathematics to students with special needs. Results and educational implications will be discussed within the context of increasing teachers' knowledge base of validated teaching strategies in mathematics and improving the research-to-practice gap through changes in teacher education.

Karen Karp
University of Louisville, Louisville, Kentucky

Amy Lingo
University of Louisville, Louisville, Kentucky

Presider: Diane Bryant
University of Texas at Austin, Austin, Texas

Franklin Hall 1, Capacity: 60

10:30 a.m.-12:00 p.m.

90
Investigations into Common Core State Standards for Mathematics (CCSSM)

Research Symposium

Even though most states have not begun officially implementing the CCSSM, the standards' potential widespread impact on U.S. mathematics education has already prompted substantial research activity. This symposium will present findings from several investigations into various aspects of CCSSM.

Jill Newton
Purdue University, West Lafayette, Indiana

Shannon Dingman
University of Arkansas, Fayetteville, Arkansas

Dawn Teuscher
Brigham Young University, Provo, Utah

Lisa Kasmer
Grand Valley State University, Allendale, Michigan, Michigan

Barbara Reys
University of Missouri—Columbia, Columbia, Missouri

Travis Olson
University of Nevada Las Vegas, Las Vegas, Nevada

Jeff Shih
University of Nevada Las Vegas, Las Vegas, Nevada

Kristen Bieda
Michigan State University, East Lansing, Michigan

Franklin Hall 2, Capacity: 139

10:30 a.m.-12:00 p.m.

91
Learning About High-Quality Mathematics Teaching: What and How?

Research Symposium

This session synthesizes prior work from four different research projects that studied the practice of teachers to identify features of high-quality mathematics instruction. We present convergent findings across the projects that compose an image of high-quality mathematics instruction that transcends context and method.

Jennifer Lewis
Wayne State University, Detroit, Michigan

Deborah Ball
University of Michigan, Ann Arbor, Michigan

Douglas Corey
Brigham Young University, Provo, Utah

Jack Dieckmann
Stanford University, Palo Alto, California

Discussant: Kristin Umland
University of New Mexico, Albuquerque, New Mexico

Franklin Hall 11, Capacity: 113

10:30 a.m.-12:00 p.m.

92
Measuring Early Algebra Impact: Quantitative Studies of Children's Algebra Learning

Research Symposium

This research symposium will compare three quantitative studies of the impact of early algebra interventions on children's algebra learning within elementary grades and beyond. The studies are based on long-term early algebra programs that use contrasting approaches across diverse student populations. Results indicate a significant impact on children's algebra understanding.

Maria Blanton
TERC, Cambridge, Massachusetts

Eric Knuth
University of Wisconsin—Madison, Madison, Wisconsin

Hannah Slovin
Curriculum Research and Development Group, University of Hawaii, Honolulu, Hawaii

Bárbara Brizuela
Tufts University, Medford, Massachusetts

David Carraher
TERC, Cambridge, Massachusetts

Analúcia Schliemann
Tufts University, Medford, Massachusetts

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

Franklin Hall 3, Capacity: 108

10:30 a.m.-12:00 p.m.

93
Repeated Addition Has Limits: New Foundations for Understanding Multiplication

Research Symposium

This session will explore evidence, from both professional mathematicians and educational researchers, indicating that repeated addition of equal groups of discrete objects cannot effectively support students' developing understanding of multiplication and multiplicative relationships beyond the early elementary grades.

Jack Smith
Michigan State University, East Lansing, Michigan

Jere Confrey
North Caroiina State University, Raleigh, North Carolina

Barbara Dougherty
University of Missouri—Columbia, Columbia, Missouri

Keith Devlin
Stanford University, Palo Alto, California

Erik Tillema
Indiana University at Indianapolis, Indianapolis, Indiana

Franklin Hall 8, Capacity: 138

10:30 a.m.-12:00 p.m.

94
Using Students' Work as a Reflection on Instruction

Work Session

Participants will consider what aspects of instruction are captured in classroom sets of students' written work, with respect to the mathematical content and normative mathematical practices, for use in research and professional development.

Melissa Boston
Duquesne University, Pittsburgh, Pennsylvania

Michael Steele
Michigan State University, East Lansing, Michigan

Franklin Hall 5, Capacity: 40

95
Writing for NCTM Practitioner Journals: "Linking Research and Practice" Awards

Work Session

In 2011, the NCTM Research Committee awarded inaugural Linking Research and Practice Outstanding Publication Awards to articles in the NCTM school journals. Award-winning authors will discuss their articles, build on their comments in the March 2012*Journal for Research in Mathematics Education's Research Commentary*, offer suggestions for writing, and answer the audience's questions.

Michelle Cirillo
University of Delaware, Newark, Delaware

Corey Drake
Michigan State University, East Lansing, Michigan

Sherryl Hauser
Sage Park Middle School, Windsor, Connecticut

Catherine Little
University of Connecticut, Storrs, Connecticut

Martina Kenyon
Ayer Public School District, Massachusetts, Massachusetts

James Tarr
University of Missouri—Columbia, Columbia, Missouri

Franklin Hall 10, Capacity: 40

Photo by Andrea Burolla Photography for PCVB

1:00 p.m.-2:30 p.m.

96
Children's Informal Conceptions of Integers

Work Session

This interactive session will draw on video of children to share research findings from 80 hour-long interviews with grades 2 and 4 students about their ways of reasoning about integers. Audience members will react to the findings and will help identify implications for teaching and research.

Lisa Lamb
San Diego State University, San Diego, California

Jessica Pierson
San Diego State University, San Diego, California

Randolph Philipp
San Diego State University, San Diego, California

Bonnie Schappelle
San Diego State University, San Diego, California

Ian Whitacre
San Diego State University, San Diego, California

Melinda Lewis
San Diego State University, San Diego, California

Franklin Hall 10, Capacity: 40

1:00 p.m.-2:30 p.m.

97
Common Core State Standards Math (CCSSM) Practice across Classes: Constructing Arguments, Critiquing Reasoning

Research Symposium

The speakers wiil demonstrate a CCSSM practice—constructing arguments and critiquing others' reasoning across different classroom settings. Five studies will offer insights on how to enhance classroom culture through this practice and address barriers teachers may encounter during its enactment.

Kelly Edenfield
Kennesaw State University, Kennesaw, Georgia, Georgia

Rick A. Hudson
University of Southern Indiana, Evansville, Indiana

Jean Sangmin Lee
University of Indianapolis, Indianapolis, Indiana

Brian Lindaman
Montana State University, Bozeman, Montana

Stephanie Whitney
Illinois Institute of Technology, Chicago, Illinois

Discussant: Barbara Reys
University of Missouri—Columbia, Columbia, Missouri

Franklin Hall 8, Capacity: 138

1:00 p.m.-2:30 p.m.

98
Developing Elementary School Math Teachers Pedagogical Content Knowledge in China

Work Session

Chinese elementary school mathematics teachers develop strong pedagogical content knowledge through weekly meetings and public lesson presentations. Lessons from grades 1–3 that exemplify the professional development environment will be analyzed. Video excerpts document the central role of public lessons in teachers' efforts to improve their teaching.

David Wilson
Buffalo State College, State University of New York, New York, New York

Shuzhu Gao
Capital Normal University, Beijing, Peoples' Republic of China, China

Franklin Hall 12, Capacity: 40

99
Geometric Thinking for English Language Learners (ELLs)

Research Symposium

A study of geometric thinking, focused on ELLs, examined effects on teachers, teaching, and students following teachers' participation in a 40-hour, year-long professional development program. Results are presented from teachers' questionnaire, assessment, and written responses; classroom observation; and students' problem solving.

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

Mark Driscoll
Education Development Center, Inc., Newton, Massachusetts

Johannah Nikula
Education Development Center, Inc., Newton, Massachusetts, Massachusetts

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

Rachel DiMatteo
Education Development Center, Inc., Newton, Massachusetts

Discussant: Kathryn B. Chval
University of Missouri—Columbia, Columbia, Missouri

Discussant: Harold Asturias
University of California, Berkeley, California

Discussant: Judith Zawojewski
Illinois Institute of Technology, Chicago, Illinois

Franklin Hall 7, Capacity: 108

100
Interactive Paper Session

Characterizing Pivotal Teaching Moments in Mathematics Instruction

Pivotal teaching moments (PTMs)—unexpected opportunities to use student thinking—are key to student-centered instruction. Secondary mathematics instruction was analyzed to identify and characterize PTMs and to examine relationships among PTMs, teachers' decisions and likely impacts on student learning. We discuss these relationships and implications for teacher professional learning.

Shari Stockero
Michigan Technological University, Houghton, Michigan

Laura Van Zoest
Western Michigan University, Kalamazoo, Michigan

Teachers' Support for Reasoning and Proof in Three Different Reform Texts

This presentation describes the results of an analysis of teacher support materials with regard to reasoning and proof (RP) in three different reform high school textbook units involving polynomials. Comparisons of support across texts as well as the nature of that support will be discussed.

Jon Davis
Western Michigan University, Kalamazoo, Michigan

Dustin Smith
Western Michigan University, Kalamazoo, Michigan

Abhik Roy
Western Michigan University, Kalamazoo, Michigan

Mathematics Teachers Exploring Reasoning and Sense Making through Action Research

This study investigated the experiences of teachers responding to recommendations for Reasoning and Sense Making through teacher action research. Narrative inquiry is used to illustrate the phenomenon studied. This presentation will share the diverse ways teachers made changes to their teaching, the challenges and opportunities encountered, and the lessons learned.

Lindsay Umbeck
Purdue University, West Lafayette, Indiana

Presider: Heather Lynn Johnson
University of Colorado Denver, Colorado

Franklin Hall 1, Capacity: 60

101
Interactive Paper Session

The Proof Is in the Practice? Graduate Teaching Assistants and Future Teachers

This dissertation examines how graduate teaching assistants, who are teaching future elementary teachers, explore proof in a college geometry math-content course. Evidenced by classroom observations and interviews, I study the in-class proving opportunities and instructors' views of teaching proof. Results inform ways to support college math instructors and prepare elementary teachers to more effectively teach about proof.

Kimberly Rogers
Michigan State Universtiy, East Lansing, Michigan

Two Student Teachers' Varying Support for Collective Argumentation

We present two very different cases of secondary student teachers' support for collective argumentation. Although the diagrams of arguments in the two classes look similarly complex, a closer analysis reveals differences in how the student teachers directly contributed to arguments and the quantity and kinds of questions they posed.

AnnaMarie Conner
University of Georgia, Athens, Georgia

Laura Singletary
University of Georgia, Athens, Georgia

Richard Francisco
University of Georgia, Athens, Georgia

Future Lower Secondary School Mathematics Teachers' Knowledge of Deductive Reasoning

In this session, we present findings from items measuring future lower secondary mathematics teachers' knowledge of deductive reasoning, based on responses to the released items from the Teacher Education and Development Study in Mathematics, a cross-national comparative study conducted in 2008.

Eun Mi Kim
Michigan State University, East Lansing, Michigan

Sharon L. Senk
Michigan State University, East Lansing, Michigan

Presider: Rachael Welder
City University of New York—Hunter College, New York, New York

Franklin Hall 6, Capacity: 40

102
Interactive Paper Session

Effects of Teacher-Child Play Interactions on Preschoolers' Mathematical Thinking

We studied teacher-child play interactions that affected preschoolers' mathematics learning ability. Consistently, number-based interactions as well as math communication showed significant positive impact on post-test scores, as also good-fit play interactions. We will discuss classroom implications with video examples.

Sudha Swaminathan
Eastern Connecticut State University, Willimantic, Connecticut

Jeffrey Trawick-Smith
Eastern Connecticut State University, Willimantic, Connecticut

Xing Liu
Eastern Connecticut State University, Willimantic, Connecticut

An Exploratory, Multilevel Model Analysis of Play in Middle School Mathematics

This exploratory study examined the impact of play on middle school students' attitudes toward mathematics. Participants (n=49) experienced play in mathematics class and took the Attitudes Toward Mathematics Inventory at five points in the year. Growth curve modeling was used to analyze results; student attitudes toward mathematics increased over time.

Sarah van Ingen
University of South Florida, Tampa, Florida

George MacDonald
University of South Florida, Tampa, Florida

Gladis Kersaint
University of South Florida, Tampa, Florida

Parents Mediating Preschoolers' Print and Mathematical Literacy during a Board Game

We investigated the similarities and differences between the ways that literacy and mathematics were mediated as thirty-two parents and their preschool children played an age appropriate board game. Overall, parents focused on the meaning of the print, with very little focus on concepts (e.g. word or letter sound). However, parents talked about and modelled mathematical concepts (e.g. number, operations, and money).

Ann Anderson
University of British Columbia, Vancouver, Canada

Ji Eun Kim
University of British Columbia, Vancouver, Canada

Jim Anderson
University of British Columbia, Vancouver, Canada

Presider: Karen Karp
University of Louisville, Louisville, Kentucky

Franklin Hall 4, Capacity: 40

103
Interactive Paper Session

Contrasting Cases in the Development of Statistical Knowledge for Teaching

The session will explore the cases of two prospective teachers in a course focused upon statistical knowledge for teaching. One participant showed substantial learning gains in comparison to the other, as assessed by standardized test items and researcher-designed questions probing the nature of learning difficulties observed during the course.

Randall Groth
Salisbury University, Maryland, Maryland

Studying the Collective Development of Mathematical Knowledge for Teaching

We discuss our efforts to study the emergence of norms and collective mathematical practices in online, professional development designed to enrich teachers' understandings of trigonometric functions. The presentation will provide detailed descriptions and examples of the collective mathematical practices and discuss how they can support teacher development.

Jason Silverman
Drexel University, Philadelphia, Pennsylvania

Chrystal Dean
Appalachian State University, Boone, North Carolina

Presider: Susan Peters
University of Louisville, Louisville, Kentucky

Franklin Hall 9, Capacity: 40

Photo by Edward Savaria, Jr. for PCVB

104
Interactive Paper Session

Teachers' Selections of Tasks for English Language Learners

The selection of tasks is an important part of a teacher's practice and student learning. In this session I will discuss a study examining high school teachers' choices of mathematical tasks for English language learners. I will discuss both the characteristics of the tasks selected and factors influencing these selections.

Zandra de Araujo
University of Georgia, Athens, Georgia

Tools to Support English Learners' Multiplying and Dividing Fractions

This study examines how a teacher of English Learners (ELs) and non-ELs modifies instruction between the courses during her teaching of multiplying and dividing fractions. The goal was to parse out the specific teacher moves that were meant to support ELs – to identify supports beyond "just good teaching."

Sarah A. Roberts
Iowa State University, Ames, Iowa

Reexamining Curricula as a Means to Improve Access for Latina and Latino Mathematics Learners

New approaches are needed to translate what we know about effective mathematics curriculum and instruction for bilingual Latina/o learners, into concrete actions in the classroom. This symposium reports on a study investigating curricular features that support teachers and students as they navigate the world of language-rich mathematics curriculum and pedagogy.

Craig Willey
Indiana University, Indianapolis, Indiana

Kathleen Pitvorec
University of Illinois at Chicago, Chicago, Illinois

Lena Khisty
University of Illinois at Chicago, Chicago, Illinois

Presider: Alejandra Salinas
Boston University, Boston, Massachusetts

Franklin Hall 13, Capacity: 40

1:00 p.m.-2:30 p.m.

105
Measuring Teaching Practice Related to Curriculum Use

Work Session

This presentation explores tools for, and approaches to, measuring teaching practice connected to curriculum material use. The goals are to generate interaction about teaching practice and the relationship between written and enacted curricula and to examine and critique tools developed to measure this relationship.

Janine Remillard
University of Pennsylvania, Philadelphia, New Mexico

Ok-Kyeong Kim
Western Michigan University, Kalamazoo, Michigan

Mary Beth Piecham
Education Development Center, Newton, Massachusetts

Michael Steele
Michigan State University, East Lansing, Michigan

Luke Reinke
University of Pennsylvania, Philadelphia, Pennsylvania

Zuzka Blasi
Education Development Center, Newton, Massachusetts

Louisa Anastasopoulos
Education Development Center, Newton, Massachusetts

Josephine Louie
Education Development Center, Newton, Massachusetts

Franklin Hall 5, Capacity: 40

1:00 p.m.-2:30 p.m.

106
Ready or Not? The Problem of Eighth-Grade Algebra

Research Symposium

Traditionally reserved for 9th grade, in recent years algebra has been taught in 8th grade, with mixed success and much controversy, as in the high-profile California 8th grade algebra mandate. This symposium centers on the question of whether most students can and should study algebra in eighth grade.

Frances Spielhagen
Mount Saint Mary College, Newburgh, New York

Julia Aguirre
University of Washington, Tacoma, Washington

Michael Bolling
Virginia Department of Education, Richmond, Virginia

Mary West
Lesley University, Cambridge, Massachusetts

Francis (Skip) Fennell
Past President, National Council of Teachers of Mathematics; McDaniel College, Westminster, Maryland

Robert Moses
The Algebra Project, Inc., Cambridge, Massachusetts

Discussant: Mary Margaret Capraro
Texas A&M University, College Station, Texas

Discussant: Robert Capraro
Texas A&M University, College Station, Texas

Franklin Hall 3, Capacity: 108

1:00 p.m.-2:30 p.m.

107
Students' Fraction Knowledge and the Common Core State Standards (CCSS)

Research Symposium

Students' fraction knowledge requires multiplicative reasoning at three levels of units, a skill that cannot be assumed for most fifth graders. This finding and others contrast with the CCSS Initiative's fraction standards. How could fractions standards be organized to respect and foster students' fraction knowledge?

Leslie Steffe
University of Georgia, Athens, Georgia

Anderson Norton
Virginia Polytechnic and State University, Blacksburg, Virginia

Amy Hackenberg
Indiana University, Bloomington, Indiana

Patrick Thompson
Arizona State University, Tempe, Arizona

Discussant: Susan Empson
University of Texas at Austin, Austin, Texas

Franklin Hall 11, Capacity: 113

108

What Matters about Students' Learning: Curriculum Implementation from Three Perspectives

Research Symposium

This symposium will explore different methods used to study curriculum implementation. The presenters will discuss these methods' implications across three major research projects that examine the connections between implementation and students' achievement.

Karen King
National Council of Teachers of Mathematics, Reston, Virginia

Monica Mitchell
MERAssociates, Vienna, Virginia

James Tarr
University of Missouri—Columbia, Columbia, Missouri

Jinfa Cai
University of Delaware, Newark, Delaware

John Moyer
Marquette University, Milwaukee, Wisconsin

Nina Wang
Widener University, Chester, Pennsylvania

Douglas Grouws
University of Missouri—Columbia, Columbia, Missouri

Jessica Tybursky
New York University, New York, New York

Discussant: Amy Roth McDuffie
Washington State University - Tri-Cities, Richland, Washington

Franklin Hall 2, Capacity: 139

1:00 p.m.-2:30 p.m.

109
Action Research and Students' Performance

Poster Session

Teachers identify a lack of motivation as the main barrier to students' learning, especially in urban areas where minority students show especially pronounced lack of engagement. The practice of action research through the inquiry cycle, however, engages students, who then improve in both performance and attitude.

Serigne Gningue
City University of New York—Lehman College, New York, New York

Roger Peach
City University of New York—Lehman College, New York, New York

Barbara Schroder
City University of New York—Lehman College, New York, New York

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

110
Algebra Misconceptions Held by Elementary School Students

Poster Session

Students often have misconceptions in algebra that their teachers fail to recognize or understand. Discovering misconceptions is crucial: any not remedied may persist throughout school. The speaker will describe a qualitative, multiple-case-study design used to reveal the algebra misconceptions of first-, second-, and fifth-grade students.

Nicole Ralston
University of Washington, Seattle, Washington

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

111
Algebraic Explanations: Linking Instruction to Students' Justifications

Poster Session

The speakers will present findings from a comparative study of two algebra classes relating instructional practices for eliciting reasoning to students' written and oral explanations. Data suggests differences in practices, supported by different curricula influence, the quality and accuracy of students' explanations and justification.

Jerilynn Lepak
Michigan State University, East Lansing, Michigan

Jamie Wernet
Michigan State University, East Lansing, Michigan

Sarah Nix
University of California, Berkeley, Berkeley, California

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

112
Cognitively Challenging Mathematical Tasks: Potential versus Implementation

Poster Session

This study investigated high school teachers' use of mathematical tasks prior to and after a two-year professional development program. The study determined whether they used cognitively challenging tasks, and if so, did they implement them in a way that maintained cognitive demands.

Elizabeth Hughes
University of Northern Iowa, Cedar Falls, Iowa

Mary Watson
University of Northern Iowa, Cedar Falls, Iowa

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

113
CRA Instruction in Fractions Retention for Middle School Students

Poster Session

A growing body of research supports sequenced concrete-representation-abstract (CRA) instruction to teach essential mathematics concepts, such as fractions. The speaker will share results from an experimental study investigating using the CRA instructional sequence to teach fractions to middle school students.

Elizabeth Hughes
Duquesne University, Pittsburgh, South Carolina

Paul Riccomini
Pennsylvania State University, State College, Pennsylvania

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

114
Elementary School Students' Views of Mathematicians

Poster Session

This paper reports on a portion of an ongoing, multifaceted research project that investigates how parents, teachers, and popular media affect elementary school students' views of mathematics and, especially, mathematicians. The speaker will examine results from an online questionnaire and discuss implications for practice.

Jennifer Hall
University of Ottawa, Ontario, Canada

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

115

Error Patterns in Fraction Computation among Struggling Sixth-Grade Students

Poster Session

This study examined errors made by struggling learners solving fraction problems in a sixth grade classroom. Findings showed specific error patterns, both skill and conceptually based, in fraction computation. Frequencies of errors for addition and division were related to whether or not denominators were equal.

Catherine Willard
Temple University, Philadelphia, Pennsylvania

Kristie Newton
Temple University, Philadelphia, Pennsylvania

Chris Teufel
Temple University, Philadelphia, Pennsylvania

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

116

Examining NCTM's Practitioner Journals as Tools Linking Research and Practice

Poster Session

The speakers will argue that NCTM's practitioner journals could serve as important mediation tools in linking research and practice in mathematics education. They will report methods and findings of an exploratory study that examined how research appeared in these journals in a recent three-year period.

Edward Silver
University of Michigan—Dearborn, Dearborn, Michigan

Crystal Lunsford
University of Michigan, Ann Arbor, Michigan

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

117
Following Beginning Mathematics Teachers' Experiences through Discussion Boards

Poster Session

The speakers will present a research study about an online discussion board designed to support beginning high school mathematics teachers in a fellowship program. Attendees will learn about struggles the teachers faced and examine actual posts to explore ideas of scaffolding, types of responses, and the facilitator's role.

Rachael Eriksen Brown
Knowles Science Teaching Foundation, Moorestown, New Jersey

Ginger Rhodes
University of North Carolina at Wilmington, Wilmington, North Carolina

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

118
Math Journals as a Tool for Reasoning and Sense Making

Poster Session

With NCTM's recent high school focus on reasoning and sense making, math journals offer a tool to address both areas in the classroom. This study investigated how students responded to journal feedback offered by the teacher and fellow classmates as well as how journaling influenced classroom discourse.

Jan Yow
University of South Carolina, Columbia, South Carolina

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

119

Mathematics History in Video: In-Service Elementary School Teachers' Experience

Poster Session

A professional development course for in-service elementary school teachers integrated mathematics history using digital media. Online discussions and reflective essays showed that the experience offers teachers a useful context for delving into roots of mathematical ideas and critiquing their perceptions of mathematics and mathematics teaching.

Lingguo Bu
Southern Illinois University, Carbondale, Illinois

Frackson Mumba
Southern Illinois University, Carbondale, Illinois

Mary Wright
Southern Illinois University, Carbondale, Illinois

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

120

Open Questions Generate a Culture of Sense-Making Reasoning and Proving

Poster Session

The speaker will present findings from an experiment that engaged preservice teachers in tasks that expanded their understanding of the roles of proof and reasoning. An open question, the right amount of scaffolding, and giving students more than a month to address the question brought out numerous roles discussed in the literature.

David Yopp
Montana State University, Bozeman, Montana

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

121

Preservice Secondary School Teachers' Understanding of the Inverse Function Concept

Poster Session

This task-based, qualitative study reported the findings of ten preservice secondary school teachers' knowledge of inverse functions. Findings from data analysis using Even's framework showed that these teachers had strong procedural skills, profound misconceptions, and weak conceptual understanding of the concept.

Leonard Kamau
Syracuse University, New York, New York

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

122

Principal Press: A Potential Support for Increasing Teachers' Collaboration

Poster Session

Implementing ambitious curricula at scale is a daunting challenge. This study used a regression model to predict the effects principals can have on teachers' collaborations in instruction.

Adrian Larbi-Cherif
Vanderbilt University, Nashville, Tennessee

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

123

Principals', Coaches', and Teachers' Perceptions of Elementary School Mathematics Coaching

Poster Session

A study explored perceptions of elementary school mathematics coaching as professional development. Case studies will highlight perceived changes in teachers' practice as a result of coaching. The speaker will share similarities and differences in perspectives and the potential implications for building and sustaining a coaching program.

Shannon Larsen
Ontario Institute for Studies in Education, University of Toronto, Canada, Canada

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

124

Problem Posing: Genuine Inquiry in a Primary School Classroom

Poster Session

A collaborative inquiry examined the problem-posing practices of primary school students. The speaker will share the problem types that the students posed, what inspired the problem posing, and the classroom environment's role in the problem-posing experiences, with accompanying visuals.

Janice Novakowski
University of British Columbia, Vancouver, Canada

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

125

Promising Classroom Practices for Supporting Mathematical Justification

Poster Session

Though the mathematics education community values students' use of justification, teachers have often found it difficult to support. The speakers will discuss strategies associated with mathematically acceptable argumentation that emerged from a study of teachers participating in a research-and-development program on justification.

Megan Staples
University of Connecticut, Storrs, Connecticut

Jill Newton
Purdue University, West Lafayette, Indiana

Corryn Brown
Purdue University, West Lafayette, Indiana

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

126

Proof Structure Produced by Experienced Doctoral Students in Mathematics

Poster Session

Studying experienced provers is one strategy for addressing the design of proof instruction, to understand why students have trouble with proof. The speaker will give some initial results from a study that used Toulmin's argumentation model, to examine proof structures in real analysis produced by experienced mathematics doctoral students.

Shiv Karunakaran
Pennsylvania State University, University Park, Pennsylvania

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

127

Relationships among Students Participation, Task Summaries, and Algebra Learning

Poster Session

This study examined the relationship among the enacted curriculum in a middle school algebra class, students' learning as seen on pretests and posttests that measure among cognitive demand, forms of participation expected of students during mathematical tasks, and how the tasks were concluded.

Samuel Otten
Michigan State University, East Lansing, Michigan

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

128

Simplified Schema-Based Instruction (SSBI) for Word-Problem Solving

Poster Session

This study used SSBI to investigate ithe program's effects on word-problem solving in elementary school students. Results demonstrated that SSBI was effective and that students maintained learned skills after the intervention's end.

Houbin Fang
Gordon College, Barnesville, Georgia

Qi Zhou
University of Southern Mississippi, Hattiesburg, Mississippi

Sherry Herron
University of Southern Mississippi, Hattiesburg, Mississippi

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

129

Strengthening the Connection between Math Methods and Preservice Teachers' Practice

Poster Session

A year-long study followed six preservice secondary school math teachers through three math methods courses and into their student teaching, to understand and strengthen the connection between what the former teaches and what emerges in the latter.

Mollie Appelgate
University of California, Los Angeles, California

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

130

Students' Understanding of Quadratic Functions: A Multiple-Case Study

Poster Session

This study, using two 75-minute interviews with each of the four participants as the primary data source, explored the scope and depth of how students understand various aspects of quadratic functions.

Volkan Sevim
Virginia Commonwealth University, Richmond , Virginia

Victor Cifarelli
University of North Carolina at Charlotte, Charlotte, North Carolina

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

131

Students' Development of Representational Fluency with CAS: An Instructional Theory

Poster Session

Design research investigated students' development of representational fluency in learning algebra with computer algebra systems (CAS) and paper and pencil. A resulting, conjectured instructional theory—processes of learning and means of supporting them—spans content, tool use, and representation-specific activity.

Nicole Fonger
Western Michigan University, Kalamazoo, Michigan

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

132
Subitizing, Arrangements of Counters, and Preschoolers' Quantitative Comparisons

Poster Session

How does the arrangement of counters affect preschoolers' success, strategies, and speed in comparing two sets? Find out how Action-on-Objects Subitizing enhanced speed in making comparisons and facilitated subitizing, a unique enumeration that does not involve counting.

Carrie Cutler
University of Houston—Downtown, Houston, Texas

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

133
Supporting Prospective Teachers' Proportional Reasoning with Technology: The Balance Metaphor

Poster Session

The speakers used a common cognitive perspective to analyze how a class of preservice teachers developed routines for solving a variety of proportional-reasoning tasks by modeling them with a balance applet.

Janet Bowers
San Diego State University, San Diego, California

Michael Fredenburg
San Diego State University, San Diego, California

Susan Nickerson
San Diego State University, San Diego, California

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

134
Teachers' Beliefs, Practices, and Interpretations of Curricular Resources

Poster Session

What messages do teachers interpret from students' textbooks and school district, state, and NCTM documents? How consistent are the messages across resources? How do

these messages relate to the teachers' beliefs and classroom practices? This session presents results of a quantitative study that examined these questions.

Christy Graybeal
Hood College, Frederick, Maryland

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

135
Teachers' Self-Efficacy Beliefs and Mathematical Knowledge for Teaching

Poster Session

This study used regression analysis of cross-sectional data to characterize traditional and alternative-route teachers' mathematical knowledge for teaching multiplicative reasoning (fractions, ratios, and proportions), using beliefs of teaching self-efficacy and controlling for teachers' experience and grade level.

Erik Jacobson
University of Georgia, Athens, Georgia

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

136
The Academic Youth Development (AYD) Program and Achievement

Poster Session

Through a unique integration of mathematics content and social-emotional concepts, the AYD program aims to affect students' beliefs and, subsequently their mathematics achievement, positively. The speaker will outline a study that investigated whether AYD program participation increased students' achievement in a rural school district.

Cynthia Schneider
Charles A. Dana Center, University of Texas at Austin, Austin, Texas

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

137
U.S. Middle School Preservice Mathematics Teachers' Content Knowledge

Poster Session

This study explores the strengths and weaknesses of the mathematical knowledge of U.S. preservice middle school mathematics teachers. It used a statistical method to show which skills in number, algebra, and geometry the preservice teachers mastered. The speaker will discuss Implications for preservice teacher education.

Shawn Broderick
University of Georgia, Athens, Georgia

Salon I/J/K/L, Capacity: 600

1:00 p.m.-2:30 p.m.

138
Using a Fraction Framework to Understand Students' Work

Poster Session

The qualitative study of classroom teachers used a fraction framework as a formative assessment tool to analyze students' work and plan subsequent instruction.

Kelly Georgius
University of Nebraska, Lincoln, Nebraska

Elizabeth Petit Cunningham
University of Nebraska, Lincoln, Nebraska

Salon I/J/K/L, Capacity: 600

139

Aligning Early-Algebra Learning Progressions and Assessments in Grades 3–8

Work Session

This working session will engage participants in critically examining grades 6–7 assessment items designed to measure students' understandings of some of the "big ideas" of early algebra. Conjectured early-algebra learning progressions for grades 3–8 will frame the examination and subsequent discussion.

Ana Stephens
University of Wisconsin—Madison, Madison, Wisconsin

Maria Blanton
TERC, Cambridge, Massachusetts

Eric Knuth
University of Wisconsin—Madison, Madison, Wisconsin

Angela Gardiner
University of Massachusetts—Dartmouth, Dartmouth, Massachusetts

Timothy Marum
University of Massachusetts—Dartmouth, Dartmouth, Massachusetts

Isil Isler
University of Wisconsin—Madison, Madison , Wisconsin

Franklin Hall 5, Capacity: 40

Photo by Andrea Burolla Photography for PCVB

3:00 p.m.-4:30 p.m.

140
Current Research on Trigonometry Teaching and Learning

Research Symposium

This symposium will explore current research on teaching and learning in trigonometry. The speakers will discuss three studies: the use of a directed length definition of the trigonometric functions, angle measure as a foundation for trigonometric functions, and the effects of visualization on students' understanding of trigonometry.

Joshua Hertel
Illinois State University, Normal, Illinois

Craig Cullen
Illinois State University, Normal, Illinois

Kevin Moore
University of Georgia, Athens, Georgia

Jeff Steckroth
Christopher Newport University, Newport News, Virginia

Discussant: Patrick Thompson
Arizona State University, Tempe, Arizona

Franklin Hall 8, Capacity: 138

3:00 p.m.-4:30 p.m.

141
Exploring Mathematics Teacher Professional Development in Online Contexts

Research Symposium

The session will focus on mathematics teacher professional learning (MTPL) in online contexts. Research shared will explore roles and interactions in online spaces and instructional decisions made to enhance learning. Audience members will discuss the development of a research program designed to explore MTPL in online contexts.

Signe Kastberg
Purdue University, West Lafayette, Indiana

Beatriz D'Ambrosio
Miami University, Oxford, Ohio

Kathleen Lynch-Davis
Appalachian State University, Boone, North Carolina

Jason Silverman
Drexel University, Philadelphia, Pennsylvania

Session 141 continued

Chrystal Dean
Appalachian State University, Boone, North Carolina

Jennifer Chauvot
University of Houston, Houston, Texas

Discussant: Paola Sztajn
North Carolina State University, Raleigh, North Carolina

Franklin Hall 11, Capacity: 113

3:00 p.m.-4:30 p.m.

142
Grades K–5 Generalization, Proof: What Knowledge, Skills Do Teachers Need?

Work Session

The presenters describe a five-phase model for a lesson sequence on investigating and proving generalizations about the behavior of the operations. Viewing a video clip to illustrate each phase, participants consider what the teacher did to support students' learning and identify knowledge the teacher called on to make that move.

Deborah Schifter
Education Development Center, Newton, Massachusetts

Susan Jo Russell
TERC, Cambridge, Massachusetts

Virginia Bastable
SummerMath for Teachers, South Hadley, Massachusetts

Franklin Hall 12, Capacity: 40

Photo courtesy of PCVB

143
Interactive Paper Session

The Effect of Students' Jungian Psychological Types on Students' Approaches to Mathematical Tasks

This study explored whether students' Jungian psychological type preferences had an effect on how they approached mathematical tasks. The project involved filming 47 sixth grade students completing fractions tasks, which were coded for mathematical process, use of materials, accuracy, and clarity of explanation.

Jane Kise
Differentiated Coaching Associates, LLC, Minneapolis, Minnesota

Constructing Ability and Disability in an Urban Middle School Classroom

This paper documents a two year study of the construction of competence in an urban middle school mathematics classroom, focusing on how students with disabilities constructed and enacted understandings of themselves as math learners, using the discourses and practices of two classrooms, including practices such as test-preparation and ability grouping.

Rachel Lambert
City University of New York, Graduate Center, New York, New York

Conservation of Quantity: An Overlooked Construct?

In this session we discuss various levels of conservation of quantity task and the difficulties that students had with these tasks across grades 1 and 2.

John Lannin
University of Missouri—Columbia, Columbia, Missouri

Delinda van Garderen
University of Missouri—Columbia, Columbia, Missouri

Tiffany Hill
University of Missouri—Columbia, Columbia, Missouri

Presider: Sandy Spitzer
Towson University, Towson, Maryland

Franklin Hall 4, Capacity: 40

144
Interactive Paper Session

Comparing Instructional Quality of U.S. and Japanese Student Teacher Lessons

We compare the mathematical quality of middle school mathematics lessons in 8 Japanese lessons and 12 US lessons by using the Mathematical Quality Instrument (MQI). The strengths and weaknesses vary between the novices in the two countries and point to where instructional differences between the two countries may begin.

Douglas Corey
Brigham Young University, Provo, Utah

Blake Peterson
Brigham Young University, Provo, Utah

Keith Leatham
Brigham Young University, Provo, Utah

Effective Elementary School Mathematics Teachers: A Cross-Cultural Perspective

Presents a study on instructional and decision-making processes used by four effective elementary mathematics teachers in New Jersey and Israel. Analysis of interview data before and after lesson implementation indicated eight common constructivist practices.

Rochelle Kaplan
William Paterson University, Wayne, New Jersey

Using Classroom Observation Research to Guide Debates about Teaching Effectiveness

We discuss the results of a large classroom observational study of 994 video mathematics lessons from grades 4-8. Our classroom observational protocol couples a strong focus on content knowledge with use of research-based teaching practices. We examine how characteristics of effective teaching forwarded by our preparation program hold up in the general population of middle school math teachers.

Candace Walkington
University of Wisconsin—Madison, Madison, Wisconsin

Matthew Valerius
University of Minnesota—Twin Cities, Minneapolis, Minnesota

Presider: Thomas Hodges
Western Carolina University, Cullowhee, North Carolina

Franklin Hall 1, Capacity: 60

145
Interactive Paper Session

Exploring Students' Outcomes after Teaching Mathematics through Problem Solving

This session describes a study in which mathematics from state-level standards was taught through problem-solving contexts to sixth-grade students. Students' outcomes were compared to their peers experiencing their typical mathematics instruction. We will explore how this investigation informs teaching mathematics in ways that align with the Common Core State Standards.

Jonathan Bostic
Bowling Green State University, Ohio, Ohio

Stephen Pape
University of Florida, Gainesville, Florida

Tim Jacobbe
University of Florida, Gainesville, Florida

Mathematics Instructional Quality, Class Size, and Achievement for Students of Low Socioeconomic Status

We explored relations between observed mathematics instructional quality (MIQ) and achievement in students from families with low income. Participants were 36 third grade teachers and their 205 students. Higher MIQ and smaller class size related to improved student test performance. Discussion considers inequity and access to high quality instruction.

Eileen Merritt
University of Virginia, Charlottesville, Virginia

Sara Rimm-Kaufman
University of Virginia, Charlottesville, Virginia

Temple Walkowiak
North Carolina State University, Raleigh, North Carolina

Examining Instructional Quality and Students' Achievement in Mathematics

In this study, we use the Instructional Quality Assessment (IQA) Mathematics Classroom Observation Toolkit as an observational assessment system to examine relationships between several meaningful aspects of ambitious mathematics instruction and students' performance on state mathematics achievement tests.

Glenn Colby
Vanderbilt University, Nashville, Tennessee

Melissa Boston
Duquesne University, Pittsburgh, Pennsylvania

Presider: Rick A. Hudson
University of Southern Indiana, Evansville, Indiana

Franklin Hall 13, Capacity: 40

146
Interactive Paper Session

Continuous Improvement of Mathematics Teacher Education

Since 2002, University of Delaware faculty have engaged in a model for instructional development, analyzing their practice with respect to student learning and generating a knowledge base for current and future educators. Results of a longitudinal study suggest that this model serves to continuously improve students' mathematics learning.

Jathan Austin
University of Delaware, Newark, Delaware

Preservice Elementary School Teachers' Learning through Discourse-Intensive Instruction

Although discourse (DII) is a recommended pedagogy for mathematics courses for preservice elementary teachers (PSTs), much is still unknown about the efficacy of this type of instruction. This session presents data from two iterations of a study that investigated the relationship between specific features of DII and PSTs' understanding of division of fractions.

Nancy Anderson
Boston University, Massachusetts, Massachusetts

Using a Theory of Instruction (Concept-Focused Instruction) with Preservice Teachers

This presentation will report research findings on the impact of using a theory of instruction called Concept-Focused Instruction to train middle level and secondary preservice mathematics teachers. Using a theory of instruction improves the planning and teaching because it simplifies the instructional decision-making process. The theory as well as the notable positive outcomes will be presented.

Denise Forrest
Coastal Carolina University, Conway, South Carolina

Austin Hitt
Coastal Carolina University, Conway, South Carolina

Presider: Charles Munter
University of Pittsburgh, Pittsburgh, Pennsylvania

Franklin Hall 6, Capacity: 40

3:00 p.m.-4:30 p.m.

147
Linking Research and Practice: A Focus on Reasoning and Sense Making with Technology

Research Symposium

The presenters will describe how current research guided the selection and description of examples and vignettes for *Focus in High School Mathematics: Technology to Support Reasoning and Sense Making.* Participants will discuss future directions for research in mathematics education.

Thomas Dick
Oregon State University, Corvallis, Oregon

Rose Zbiek
Pennsylvania State University, University Park, Pennsylvania

M. Kathleen Heid
Pennsylvania State University, University Park, Pennsylvania

Anthony Dove
North Carolina State University, Raleigh, North Carolina

Gail Burrill
Michigan State University, East Lansing , Michigan

Hollylynne Lee
North Carolina State University, Raleigh, North Carolina

Jessica Cohen
Western Washington University, Bellingham, Washington

Discussant: Karen Hollebrands
North Carolina State University, Raleigh, North Carolina

Franklin Hall 7, Capacity: 108

3:00 p.m.-4:30 p.m.

148
Research and Effects in Grades K–8 Mathematics Coaching

Work Session

Participants will consider results from a research study of grades K–8 mathematics instructional coaching, focusing on relationships between teacher mathematics knowledge and teacher practiceand effects of coaching on students' achievement. They will examine the methods used to arrive at effects and discuss alternatives for further analysis.

David Yopp
Montana State University, Bozeman, Montana

John Sutton
RMC Research, Denver, Colorado

Clare Heidema
RMC Research, Denver, Colorado

Arlene Mitchell
RMC Research, Denver, Colorado

Dan Jesse
RMC Research, Denver, Colorado

Franklin Hall 10, Capacity: 40

3:00 p.m.-4:30 p.m.

149
RtI: Mathematics and Special Educators Sharing Responsibility: A Call for Action

Research Symposium

The presenters will describe the importance of mathematics and special educators collaborating to provide evidence-based instruction as part of the Response to Intervention (RtI) process. They will discuss recommendations for working with administrators and teachers, coordinating at the state and national levels, and identifying policy implications.

Barbara Dougherty
University of Missouri—Columbia, Columbia, Missouri

Karen Karp
University of Louisville, Louisville, Kentucky

Diane Bryant
University of Texas at Austin, Austin, Texas

Leanne Ketterlin-Geller
Southern Methodist University, Dallas, Texas

David Chard
Southern Methodist University, Dallas, Texas

Brian R. Bryant
University of Texas at Austin, Austin, Texas

Franklin Hall 2, Capacity: 139

150

The Notion of Proof in Mathematics Teaching: Is It Changing?

Research Symposium

Researchers from five different teams give overviews of their projects and to discuss how, through research and professional development, they are working with teachers to influence their notions of, and practices in, reasoning and proof.

Michelle Cirillo
University of Delaware, Newark, Delaware

Amy Ellis
University of Wisconsin—Madison, Madison, Wisconsin

Pat Herbst
University of Michigan, Ann Arbor, Michigan

Margaret Smith
University of Pittsburgh, Pennsylvania, Pennsylvania

Megan Staples
University of Connecticut, Storrs, Connecticut

Discussant: Kristen Bieda
Michigan State University, East Lansing, Michigan

Franklin Hall 3, Capacity: 108

Index of Session Participants

Notes

Notes