



*....where the Mathematics
comes sweepin' down
the plain....*

Research Council on Mathematics Learning

40th Annual Meeting February 28 – March 2, 2013

Tulsa, Oklahoma

Contents

| | |
|--|----|
| Welcome from RCML | 3 |
| Schedule of Events | 4 |
| Keynote Speakers | 5 |
| Schedule by Day: Thursday, February 28, 2013 | 5 |
| Schedule by Day: Friday, March 1, 2013 | 6 |
| Schedule by Day: Saturday, March 2, 2013 | 25 |
| Presenters Index | 36 |
| Hotel Floor Plan | 41 |

| <i>Date</i> | <i>Start Time</i> | <i>End Time</i> | <i>Function</i> | <i>Room</i> |
|-------------|-------------------|-----------------|--------------------------|----------------------|
| 2/28/2013 | 4:00 P.M. | 6:45 P.M. | RCML Registration | Council Oak Foyer |
| | 5:30 P.M. | 6:30 P.M. | Wilson Memorial Lecture | Council Oak Ballroom |
| | 6:30 P.M. | 8:00 P.M. | Reception | Council Oak Ballroom |
| 3/1/2013 | 7:30 A.M. | 4:00 P.M. | RCML Registration | Council Oak Foyer |
| | 7:45 A.M. | 9:15 A.M. | Continental Breakfast | Council Oak Foyer |
| | 8:00 A.M. | 8:45 A.M. | Breakout Sessions | |
| | 9:00 A.M. | 9:45 A.M. | Breakout Sessions | |
| | 10:00 A.M. | 10:45 A.M. | Breakout Sessions | |
| | 11:00 A.M. | 11:45 A.M. | Breakout Sessions | |
| | 12:00 P.M. | 1:15 P.M. | Lunch & Business Meeting | Council Oak Ballroom |
| | 1:30 P.M. | 2:15 P.M. | Breakout Sessions | |
| | 2:30 P.M. | 3:15 P.M. | Breakout Sessions | |
| | 3:30 P.M. | 4:15 P.M. | Breakout Sessions | |
| | 4:30 P.M. | 5:30 P.M. | Founders' Lecture | Council Oak Ballroom |
| 3/2/2013 | 7:30 A.M. | 11:00 A.M. | RCML Registration | Council Oak Foyer |
| | 7:45 A.M. | 9:15 A.M. | Continental Breakfast | Council Oak Foyer |
| | 8:00 A.M. | 8:45 A.M. | Breakout Sessions | |
| | 9:00 A.M. | 9:45 A.M. | Breakout Sessions | |
| | 10:00 A.M. | 10:45 A.M. | Breakout Sessions | |
| | 11:00 A.M. | 11:45 A.M. | Breakout Sessions | |
| | 12:00 P.M. | 1:30 P.M. | Lunch & Keynote Speaker | Council Oak Ballroom |



**Research Council On
Mathematics Learning**

The Research Council on Mathematics Learning seeks to stimulate, generate, coordinate, and disseminate research efforts designed to understand and/or influence factors that affect mathematics learning.

Website: <http://web.unlv.edu/RCML/index.html>

Welcome

Welcome to the 40th RCML Annual Conference! We want to send a special thank you to all of those contributing to this year's conference, including the session presenters, RCML board, 2013 conference committee, and all those who helped with organization.

We hope you enjoy your time in Tulsa, and may the conference provide you with valuable information you can bring to your university. Please let us know if we can assist you in any way during your stay. Feel free to contact Juliana Utley at (405) 880-7955.

Conference Chair: Juliana Utley, Oklahoma State University

Program Chair: Patricia Jordan, Oklahoma State University

RCML Board

PRESIDENT, 2011-2013

Kay A. Wohlhuter
University of Minnesota, Duluth
Duluth, MN
kwohlhut@d.umn.edu

PRESIDENT-ELECT, 2012-2013

Mary Swarhout
Sam Houston State University
Huntsville, Texas 77341
swarhout@shsu.edu

VICE PRESIDENT FOR CONFERENCES, 2012-2014

Bob Drake
University of Cincinnati
Cincinnati, Ohio
bob.drake@uc.edu

VICE PRESIDENT FOR PUBLICATIONS, 2009-2014

Sheryl A. Maxwell
University of Memphis (Retired)
289 Crestmont Cove
Cordova, TN 38018-6904

TREASURER, 2012-2014

Jean McGhee
University of Central Arkansas
Conway, Arkansas 72035
jeanm@uca.edu

SECRETARY, 2011-2013

Megan Che
Clemson University
Clemson, SC 29634
sche@clemson.edu

ARCHIVIST

William R. Speer
Office of the Dean
University of Nevada Las Vegas
Las Vegas, NV 89154
william.speer@univ.edu

INVESTIGATIONS EDITOR

Vicki Schell
Pensacola State College
Pensacola, FL 32526
rcmleditor@cox.net

CONFERENCE PROCEEDINGS EDITOR

(Appointed)
Stacey Reeder
University of Oklahoma
Jeannine Rainbolt College of Education
Department of Instructional Leadership
and Academic Curriculum
820 Van Vleet Oval, ECH 114
Normal, OK 73019
reeder@ou.edu

CONFERENCE PROCEEDINGS CO- EDITOR (Appointed)

Gabriel Matney
Bowling Green State University
gmatney@bgsu.edu

INTERSECTIONS EDITOR (Appointed)

Summer Bateiha
Western Kentucky University
Bowling Green, KY 42101
summer.bateiha@wku.edu

MEMBERSHIP CHAIRMAN (Appointed)

Dr. Mary B. Swarhout
Sam Houston State University
Math and Statistics Dept., P.O. Box 2206
Huntsville, TX 77341-2206
swarhout@shsu.edu

WEBMASTER (Appointed)

Ryan Speer
Perrysburg, Ohio
rspeer@sbcglobal.net

Conference Committee

Eileen Faulkenberry (2010-2013)
Texas A&M University, Commerce
Eileen_Faulkenberry@tamu-
commerce.edu

Gabriel Matney (2010-2013)
Bowling Green State University
gmatney@bgsu.edu

Keith Adolphson (2011-2014)
Eastern Washington University
Cheney, WA
kadolphson@ewu.edu

Thomas Faulkenberry (2012-2015)
Texas A&M University- Commerce
Thomas_Faulkenberry@tamu-
commerce.edu

Angela Krebs (2012-2015)
University of Michigan-Dearborn
askrebs@umd.umich.edu

Nancy Ceruso (2012-2014)
Saint Leo University
Saint Leo, FL
Nancy.ceruzo@saintleo.com

Schedule of Events

Thursday, February 28, 2013

| | |
|---|---------------------|
| Registration (<i>Council Oak Foyer</i>) | 4:00 p.m.-6:45 p.m. |
| Wilson Memorial Lecture (<i>Council Oak Ballroom</i>) | 5:30 p.m.-6:30 p.m. |
| <i>Mathematics and Sled Dog Racing – It's All About the Dogs by Doug Aichele</i> | |
| Reception (<i>Manchester</i>) | 6:30 p.m.-8:00 p.m. |

Friday, March 1, 2013

| | |
|--|-----------------------|
| Continental Breakfast (<i>Council Oak Foyer</i>) | 7:30 a.m.-9:15 a.m. |
| Registration (<i>Council Oak Foyer</i>) | 7:30 a.m. 4:00 p.m. |
| Sessions 1-8 | 8:00 a.m.-8:45 a.m. |
| Sessions 9-16 | 9:00 a.m.-9:45 a.m. |
| Sessions 17-24 | 10:00 a.m.-10:45a.m. |
| Sessions 25-31 | 11:00 a.m.-11:45 a.m. |
| Lunch and Annual Business Meeting (<i>Council Oak Ballroom</i>) | 12:00 p.m.-1:15 p.m. |
| Sessions 32-38 | 1:30 p.m.-2:15 p.m. |
| Sessions 39-44 | 2:30 p.m.-3:15 p.m. |
| Sessions 45-51 | 3:30 p.m.-4:15 p.m. |
| Founders' Lecture (<i>Council Oak Ballroom</i>) | 4:30 p.m.-5:30 p.m. |
| <i>Firm Foundations Forged by Founders and Those that Follow, Melfried and Judy Olson</i> | |

Saturday, March 2, 2013

| | |
|--|-----------------------|
| Continental Breakfast (<i>Council Oak Foyer</i>) | 7:30 a.m.-9:15 a.m. |
| Registration (<i>Council Oak Foyer</i>) | 7:30a.m.-11:00 a.m. |
| Sessions 52-59 | 8:00 a.m.-8:45 a.m. |
| Sessions 60-67 | 9:00 a.m.-9:45 a.m. |
| Sessions 68-75 | 10:00 a.m.-10:45 a.m. |
| Sessions 76-82 | 11:00 a.m.-11:45 a.m. |
| Boxed Lunch & Keynote Speaker (<i>Council Oak Ballroom</i>) | 12:00 p.m.-1:30 p.m. |
| <i>Building Teacher Content Knowledge through Reasoning and Making Sense, Linda Gojak</i> | |

Thursday, February 28, 2013

Thursday, February 28, 2013 Wilson Lecture 5:30 p.m.-6:30 p.m.

Douglas B. Aichele
Professor of Mathematics
Oklahoma State University
Stillwater, OK

Gumbie
Alaskan Husky
Oklahoma State University
Stillwater, OK



Mathematics and Sled Dog Racing – It's All About the Dogs!

Alaskan Huskies are amazing canine athletes capable of surviving in extremely cold temperatures for long periods of time and maintaining their racing strength throughout. We will share with you some of the fundamentals of sled dog racing, recent research findings related to their endurance capabilities, and our school-related experiences with young children. There will be time for you to ask Gumbie questions.

Located in the Council Oak Ballroom

Special Thanks



COLLEGE OF
Education

Oklahoma State University – College of Education

A special thank you to the College of Education and Dean Pamela “Sissi” Carroll for their support for the RCML 2013 Conference. The Dean donated the cost of printing the program this year, a variety of registration materials such as folders and pens, and covering the cost for miscellaneous conference materials.

EAI Education

A special thank you to EAI Education and Barbara Tuzzeo for their support of the RCML 2013 conference by donating bags for attendees.



Proposal Reviewers

We offer our heartfelt thanks to the following team who reviewed the proposal submissions, made recommendations for program section assignments, and provided input for strengthening the proposal review process: Luke Foster, Wendy James, Karl Kruczek, Mary Barbara Lewis, Cynthia Orona, Dan Sisk, and Dena Walker.

Friday, March 1, 2013

| Overview of Friday Morning Sessions | | | | |
|---------------------------------------|---|--|---|--|
| | 8:00-8:45 | 9:00-9:45 | 10:00-10:45 | 11:00-11:45 |
| Woodward | 1. A Comparison of Prospective Elementary Teachers' Feelings about Fractions Sharon & Hughes | 9. Identifying Reading Challenges on Standardized Mathematics Tests Cerezo, Carver, & Disabato | 17. Verifying Trigonometric Identities: Student Conceptions in Problem Solving Wescoatt | |
| Remington | 2. Toward Improving MyMathLab Xing & Plaisance | 10. Support for Students Learning Mathematics Via Student-Centered Curricula Slovin & Zenigami | 18. Supporting PST Development of Practical Conceptions of the Mathematical Practices Courtney | 25. Pre-service Elementary Teachers' Perceptions of CCSSM and Their Beliefs on Teaching Mathematics Columba & Stotz |
| Gilcrease | 3. TNT Pre-service Teachers' Perceptions of Teaching- A Qualitative Study Fields | 11. Learning Mathematics in the 21 st Century: Student Interactions While Learning Online Ichinose | 19. Challenges in the Mathematics Preparation of Elementary Pre-service Teachers Hayata | 26. The Effects of Long-term Professional Development on Teacher Self-Efficacy Faulkenberry & Nottingham |
| Philbrook | 4. Preservice Elementary and Middle School Teachers' Understanding of Variables Brown | 12. Does One Word Say It All? Lucas, Cassel, & Hanlon | 20. Mathematics Teacher Candidates' Understanding of Function Reeder & Bates | 27. Promoting Pre-service Teachers' Learning through making Connects with Students' Practice Lu |
| Dover | 5. Developing a Measure Regarding Beliefs About Math and English Learners McLeman & Fernandes | 13. How Does Undergraduate Bridge Theory and Practice? Abney, Shiver, Santarone, & Waldron | 21. Origination: Reading! Destination: Math Baker | 28. Ensuring Teacher Quality for the Algebra I Course Mallam |
| Westminster | 6. Conditional Probability: Making It Meaningful to Elementary School Pre-service Teachers Menon | 14. How Can the Classroom Flip Support Standards-based Mathematics Learning? Strayer | 22. Tinkerplots and Pre-service Elementary Teachers' Understanding of Statistics Foster | 29. Developing Key Statistics Concepts in a Dynamic Technological Learning Environment Strayer & Duncan |
| Coventry | 7. The Development of an Observation Instrument for Formative Assessment Heitz & Eddy | 15. Fostering Pre-service Teachers' Mathematical Empowerment Harper | 23. Using Children's Work to Understand Mathematical Thinking Krebs | 30. When Procedural Is Ingrained: Examining Our Mathematical Practices Carter & Erwin |
| 2 nd Floor Conference Room | 8. Second Grade Students' Exploration of Five-Sided Shapes Reynolds & Lillard | 16. Math Achievement and Perceptions of Math Efficacy in Rural 3 rd Graders Orona | 24. Routines of Practice for Supporting Mathematical Connections: Early Algebra Context Store | 31. Perceptions of the Standards of Mathematical Practices and Plans for Implementation Olson & Olson |

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 1-4 8:00 a.m.-8:45 a.m.

Session 1 (*Woodward*)

A Comparison of Prospective Elementary Teachers' Feelings about Fractions

Valerie Sharon, *Sam Houston State University*; Teresa Hughes, *Prairie View A&M University*

We used a modified version of the Mathematics Teaching Efficacy Beliefs Inventory (MTEBI) to measure prospective elementary teachers' beliefs about their ability to teach fraction concepts. We also asked participants to write a description of their feelings about working with fractions and teaching fraction concepts. We compared their written responses to corresponding scores on the self-efficacy portion of the modified MTEBI in an effort to compare the personal feelings individuals with low-levels of self-efficacy to teach fraction concepts have compared to those with high-levels of self-efficacy.

Session 2 (*Remington*)

Toward Improving MyMathLab

Cong-Cong Xing & DesLey Plaisance, *Nicholls State University*

While MyMathLab (MML) has achieved notable success in general mathematics education, it has some fundamental and pedagogical issues that need to be addressed. In this short paper, we (1) identify some MML-associated problems that commonly exist in lower-level college mathematics teaching and learning; (2) propose our solution to these problems; (3) demonstrate the solution by examples; and (4) summarize the contribution of this paper. In addressing these issues, we hope to see an improved MML in the near future.

Session 3 (*Gilcrease*)

TNT Pre-Service Teachers Perceptions of Teaching - A Qualitative Study

Melanie Fields, *University of North Texas - Teach North Texas Program*

Come hear how the Teach North Texas program is changing the way pre-service teachers feel about teaching. Teach North Texas (TNT) uses the 5E model to help guide our students to teach using inquiry based lessons and for conceptual understanding not simply memorizing. This is an informal presentation for you to hear what our TNT students are saying about teaching after taking the very first course called Step One. A qualitative study was done to gain insight on how this class changes their reasons and perceptions of teaching. They had a lot to say about how to teach and learn mathematics.

Session 4 (*Philbrook*)

Preservice Elementary and Middle School Teachers' Understanding of Variables

Sue Brown, *University of Houston Clear Lake*

This study considers preservice elementary and middle school teachers' knowledge of variables. A total of 73 preservice teachers, all candidates for Early Childhood - 6 certification, were given the same variable assessments completed by middle school students. Many of the misconceptions displayed by middle school students were also present in the results from preservice elementary and middle school teachers. This suggests that another means of improving middle school students' performance in algebra is by strengthening the preservice elementary and middle school teachers' understanding of variables.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 5-8 8:00 a.m.-8:45 a.m.

Session 5 (Dover)

Developing a Measure Regarding Beliefs About Math and English Learners

Laura McLeman, *University of Michigan-Flint*; Anthony Fernandes, *University of North Carolina Charlotte*

This presentation will outline the development and initial use of the Mathematics Education of English Learners Scale (MEELS). The scale is designed to measure preservice teachers' beliefs about the mathematics education of the rapidly growing population of English learners. Content validity was addressed through consultation with experts to ensure the relevance and representation of items. Using Principal Component Factor analysis with Varimax rotation, a five factor solution was determined. Cronbach's coefficient alphas were good for three factors and low for the other two. We will discuss future revisions in progress to improve the overall reliability.

Session 6 (Westminster)

Conditional Probability: Making It Meaningful to Elementary School Preservice Teachers

Ramakrishnan Menon, *Georgia Gwinnett College*

Math is usually not a favourite discipline of elementary school teachers, and probability is a topic that, because of its abstract nature, is even more challenging for such students, especially when it is commonly associated with tossing coins and finding the probability of heads or tails, something that is not engaging or relevant to these students. This presentation will discuss how the use of a project based approach allowed students to understand, present, and clarify probabilistic fallacies based on conditional probabilities in situations that were relevant and meaningful to them, such as in medical tests, and court cases.

Session 7 (Coventry)

The Development of an Observation Instrument for Formative Assessment

Layne Heitz, *Southeastern Oklahoma State University*; Colleen Eddy, *University of North Texas*

Research has demonstrated that the correct application of formative assessment strategies can improve student achievement and motivation (Black & William, 1998). This session is an informative look at the development of a formative assessment observation instrument. This instrument can be used to inform teachers and administrators of a teachers' use of formative assessment in the classroom. Theoretical and research background will be provided as well as the journey the researchers went through to develop the instrument to this point. This can be useful for teacher educators as this instrument can provide development direction for pre-service teachers who are interested in formative assessment.

Session 8 (2nd Floor Conference Room)

Second Grade Students' Exploration of Five-Sided Shapes

Anne Reynolds, *Kent State University*; Eileen Lillard, *University of Oklahoma*

We report on the mathematical constructions of 2nd grade students in a mathematics enrichment class as they explored five sided shapes. In particular we will share their thinking about sides and angles.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 9-12 9:00 a.m.-9:45 a.m.

Session 9 (*Woodward*)

Identifying Reading Challenges on Standardized Mathematics Tests

Nancy Cerezo, Lin Carver, & Sharyn N. Disabato, *Saint Leo University*

Come join the conversation about student success in mathematics. For student success, instruction of mathematics concepts alone is not enough. The researchers analyzed released tests from Florida, Texas, and California comparing linguistic and visual components and readability.

Session 10 (*Remington*)

Support for Students Learning Mathematics Via Student-Centered Curricula

Hannah Slovin, Fay Zenigami, *University of Hawaii*

This presentation describes research on supports needed for at-risk students learning mathematics through curricula developed for a constructivist environment. Classroom observation data from a first grade class and a sixth grade class identified areas where the respective curriculum and pedagogy promoting student-centered learning posed specific challenges for struggling learners and suggested the potential supports that could help students access critical content and processes. Mathematics education faculty and special education faculty collaborated on this study.

Session 11 (*Gilcrease*)

Learning Mathematics in the 21st Century: Student Interactions While Learning Online

Cherie Ichinose, *California State University Fullerton*

Online courses are often used to remediate mathematical skills for the most struggling learners. Students are given access to software to supplement or replace the current learning environment with little to know interactions from their teachers. This study provides evidence of the power of interactions. In a study of 450 high school students, entry-level mathematics students benefited most from the synchronous interactions. Students were able to ask their questions in real-time, thereby fostering deeper relationships with their teacher. Advanced students preferred the asynchronous environment for learning mathematics as shown through the increased collaborative participation through the online discussion boards.

Session 12 (*Philbrook*)

Does One Word Say It All?

Carol Lucas & Darlinda Cassel, *University of Central Oklahoma*; Adele Hanlon, *Jacksonville University*

"What is one word that best describes your feeling about math?" is a question that has been asked of pre-service elementary, early childhood, and special education teachers the first day of their mathematics content courses. Through the use of Wordle, the data collected from several years will be presented and analyzed. We will discuss how the feelings that these students express towards mathematics connect to other research. We will also explore how recognizing the attitude of the students can help the instructor be more responsive to not only teaching the math content but to also developing a more comfortable relationship with mathematics.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 13-16 9:00 a.m.-9:45 a.m.

Session 13 (*Dover*)

How Does Undergraduate Research Bridge Theory and Practice?

Angel Rowe Abney, *Georgia College*; Janet Shiver, *Central Washington University*; Doris Santarone & Rachel Waldron, *Georgia College*

Through a variety of projects mathematics teacher educators seek to involve undergraduate prospective mathematics teachers in the research process. These projects include but are not limited to Lesson Studies, Interviews with students framed in the literature, and student directed Capstone Experiences. This presentation will describe the projects, the courses and programs in which the projects are imbedded, and discuss the perspectives of the prospective teachers involved. We are interested in whether these projects help prospective teachers connect theory and practice in a meaningful way.

Session 14 (*Westminster*)

How Can the Classroom Flip Support Standards-based Mathematics Learning?

Jeremy F. Strayer, *Middle Tennessee State University*

This session reports research conducted in a flipped classroom. The challenges of managing the out of class learning environment and the in class learning environment in order to provide students with a coherent, standards-based learning experience are identified. Recommendations for implementing a standards-based classroom flip will be presented.

Session 15 (*Coventry*)

Fostering Pre-service Teachers' Mathematical Empowerment: Examining Mathematical Beliefs in a Math Content Course

Mary Harper, *East Central University*

The context of this study was a group of preservice teachers in a mathematics content course that incorporated meaning-making, dialogue, space and justification into classroom learning experiences. Further, the usual power dynamics between teacher and student were revisited and revised as part of the social norms established in the classroom. Due to the learning experiences in this non-traditional course, students reported plans for their future pedagogical practices as being conceptually oriented, gaining mathematical empowerment, a change in beliefs about the nature of mathematics, a new appreciation for mathematics in general, and enjoyment of group work, presentations, and the use of manipulatives (term used for the use of physical models).

Friday, March 1, 2013

Friday, March 1, 2013 Session 16 9:00 a.m.-9:45 a.m.

Session 16 (*2nd Floor Conference Room*)

Math Achievement and Perceptions of Math Efficacy in Rural 3rd Graders

Cynthia Orona, *Oklahoma State University*

This study was conducted to determine if a relationship exists between rural third grade students' math self-efficacy and their scores on a state criterion referenced achievement test. Initial analysis of data indicates a significant difference in self-efficacy amongst achievement groups. Students with higher achievement scores tended to have a higher level of self-efficacy. The regression analysis yielded similar regression equations, one for students with lower achievement test scores and one for students with higher achievement test scores. The regression lines for the two groups have a similar slope but the higher achievement group has a higher initial value.

Friday, March 1, 2013 Sessions 17-18 10:00 a.m.-10:45 a.m.

Session 17 (*Woodward*)

Verifying Trigonometric Identities: Student Conceptions in Problem Solving

Benjamin Wescoatt, *Oklahoma State University*

This study concerns aspects of students' problem solving behavior while verifying trigonometric identities (VTI). Despite providing opportunities for investigating many areas of student knowledge, VTI has not been well-studied. To explore student conceptions, eight undergraduate trigonometry students were interviewed while engaged in VTI. The interviews focused on understanding students' motivations for their problem solving decisions and the resources the students utilized. The student VTI attempts were analyzed through Carlson and Bloom's (2005) Multidimensional Problem Solving framework. In addition to a description of the resulting VTI framework and its components, broad themes related to students' conceptions of VTI will be presented.

Session 18 (*Remington*)

Supporting PST Development of Practical Conceptions of the Mathematical Practices

Scott A. Courtney, *Kent State University*

The movement to adopt the Common Core State Standards for Mathematics impacts not school districts and their teachers, but university teacher preparation programs. In order to productively implement and sustain the Common Core's vision of developing mathematically competent students, preparation programs must support prospective teachers' development of practical conceptions of the Standards for Mathematical Practice. The presentation describes middle childhood PSTs' engagements with mathematics problems designed to reveal PSTs' initial conceptions of the mathematical practices, highlights struggles PSTs encountered in their attempts to articulate the practices in their written work, and provides suggestions to support PSTs in their development.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 19-21 10:00 a.m.-10:45 a.m.

Session 19 (*Gilcrease*)

Challenges in the Mathematics Preparation of Elementary Pre-service Teachers

Carole A. Hayata, *Texas Woman's University*

Teachers in grades K-12, knowledgeable in both mathematics content and pedagogy are needed to guide students' learning in both content, and thinking and reasoning skills in this time of extraordinary and accelerating change. The development of mathematical knowledge for teaching (MKT) among 186 undergraduate elementary pre-service teachers during a mathematics methods course and student teaching experience was studied over a nine month period. The results of the study suggested that a low initial level of mathematics content knowledge and a deeply rooted belief that there is only one solution to mathematics problems contributed to the lack of development of MKT.

Session 20 (*Philbrook*)

Mathematics Teacher Candidates' Understanding of Function

Stacy Reeder, *University of Oklahoma*; Rachel Bates, *Redlands Community College*

The concept of function is central to students' ability to describe relationships of change between variables, explain parameter changes, and interpret and analyze graphs. Not surprisingly the Principles and Standards for School Mathematics advocates instructional programs from prekindergarten through grade 12 that enable all students to understand patterns, relations, and functions. Although the function concept is a central one in mathematics, many research studies of high school and college students have shown that it is also one of the most difficult for students to understand. The results of a research study focused on mathematics teacher candidates understanding of function will be presented.

Session 21 (*Dover*)

Origination: Reading! Destination: Math

Mary E. Baker, *University of North Dakota*

In each generation of educators it seems that innovative practices in Reading Education have been the impetus to innovations in Mathematics Education. In this session we will examine how research-based best practices in reading have been adapted to mathematics instruction (Guided Math, RTI, Assessment, etc.). These adapted strategies show promise in the field of mathematics education and have been proven to have a net effect on student learning. We examine how mathematics educators can integrate reading and mathematics methods instruction with preservice and inservice teachers to help them more easily connect the two content areas together, both pedagogically and content-wise.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 22-24 10:00 a.m.-10:45 a.m.

Session 22 (*Westminster*)

Tinkerplots and Pre-Service Elementary Teachers Understanding of Statistics

Lucas Foster, *Oklahoma State University*

The primary purpose of this study is to determine through both qualitative and quantitative methodology whether the use of Tinkerplots in a mathematics education classroom significantly improves pre-service elementary teachers' level of understanding of data analysis. In particular, the study investigates the effect, if any, that Tinkerplots has on pre-service elementary teachers' understanding of how to appropriately select, use and make informal inferences from both graphical representations of data and measures of center.

Session 23 (*Coventry*)

Using Children's Work to Understand Mathematical Thinking

Angela Krebs, *University of Michigan- Dearborn*

In this session, the participants will analyze sixth grade children's work on various mathematical topics. The presenter will lead a discussion on the mathematical understanding of the children based on the written work. Then, the focus of the discussion will shift to how this type of discussion can help pre-service elementary teachers deepen their own mathematical understanding. Finally, the discussion will center on what the pre-service teachers might learn about children's understanding of mathematics from analyzing written work.

Session 24 (*2nd Floor Conference Room*)

Routines of Practice for Supporting Mathematical Connections: Early Algebra Context

Jessie C. Store, *Alma College*

Teaching mathematics as a connected subject is very important. In fact, the Common Core State Standards for Mathematics are meant to serve this purpose. However, several studies show that the intended curriculum often differs from the enacted curriculum. To realize the goal of teaching mathematics as a connected subject then requires studies on pedagogical practices that connect different mathematical domains. This study discusses how elementary school teachers supported students' activities in connecting mathematical ideas within and across different contexts and how this practice supported students' algebraic reasoning.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 25-27 11:00 a.m.-11:45 a.m.

Session 25 (*Remington*)

Pre-service Elementary Teachers' Perceptions of the CCSSM and Their Beliefs on Teaching Mathematics

Lynn Columba & Megan Stotz, *Lehigh University*

Classroom implementation of the Common Core Curriculum Standards in Mathematics (CCSSM) requires significant development that is sustained over time. What is the impact of an elementary mathematics methods course on pre-service teachers' understanding of the mathematical practices and their perceptions of the importance of the CCSSM? What instructional activities have an impact on helping teachers to experience, plan, teach and reflect on the mathematical practices? Initial survey results related to the impact of CCSSM, the students beliefs about teaching mathematics, and what they consider to be research-affirmed best practices will be reviewed.

Session 26 (*Gilcrease*)

The Effects of Long-term Professional Development on Teacher Self-Efficacy

Eileen Durand Faulkenberry, *Texas A&M University-Commerce*; Maribeth Nottingham, *Southeastern Oklahoma State University*

The three-year professional development for math and science teachers focused on instructional strategies to promote inquiry based learning in the teachers' classroom practices. The professional development included two-week summer workshops each year with Learning Academies twice a month during each academic year. The workshops included Japanese Lesson Study, Problem Based Learning, and Action Research. We found that the mean scores on the Teacher Self-Efficacy Scale significantly increased throughout the project. Classroom observations showed an increase in inquiry based learning in the teachers' classrooms.

Session 27 (*Philbrook*)

Promoting Pre-service Teachers' Learning through Making Connections with Students' Practice

Lianfang Lu, *University of Arkansas at Little Rock*

This study presents an empirical model that has been used in our content and methods courses with pre-service teachers. The pre-service teachers develop their content and pedagogical knowledge through understanding their own problem-solving experience, examining students' practice in solving the same problems, and making connections between different approaches. The focus of the study is on analysis of mathematical understanding, strategies, and difficulties that pre-service teachers and students demonstrated, and on discussion of possible teaching interventions to help students overcome the difficulties and develop mathematical understanding and reasoning.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 28-30 11:00 a.m.-11:45 a.m.

Session 28 (*Dover*)

Ensuring Teacher Quality for the Algebra 1 Course

Winifred A. Mallam, *Texas Woman's University*

Algebra I is considered the gateway course for further learning of mathematics. The goal of the project was to increase the preparedness of middle school and high school teachers to teach Algebra 1. The study examined the content knowledge and background of teachers in a major suburban school district in North Texas. The focus was on the teaching and learning of Algebra 1 using a state professional development unit that focused on incorporating problem solving and relevant technology. Sample problems and pertinent feedback are shared in addition to the findings of the pre- and post-tests.

Session 29 (*Westminster*)

Developing Key Statistics Concepts in a Dynamic Technological Learning Environment

Jeremy F. Strayer & Matthew Duncan, *Middle Tennessee State University*

This session reports the results of an investigation of how the TI-Nspire handheld calculator can be used to support students' developing conceptual understanding of sampling, variability, distribution, and average. Session participants will complete an Nspire task together and engage in a discussion of key statistical concepts in this study.

Session 30 (*Coventry*)

When Procedural Is Ingrained: Examining Our Mathematical Practices

Tyrette Carter & Kimberly Erwin, *North Carolina A&T State University*

Effectively preparing candidates to implement the Common Core mathematics standards, when they have developed procedural habits of mind and are unwilling to make the shift from a procedural to a more conceptual approach is a difficult, but necessary task. Cobb & Jackson (2011) stated that improvements in mathematics education involves, not only the mathematics education community, but also this improvement should included a system of individuals who support teacher quality (mathematics educators, administrators, specialists, community leaders, etc.). So, teachers must build their content knowledge and skills to implement equitable mathematical practices by exploring their funds of knowledge and their students.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 31 11:00 a.m.-11:45 a.m.

Session 31 (*2nd Floor Conference Room*)

Perceptions of the Standards of Mathematical Practices and Plans for Implementation

Travis A. Olson, *University of Nevada Las Vegas*; Melfried Olson, *University of Hawaii*

We have soliciting feedback from over 30 teachers on two questions related to each Standard for Mathematical Practice. Specifically, after reading each standard, we asked the teachers: 1) Name one or two things that caught your eye as you read the standard, and 2) What is one way you are, or plan on being, more intentional about this standard in your teaching. In our session we will discuss the depth of responses regarding ideas that stand out for teachers per standard and the depth of implementation teachers perceive they are doing or about which they intend to be more intentional.

Friday, March 1, 2013 Lunch & Business Meeting 12:00 p.m.-1:20 p.m.

Buffet Lunch

Located in the Council Oak Foyer and Ballroom

Friday, March 1, 2013

| Overview of Friday Afternoon Sessions | | | |
|--|---|--|--|
| | 1:30-2:15 | 2:30-3:15 | 3:30-4:15 |
| Woodward | | 39. Preparing Teachers for the CCSS: Looking Towards the Future (Part 1) Bostic, Matney, Brahler, Gojak, & Speer | 45. Preparing Teachers for the CCSS: Looking Towards the Future (Part 2) Bostic, Matney, Brahier, Gojak, & Speer |
| Remington | 32. Academic Rigor in All Girls, All Boys, and Co-Ed Mathematics Classes Che & Bridges | | 46. Examining In-Service Teachers' Beliefs About Using Children's Literature to Teach Mathematics Wheeler |
| Gilcrease | 33. Spatial Reasoning and Problem Solving in Undergraduate Mathematics Prugh | 40. How the Hand Mirrors the Mind: The Embodiment of Numerical Cognition Faulkenberry | 47. The Power of Writing to Learn in the Mathematics Classroom: A New Instructional Model Columba & Drake |
| Philbrook | 34. An Innovative Approach for Supporting At-Risk Students in Algebra 1 Olson, Olson, Slovin, , & Zenigami | 41. An Investigation of Teaching and Learning of Mathematics in a Dual Language Program Taregan | 48. Implementing a Master's Degree Program in OMCIP (Including Certification) George A. Pattison III |
| Dover | 35. Metaphors as a Medium for Hermeneutic Listening for Teachers Sean Yee | 42. The Evolution of Student Ideas: The Case of Multiplication Ricca & Green | 49. Clinical Research's Revelations About Mathematical Knowledge for Teaching Greeno |
| Westminster | 36. How Do ELL Students and Families View Communication in Mathematics? Smith, Silva, & Weinburg | 43. Authentic Discomfort Wall | 50. What are Impediments Standing in the Way of Substantive Teacher Change? Mikusa & Courtney |
| Coventry | 37. Enhancing Mathematics Instruction and Student Success Through an Innovative Model for TAs Nepal & Aichele | 44. The Impact of Instruction on Developing Autonomous Learning in Statistics Bateiha | 51. Successfully Publishing in Investigations Schell |
| 2nd Floor Conference Room | 38. Characterizing Middle School Students' Engagement in a Mathematics Class Leal | | |

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 32-34 1:30 p.m.-2:15 p.m.

Session 32 (*Remington*)

Academic Rigor in All Girls, All Boys, and Coed Mathematics Classes

S. Megan Che & William Bridges, *Clemson University*

In this presentation, we examine one facet of single-sex public mathematics classrooms: academic rigor. Academic rigor is operationalized through the Instructional Quality Assessment (IQA) instrument (Junker, et.al., 2004). For this study, we videoed a total of 30 instructional sessions each for two different teachers who were teaching the same mathematics content to all girls, all boys, and coeducational middle grades (grades 6 and 8) classrooms. We collected videos for 10 instructional sessions for each classroom type (all girls, all boys, and coeducational) for each teacher and then rated the sessions for academic rigor according to the rubrics in the IQA (inter-rater reliability was established before we rated the data for this study and with videos of teachers not participating in this study). During this presentation, we will share the results of the analysis and video clips that illustrate the meanings of the ratings.

Session 33 (*Gilcrease*)

Spatial Reasoning and Problem Solving in Undergraduate Mathematics

Lindsay Prugh, *Oklahoma Christian University*

The need for spatial thinkers is evident in the growing concerns regarding performance in mathematics and the lack of interest in spatially-driven fields. According to NCTM, problem solving is an integral part of all mathematics learning, backing research that has linked spatial thinking to problem solving. The embedded case study to be presented examined how the inclusion of spatial tasks influenced problem-solving performance, spatial thinking ability, and beliefs of undergraduate mathematics students. Data were collected through quantitative and qualitative instruments. The findings of this study suggest the inclusion of spatial thinking tasks has an influence on students' spatial visualization ability, problem-solving strategies, and beliefs about the relevance of spatial thinking.

Session 34 (*Philbrook*)

An Innovative Approach for Supporting At-Risk Students in Algebra 1

Judith Olson, Melfried Olson, Hannah Slovin, & Fay Zenigami, *University of Hawaii*

The Curriculum Research & Development Group has developed, A Modeling Approach to Algebra, a curriculum created to support ninth-grade students' learning algebra with understanding. Under a contract with the Hawaii Department of Education, the materials were developed to support struggling learners by emphasizing modeling as both a practice and mathematics content as described in the Common Core Curriculum Standards for Mathematics. We will discuss the conceptualization and organization of the materials, integration of technology, the pilot work in the first year of implementation, and the research being conducted. Examples of student and teacher materials will be shared.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 35-37 1:30 p.m.-2:15 p.m.

Session 35 (*Dover*)

Metaphors as a Medium for Hermeneutic Listening for Teachers

Sean Yee, *California State University, Fullerton*

The teachers' ability to listen well is critical for pedagogical paradigms such as constructivism and is becoming more necessary with the Common Core State Standards. How do we improve teachers' listening skills? My research has identified a coherent set of conceptual metaphors students and teachers associate with mathematical problem solving. The results of this study will be shared and used as a springboard to discuss how the methodology of my study, Conceptual Metaphor Theory (CMT) analysis, is being applied to improve teacher listening. Specifically, CMT analysis helps teachers move from interpretive listening to hermeneutic listening (Davis, 1997).

Session 36 (*Westminster*)

How Do ELL Students and Their Families View Communication in Mathematics?

Kathy Horak Smith, *Tarleton State University*; Cecilia Silva, Molly Weinburgh, *Texas Christian University*

This study is part of a larger study that focuses on English Language Learners (ELL) acquisition of academic language in mathematics and science. Upper elementary ELL students were involved in an intensive three-week summer school program focusing on communication in mathematics and science. The qualitative analysis of pre- and post- student journal entries, interview transcripts, classroom videos, and photographs of student work shows how students and their parents view communicating mathematically. The initial findings from this study show student growth, but also suggest a continued need for emphasis on communicating through multiple representations.

Session 37 (*Coventry*)

Enhancing Mathematics Instruction and Student Success Through an Innovative Model for TAs

Kedar Nepal & Douglas B. Aichele, *Oklahoma State University*

Mathematics graduate teaching assistants (TA) typically play vital roles in the delivery of the undergraduate mathematics curriculum. Most of those TAs who become faculty in the future experience little professional development in teaching mathematics (Speer, Gutman & Murphy, 2005). Teaching preparation for TAs employed by universities varies widely - ranging from few days of orientation to semester long courses. Inadequate preparation of TAs leaves both TAs and the undergraduate students often dissatisfied (Damrin & West, 1979). I will discuss an innovative TA preparation model developed by professor Douglas B. Aichele at OSU, and the results of ongoing research with TAs.

Friday, March 1, 2013

Friday, March 1, 2013 Session 38 1:30 p.m.-2:15 p.m.

Session 38 (*Woodward*)

Characterizing Middle School Students' Engagement in a Mathematics Class

Lina Sanchez Leal, *Rutgers University*

Engagement refers to a wide spectrum of behavioral, cognitive, and affective structures (Fredricks, Blumenfeld & Paris, 2004). Studies show that when students are solving challenging mathematical problems, their cognitions, behaviors and affect (which includes emotions, attitudes, beliefs, and values) can vary widely, even from moment to moment. Since the type of engagement that students experience can be important for their mathematical learning (McLeod, 1992), our study was designed to investigate the momentary fluctuations and patterns of engagement that occur and how they relate to the mathematical learning of students from a large Urban district, while they work on SimCalc MathWorlds® activities.

Friday, March 1, 2013 Sessions 39-40 2:30 p.m.-3:15 p.m.

Session 39 (*Woodward*)

Preparing Teachers for the CCSS: Looking Towards the Future (Part 1)

Jonathan Bostic, Gabriel Matney & Daniel Brahier, *Bowling Green State University*; Linda Gojak, *John Carroll University*; William Speer, *University of Nevada Las Vegas*

This panel discussion has two aims. First, it will synthesize results from four grant-funded professional development projects focused on supporting teachers' transition to the Common Core State Standards for Mathematics (CCSSM). The projects supported elementary, middle, and high school mathematics teachers. Activities from the professional development and initial evaluation results will be shared. The second aim is to offer guidance for future professional development to help teachers engage with the CCSSM. Presenters will draw on their 75 years of combined experience to empower mathematics teacher educators to create meaningful experiences for inservice and preservice teacher educators learning about the CCSSM.

Session 40 (*Gilcrease*)

How the Hand Mirrors the Mind: The Embodiment of Numerical Cognition

Thomas J. Faulkenberry, *Texas A&M University-Commerce*

Much knowledge about how the mind does mathematics is based on the traditional, computer-based metaphor of cognition that assumes cognition is stage-based and independent of the motor cortex. In the present study, I provide evidence for an alternative view. I recorded participants' hand movements as they chose the correct parity (odd/even) for single-digit numerals. Distributional analyses of these movements indicated that responses resulted from competition between parallel and partially-active mental representations rather than occurring in discrete stages. Furthermore, this competition was carried through to the motor cortex, indicating that numerical representations are more tied to bodily affordances than previously thought.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 41-43 2:30 p.m.-3:15 p.m.

Session 41 (*Philbrook*)

An Investigation of Teaching and Learning of Mathematics in a Dual Language Program

Mehmet Taregan, *Barry University*

Contrary to popular belief, mathematics is neither universal, nor language/culture free. Furthermore, highly contextualized use of language is essential in developing and understanding mathematical concepts (NCTM, 1989). However, the language and the meanings of words in mathematics are often different than their daily usage (Taregan, 2012). This study focuses on a High School Dual Language Program that offers approximately 50 students the opportunity to continue to learn mathematics in their first language, Haitian Creole, and in English. Various challenges faced in teaching and learning mathematical concepts bilingually, as well as the impact bilingual instruction has on achievement will be discussed.

Session 42 (*Dover*)

The Evolution of Student Ideas: The Case of Multiplication

Bernard Ricca & Kris Green, *St. John Fisher College*

The genesis of ideas, studied by Piaget and others, is important in understanding how students learn, which in turn, informs pedagogy. Using biological genetics as a metaphor for learning, we revisit previous work on multiplication, examine some teachers' explanations of multiplication and explore how these teachers use their explanations to generate new understandings of multiplication. This examination supports the use of the biological metaphor, and provides some insight into how to teach multiplication and how to help students become flexible in their understanding of multiplication.

Session 43 (*Westminster*)

Authentic Discomfort

Edward Wall, *City College of New York*

Much has been written about uncertainty in mathematics teaching. Uncertainty, I am told, can be something to be embraced. I become, as one scholar has put it, "a guide on the side." On the other hand, uncertainty, it appears, is something to be minimized. I become, as another scholar has put it, "a sage on the stage."

Intriguingly, many effective mathematics teachers seem to blend these two seemingly incompatible stances toward uncertainty. In this essay, trying to get a better grip on the place, on the phenomena of uncertainty within mathematics teaching, I wonder why and how.

Friday, March 1, 2013

Friday, March 1, 2013 Session 44 2:30 p.m.-3:15 p.m.

Session 44 (*Coventry*)

The Impact of Instruction on Developing Autonomous Learners in Statistics

Summer Bateiha, *Western Kentucky University*

This study examines the influence of instruction method on student learning. One section of introductory statistics was taught using a teacher-centered lecture-based approach, and one section was taught using a student-centered collaborative-learning approach. The findings we present here focus on the development of autonomous learners. In particular, they address how students in the non-lecture class were required to take more responsibility for their own learning, whereas much of that responsibility seemed to fall on the instructors' shoulders in the lecture-based class.

Friday, March 1, 2013 Sessions 45-46 3:30 p.m.-4:15 p.m.

Session 45 (*Woodward*)

Preparing Teachers for the CCSS: Looking Towards the Future (Part 2)

Jonathan Bostic, Gabriel Matney & Daniel Brahier, *Bowling Green State University*; Linda Gojak, *John Carroll University*; William Speer, *University of Nevada Las Vegas*

This panel discussion has two aims. First, it will synthesize results from four grant-funded professional development projects focused on supporting teachers' transition to the Common Core State Standards for Mathematics (CCSSM). The projects supported elementary, middle, and high school mathematics teachers. Activities from the professional development and initial evaluation results will be shared. The second aim is to offer guidance for future professional development to help teachers engage with the CCSSM. Presenters will draw on their 75 years of combined experience to empower mathematics teacher educators to create meaningful experiences for inservice and preservice teacher educators learning about the CCSSM.

Session 46 (*Remington*)

Happily Ever After: Examining In-Service Teachers' Beliefs About Using Children's Literature to Teach Mathematics

Ann Wheeler, *Texas Woman's University*

During this session, attendees will learn how incorporating children's literature in the mathematics classroom impacted 18 middle school (Grades 6-8) inservice teachers' mathematics pedagogy. Data collection consisted of pre-tests, background surveys, journal article reviews, and daily reflections. Based on data analysis, findings suggest that all participants were receptive to the idea of using children's fiction in their mathematics classroom with seven claiming to want to incorporate fiction more than ever before in the upcoming years. Examples of children's literature with teaching tips and sample lesson ideas will also be discussed.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 47-49 3:30 p.m.-4:15 p.m.

Session 47 (*Gilcrease*)

The Power of Writing to Learn in the Mathematics Classroom: A New Instructional Model

Lynn Columba, *Lehigh University*; Bob Drake, *University of Cincinnati*

Much can be learned from formal, extended, and public writing using a process model approach (Graves, 1983). Writing in the mathematics classroom is often developed from the following perspective: 1) Opportunity to organize and clarify concepts; 2) the benefits as a diagnostic tool; and, 3) an opportunity to clear up misunderstandings. In turn, this feedback can be used to help teachers become more effective (Drake & Amspaugh, 1994). In many instances teachers in mathematics adhere to the model of writing which is the following: Organize and Clarify Concepts for Understanding and Retention (OCCUR) (Wellman, Columba, Kim, & Moe, 2012).

Session 48 (*Philbrook*)

Implementing a Master's Degree Program in OMCIP (Including Certification)

George A. Pattison III, *Independent Consultant*

At the 39th RCML Conference in Charlotte, NC, I discussed a theory-driven, "open" clinical intervention process for describing and treating atypical underlying blocks to teaching/ learning Mathematics. The presentation included a proposed Master's Degree in Open Mathematics Clinical Intervention Process, which program included certification. Recall, my research had revealed unusual and seemingly limitless blocks, emanating from any of six learner impacting domains (Social, Cognitive, Affective, Psychomotor, Environmental and Spiritual), and often having little to do with Mathematics.

Our Working Group will critique and refine the degree program giving attention to its underlying tenants, while providing advice for future dissemination.

Session 49 (*Dover*)

Clinical Research's Revelations About Mathematical Knowledge for Teaching

Clyde Greeno, *The American Institute for the Improvement of Mathematics Learning and Instruction*

Eductive methods of clinical research frequently detect how and why students' difficulties in perceiving the mathematical sensibility, and the mathematical reasonability of instructional presentations are natural consequences of mathematical holes and gaps in the American core curriculum. As teachers respond to the state standards, their own mathematical knowledge must empower them to increase students' mathematical comprehension by overcoming such mathematical flaws in instructional media. Examples of little known curricular omissions will focus on the arithmetics of whole numbers and fractions. The clinical findings call for major reforms in the mathematical education of teachers at all levels of school mathematics.

Friday, March 1, 2013

Friday, March 1, 2013 Sessions 50-51 3:30 p.m.-4:15 p.m.

Session 50 (*Westminster*)

Secondary PD: What are Impediments Standing in the Way of Substantive Teacher Change?

Michael Mikusa *Kent State University*; Scott Courtney, *Kent State University*

During our presentation we will present both quantitative and qualitative evidence that will illustrate how our effort has impacted student achievement and teacher's practices. Student achievement was measured by end of year state tests and by teacher created common assessments. Classroom observations were used to gather data on changes in practices as well as interviews that were conducted to determine development of community. We see trends in this data and will be asking participants to comment on our analysis as well as their own research efforts regarding secondary mathematics teachers. In addition to this data, we will present data which lists many impediments to significant long-term change in teacher practices and student learning. We encourage participants to engage and share their experiences for possible future collaborations.

Session 51 (*Coventry*)

Successfully Publishing in Investigations

Vicki Schell, Pensacola State College

In this session, I will discuss the submission process, review of manuscripts, revision process, and publication in the RCML journal *Investigations in Mathematics Learning*. Potential authors and referees are encouraged to attend. The session will end with a question and answer period.

Friday, March 1, 2013

Friday, March 1, 2013 Founders' Lecture 4:30 p.m.-5:20 p.m.

Melfried and Judy Olson
University of Hawaii



Firm Foundations Forged by Founders and Those that Follow

The lens through which we view our profession is shaped during our graduate studies and our early professional experiences, which hopefully includes RCML. We will provide examples showing how the early mission of RCML (aka RCDPM) to stimulate, generate, coordinate and disseminate research efforts that focus on the learning of mathematics with particular emphasis on those factors which inhibit maximal learning is currently exemplified in many standard practices in mathematics education. What foundations can we establish so RCML's mission can influence future directions in mathematics education?

Located in the Council Oak Ballroom

Special Thanks

A special thank you to the following volunteers for their help with making the conference run smoothly through their help with registration and technology.

Keith Adolphson
Diana Early
Cynthia Orona
Dan Sisk
Dena Walker

A VERY special thank you to Brit'ny Stein for her countless hours helping with the 40th RCML Conference Program.

Saturday, March 2, 2013

| Overview of Saturday Morning Sessions | | | | |
|---|---|--|--|---|
| | 8:00-8:45 | 9:00-9:45 | 10:00-10:45 | 11:00-11:45 |
| Woodward | 52. Powerful Actions to Enrich Implementation of Standards-Based Instruction Mitchell | 60. Student Perceptions and Potential Use of Non-Traditional Instruction Conrady & James | 68. Examining Teacher-Student Gender Interaction in Mathematics Classroom Carter & Che | |
| Remington | 53. Developing Discourse that Promotes Reasoning and Proof Lu | 61. The Primacy Fraction Components in Adults' Numerical Judgments Faulkenberry & Montgomery | 69. Bricks in a Field: Research on the Learning of Calculus Zollman | 76. Elementary Pre-service Teachers and Questioning Strategies in Mathematics Browning |
| Gilcrease | 54. Secondary Mathematics Alternative Certification Teacher Problem Solving Evans | 62. Exploring Teachers' Categorizations and Conceptions of Combinatorial Problems Wasserman | 70. The Power of Writing to Learn in the Mathematics Classroom Columba & Drake | 77. Pre-service Teachers' Emotional Engagement with the Tower of Hanoi Ives, Young, & Guardiola |
| Philbrook | 55. A Professor's Journey in Teaching the NCTM Process Standards Smith & Conrady | 63. Elementary Teachers' Readiness to Implement the Common Core Mathematics Standards Redmond-Sanogo | 71. Mathematical Me: K-8 PST Mathematical Autobiographies in First Content Course Ives | 78. Pre-service Teachers' Perceptions and Use of Number Relationships Mary Barbara Lewis |
| Dover | 56. Analyzing Correct vs. Incorrect Samples: Impact on Mathematical Proficiency Moseley | 64. Gauging Students' Perceptions of STEM David | 72. Algebra I Teachers and Inclusion Thompson | 79. A Comparative Analysis of the Effects of Learning Styles on Performance Ma & Ma |
| Westminster | 57. Serving through Precalculus: Teacher Reflections and Student Preconceptions Ives & Bannerjee | 65. Kindergarten Students Exploring Big Ideas: An Evolution for Teachers Olson & Zenigami | 73. Where Equity and Knowledge Meet: Teaching Teachers to Teach Phillips & Ma | 80. Understanding the Experiences of Developmental Mathematics Students Phillips |
| Coventry | 58. Geometry Teachers' Transition to CCSS: Impact of a PD Grant on Knowledge and Practice McGehee | 66. Elementary Mathematics Specialists in Oklahoma: Programs and Research Reeder & Utley | 74. Beliefs About Geometry Cuevas & White | 81. An APOS Analysis of Calculus Student Comprehension of Continuity Wangle |
| 2nd Floor Conference Room | 59. Technology and Interactive Whiteboard Usage in Higher Education Mathematics Walker | 67. The Impact of a Technology Intensive Professional Development Jiang | 75. Technology and Discourse Adolphson | 82. Algebra: Gatekeeper or Gateway? Jordan |

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 52-55 8:00 a.m.-8:45 a.m.

Session 52 (*Woodward*)

Powerful Actions to Enrich the Implementation of Standards-Based Instruction

Suzanne Mitchell, *National Council of Supervisors of Mathematics*

Mathematics faculty have unique leadership opportunities to share instructional ideas and resources to influence mathematics leaders. The National Council of Supervisors of Mathematics (NCSM) has tools and strategies to enrich your mathematics classroom and improve student interest and motivation. Current research from NCSM Position Papers will be shared.

Session 53 (*Remington*)

Developing Discourse that Promotes Reasoning and Proof

Lianfang Lu, *University of Arkansas at Little Rock*; Thomas E. Ricks, *Louisiana State University*

This case study is part of a larger study investigating mathematics teaching reform in China. This study investigated a high-quality model lesson that represented the recommended instructional practices in current Chinese mathematics education reform. We focused our analysis on the design of the lesson, the unfolding of discourse, and the development of students' mathematical reasoning and proof in the lesson. Findings indicate a recursive inquiry-based instruction design that emphasized the process of conjecturing, testing, revising and proof. It also indicates an evolving discourse with increasing mathematical understanding and reasoning skills.

Session 54 (*Gilcrease*)

Secondary Mathematics Alternative Certification Teacher Problem Solving

Brian Evans, *Pace University*

The purpose of this study was to understand alternative certification middle and high school teachers' mathematical problem solving abilities and perceptions. Participants were given a problem solving examination and required to reflect upon their students' and their own problem solving. Findings revealed there was a significant improvement in problem solving abilities for the teachers over the course of the semester, and there was a direct correlation between content knowledge and problem solving ability. Teachers perceived their students' problem solving abilities as generally weak due to not understanding how to start a problem, lack of persistence, and poor literacy skills.

Session 55 (*Philbrook*)

A Professor's Journey in Teaching the NCTM Process Standards

Kathy Horak Smith, *Tarleton State University*; Kansas Conrady, *University of Oklahoma*

Preliminary results from a multi-year research study of a mathematics education professor's teaching practices and beliefs will be presented. Even though the professor teaches a mathematics content course, teaching practices based on the NCTM Process Standards are demonstrated and discussed during the class. Through the analysis of lesson plans, video tapes, professor's journal entries, and interviews, as well as student responses, researchers will show the alignment and misalignment of teaching practices and how these changed over time.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 56-58 8:00 a.m.-8:45 a.m.

Session 56 (*Dover*)

Analyzing Correct vs. Incorrect Samples: Impact on Mathematical Proficiency

Lauren Jeneva Moseley, *University of Tennessee, Knoxville*

NCTM suggests that students critique peers' problem-solving strategies (2000); however, what are differences between analyzing correct and incorrect student work samples? 181 calculus students were randomly assigned to two groups: one analyzing correct and one analyzing incorrect student work samples. Accounting for pretest data, what difference exists between the two groups in (a) final exam scores? (b) determining correct solutions to problems similar to the work samples analyzed? (c) replication of errors similar to the incorrect work samples? (d) perceptions of how analysis of student work samples impacts mathematical proficiency? and (e) descriptions of their experiences analyzing student work samples?

Session 57 (*Westminster*)

Serving through Precalculus: Teacher Reflections and Student Preconceptions

Sarah E. Ives, *Texas A&M University- Corpus Christi*; Pragati Bannerjee, *Roy Miller HS Metropolitan School of Design*

Service Learning can be an excellent way for students to apply knowledge from school mathematics to their community. During the 2012-2013 academic year 110 high school students are participating in a study on the use of service learning in pre-calculus. The purpose of the study is to investigate impacts of service learning on student motivation and engagement as well as students' perceptions of learning mathematics. Data are collected from projects, pre- and post-surveys of students' perceptions. This presentation will report on the process of introducing service learning into an existing pre-calculus curriculum, challenges encountered, and preliminary findings from the study.

Session 58 (*Coventry*)

Geometry Teachers' Transition to CCSS: Impact of a PD Grant on Knowledge and Practice

Jean J. McGehee, *University of Central Arkansas*

High school geometry teachers participated in an NCLB funded summer institute and follow-up seminars to integrate knowledge of the van Hiele levels of understanding geometry, the Geometric Habits of Mind (Mark Driscoll's work in *Fostering Geometric Thinking*), and Geometer's Sketchpad with the requirements of the new Common Core Curriculum. This session presents all the data from the project including pre/post test results for both teachers and their students, observations of teacher practice and related student work, as well as documentation of their progress with GSP and its use in their classrooms. There were some nice surprises.

Saturday, March 2, 2013

Saturday, March 2, 2013 Session 59 8:00 a.m.-8:45 a.m.

Session 59 (*2nd Floor Conference Room*)

Technology and Interactive Whiteboard Usage in Higher Education Mathematics

Dena Walker, *Northwestern Oklahoma State University*

University faculty members have some hard questions to ask themselves. How can the needs of the digital native students be met in our classrooms? How can technology be utilized to meet those needs? How must the instructional techniques and strategies change? This session will present preliminary findings from a pilot study that was conducted to test a survey that focuses on technology and interactive whiteboard usage at the higher education level. The purpose is to have an open discussion on the creation of the survey, preliminary results, and receive feedback from attendees to improve the survey for future use.

Saturday, March 2, 2013 Sessions 60-61 9:00 a.m.-9:45 a.m.

Session 60 (*Woodward*)

Student Perceptions and Potential Use of Non-Traditional Instruction

Kansas Conrady, *University of Oklahoma*; Wendy James, *University of Central Oklahoma*

We will share the findings from a two-part survey administered to Elementary Pre-Service Teachers during a geometry content course designed to provide non-traditional learning experiences to the student. This course provides the first non-traditional learning experience for many of the students and thus may have a profound impact on their understandings of what a non-traditional instruction entails. Responses from the open-ended questions in Part 1 of the survey along with descriptors from the course-adopted text were used to develop the rank order items found on Part 2.

Session 61 (*Remington*)

The Primacy Fraction Components in Adults' Numerical Judgments

Thomas J. Faulkenberry & Sarah A. Montgomery, *Texas A&M University- Commerce*

A fundamental question in numerical cognition concerns how people make judgements about the magnitude of fractions. There is much debate around the issue of whether fraction representations are holistic or component-based. In the present study, we measured hand movements as people mentally compared fractions to $1/2$. We found that participants' hands tended to move according to the size of components rather than the overall magnitude of the fraction. This indicates that people form an initial automatic representation that is tied to surface format (i.e., component-based), but later refine this representation according to task demands.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 62-64 9:00 a.m.-9:45 a.m.

Session 62 (*Gilcrease*)

Exploring Teachers' Categorizations and Conceptions of Combinatorial Problems

Nicholas H. Wasserman, *Southern Methodist University*

While counting is simple enough, counting problems span the spectrum of difficulty. Although mathematicians who study combinatorics have succinct categories for differing problem types (with and without repetition, ordered and unordered selection), students struggle to solve problems (Eizenberg & Zaslavsky, 2004) and to identify related problem structures (English, 2005). In a graduate course, K-12 mathematics teachers (n=7) were introduced to combinatorial problems and then given a set of problems and asked to categorize them. Results from this qualitative study specify ways that novice combinatorialists (but mathematics teachers) identified similarities between problems; particularly difficult cases reveal poignant conceptions and explanatory categorizations.

Session 63 (*Philbrook*)

Elementary Teachers' Readiness to Implement the Common Core Mathematics Standards

Adrienne Redmond-Sanogo, *Oklahoma State University*

As a part of a larger study that examined the readiness of Oklahoma fourth and fifth grade teachers' readiness to implement the Common Core Mathematics Standards, this mixed methods study focused on exploring teachers' understanding of the learning trajectories for teaching fractions. Additionally, teachers' content knowledge of fraction operations was explored. Findings will be shared and strategies for developing appropriate professional development opportunities will be discussed.

Session 64 (*Dover*)

Gauging Students' Perceptions of STEM

Kimberly Davis, *Oklahoma State University*

A renewed push for STEM Education in the US is evident as we struggle to maintain leading status as one of the world's strongest, innovative countries. To regain its economic status as a world superpower, more American students must be prepared to enter STEM careers (Thompson & Bolin, 2011). Currently, high school graduates have been found unprepared for postsecondary education and the workforce in critical STEM areas (Toulmin & Groome, 2007; NSB, 2007). In response, this research study gauged student's interest and perception of STEM content and careers. Findings from the study and implications for STEM teachers will be discussed.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 65-67 9:00 a.m.-9:45 a.m.

Session 65 (*Westminster*)

Kindergarten Students Exploring Big Ideas: An Evolution for Teachers

Melfried Olson & Fay Zenigami, *University of Hawaii*

This session describes the experiences of a team of kindergarten teachers as they came to grips with what ideas students could meaningfully explore, represent, and communicate. We will showcase how teachers collaboratively planned problem-solving lessons for their students and in the process explored mathematics ideas that previously puzzled them. We will examine students' work that demonstrated their engagement in the mathematics of the lessons, teachers' reflections on the lessons, teachers' thoughts about the significance of their students' thinking, and in the manner in which they orchestrated student-student communication.

Session 66 (*Coventry*)

Elementary Mathematics Specialists in Oklahoma: Programs and Research

Stacy Reeder, *University of Oklahoma*; Juliana Utley, *Oklahoma State University*

In an effort to improve mathematics teaching and learning in the state of Oklahoma, an elementary mathematics specialist certification has been recently developed. This presentation will provide participants the competencies developed for this new add-on certification as well as information about the competency setting process. Additionally, the programs, from two universities, designed to satisfy the elementary mathematics specialist certification competencies will be presented along with a multi-phase research effort being undertaken in the state.

Session 67 (*2nd Floor Conference Room*)

The Impact of a Technology Intensive Professional Development

Zhonghong Jiang, *Texas State University San Marcos*

An NSF funded project investigates the efficacy of the dynamic geometry approach to high school geometry instruction. This presentation will describe a study that examines the impact of the professional development component of this research project on the improvement of teachers' content knowledge. Interviews with selected teachers provided evidence that teachers in the experimental group were very competent in using the software to conduct geometric explorations, and then make and test conjectures. However, as to proving their conjectures, teachers varied considerably. Some could generate correct proofs, mostly for relatively simple geometric problems, and the others were quite weak in proofs.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 68-70 10:00 a.m.-10:45 a.m.

Session 68 (*Woodward*)

Gender Matters: Examining Teacher-Student Gender Interaction in Mathematics Classroom Discourse

Traci L. Carter & S. Megan Che, *Clemson University*

In mathematics education, there continues to be a great deal of focus on gender equity with much of this research being focused on comparing the academic achievement of boys and girls. One area in the field of mathematics education that has been neglected in the research is the teacher-student gender interaction in mathematics classroom discourse. The purpose of this study is to analyze and compare the discourse of single-sex and coeducational middle grades mathematics classes taught by male teachers and female teachers. This study could help identify possible explanations for the underrepresentation of females in mathematics courses and mathematics fields.

Session 69 (*Remington*)

Bricks in a Field: Research on the Learning of Calculus

Alan Zollman, *Northern Illinois University*

Research has made a lot of very nice bricks (research studies), but there is not a design plan of what kind of bricks to make and where each individual brick should be placed in relation to other bricks to build something substantial and useful. So it is with student difficulties in learning calculus. The isolated nature of research studies is a hindering factor in building a cohesive knowledge depository. This is a presentation of the research on pre-requisite and requisite calculus concepts (from function notation through limits and continuity) for the purpose of helping students better understand calculus.

Session 70 (*Gilcrease*)

The Power of Writing to Learn in the Mathematics Classroom: A New Instructional Model

Lynn Columba, *Lehigh University*; Bob Drake, *University of Cincinnati*

Much can be learned from formal, extended, and public writing using a process model approach (Graves, 1983). Writing in the mathematics classroom is often developed from the following perspective: 1) Opportunity to organize and clarify concepts; 2) the benefits as a diagnostic tool; and, 3) an opportunity to clear up misunderstandings. In turn, this feedback can be used to help teachers become more effective (Drake & Amspaugh, 1994). In many instances teachers in mathematics adhere to the model of writing which is the following: Organize and Clarify Concepts for Understanding and Retention (OCCUR) (Wellman, Columba, Kim, & Moe, 2012).

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 71-73 10:00 a.m.-10:45 a.m.

Session 71 (*Philbrook*)

Mathematical Me: K-8 PST Mathematical Autobiographies in First Content Course

Sarah E. Ives, *Texas A&M University- Corpus Christi*

This study examines the mathematical autobiographies of 60 prospective K-8 teachers enrolled in three sections of the first of three mathematics content courses for teachers. The prospective teachers were required to write a 2-3 page reflection on their experiences as a mathematician, including emotions, attitudes, and beliefs about mathematics and what their mathematical experiences mean for learning and teaching mathematics. At the end of the course they revisited their journals and reflected on how their emotions, attitudes, and beliefs about learning and teaching mathematics changed, if at all. The presentation will report initial findings and implications for teacher education.

Session 72 (*Dover*)

Algebra I Teachers and Inclusion

Anthony Thompson, *East Carolina University*

Over the last decade, the percentage of students with disabilities taught in general education classrooms has increased significantly. However, little is known about inclusive education in specific courses such as Algebra I which often poses a significant challenge (even for students without disabilities). This study investigated Algebra I teachers' perceptions of teaching students with learning disabilities and their use of "best practices". This proposal addresses the mission of RCML in its effort to disseminate research that seeks to better understand mathematics teachers' perceptions of inclusion which is a major factor that affects the teaching and learning of mathematics.

Session 73 (*Westminster*)

Where Equity and Knowledge Meet: Teaching Teachers to Teach

Glenn Allen Phillips, *Texas A&M University*

As the main focus a three million dollar National Science Foundation grant, pre-service teachers are currently being taught both equity and math knowledge. Using a virtual platform, Second Life, pre-service teachers get the chance to instruct student avatars in a no risk environment. This presentation will highlight the purposes of the grant, the current state of the project, and how the lines of equity and content knowledge build on one another.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 74-75 10:00 a.m.-10:45 a.m.

Session 74 (*Coventry*)

Beliefs About Geometry

Gilbert Cuevas & Alexander White, *Texas State University- San Marcos*

Past research has shown the importance of affective factors on learning in mathematics. This paper describes the analysis of results of the first instrument specifically designed to assess students' beliefs about geometry. The final form of the instrument consisted of 18 items given to over 1200 high school geometry students. A factor analysis of the responses identified two factors. Eight of the items converged at the first factor represented as beliefs about the general nature of geometry. Ten items were grouped around a second factor addressing beliefs about the processes of geometric thinking.

Session 75 (*2nd Floor Conference Room*)

Technology and Discourse

Keith Adolphson, *Technology and Discourse*

Pre-service elementary education students often have a very narrow view of mathematics and what it means to teach mathematics. Technology can provide a vehicle for them to reconsider those ideas. This session discusses the use of technology to further discourse among pre-service elementary mathematics methods students through the use of Livescribe pencasts. The capabilities of Livescribe pens will be demonstrated and specific examples of student originated pencasts will be examined. Exemplars will serve as a vehicle for discussing the potential of pencasts for developing discourse and enriching mathematical understanding.

Saturday, March 2, 2013 Session 76 11:00 a.m.-11:45 a.m.

Session 76 (*Remington*)

Elementary Pre-service Teachers and Questioning Strategies in Mathematics

Sandra Browning, *University of Houston, Clear Lake*

Recent research has demonstrated an increased interest in the relationship between teachers' questioning strategies and children's ability to reason (Baroody & Ginsburg, 1990; Buschman, 2001; Carpenter, Fennema, Peterson, Chiang & Loef, 1989; Fennema, Carpenter, Franke, & Carey, 1993; Fennema, Franke, Carpenter & Carey, 1993, Sousa, 2000). Helping preservice teachers develop effective questioning strategies can be an important component of a teacher education program. This session describes a pilot exploration designed to determine how well EC-6 preservice teachers can (a) recognize effective questioning strategies when observing inservice teachers and (b) analyze the effectiveness of their own questioning strategies after field experiences.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 77-79 11:00 a.m.-11:45 a.m.

Session 77 (*Gilcrease*)

Pre-service Teachers' Emotional Engagement with the Tower of Hanoi

Sarah E. Ives, Elaine Young, Jose Guardiola

Engaging pre-service teachers in challenging yet accessible problem-solving tasks can potentially impact strongly held negative beliefs about mathematics. Pre-service elementary and middle school teachers in the first of three mathematics content courses engaged in the cognitively demanding task of the Tower of Hanoi puzzle. Qualitative analysis of 275 reflective journals were paired with quantitative analysis of 88 questionnaires. Results revealed significant changes in emotion, from neutral to negative to positive across the time period for the task.

Session 78 (*Philbrook*)

Pre-service Teachers' Perceptions and Use of Number Relationships

Mary Barbara Lewis, *Oklahoma State University*

The purpose of this study is to uncover number relationships, foundational aspects of number sense, elementary educators perceive and utilize in grappling with the base-ten number system. Development of number relationships provides opportunities for individuals to move beyond counting, memorization of facts and procedures, and an over-reliance on technology in grappling with computation and mathematical problem solving. In this descriptive case study, the researcher explored how two pre-service teachers in a first mathematics methods course perceive the relationships between and among the numbers 1-20.

Session 79 (*Dover*)

A Comparative Analysis of the Effects of Learning Styles on Performance in Mathematics

Vania J. Ma, *Paul Laurence Dunbar High School*; Xin Ma, *University of Kentucky*

One of the most enduring concerns among mathematics educators is the enhancement of knowledge and skills through effective learning. This study utilizes the 2003 Programme for International Student Assessment (PISA) to examine the relationship between learning styles and mathematics performance in the United States, Hong Kong, Japan, and Korea. Results of hierarchical linear modeling (HLM) demonstrate that while competitive learning has a strong positive impact on mathematics performance across all countries, the superior performance of Asian students relative to American students in mathematics is consistently attributed to their ability to employ cooperative learning more effectively. These results enhance understanding of the disparities in mathematics performance between American and Asian students in the context of mathematics learning styles.

Saturday, March 2, 2013

Saturday, March 2, 2013 Sessions 80-82 11:00 a.m.-11:45 a.m.

Session 80 (*Westminster*)

I'm Not a Math Person: Understanding the Experiences of Developmental Mathematics Students

Glenn Allen Phillips, *Blinn College*

Developmental education is both a gateway and a litmus test for many non-traditional and under-prepared students. Historically these are often under-served students as well. To better teach these students, we must better understand them. Through reflective exercises with over 300 students, I have started to gain a better perspective on developmental math student needs, experiences, and characteristics.

Session 81 (*Coventry*)

An APOS Analysis of Calculus Student Comprehension of Continuity

Jayleen Wangle, *Northern Illinois University*

Even though continuity is a central concept in calculus, the brief attention often given to the subject communicates to students that the concept is of little importance. Previous research shows that students have difficulties with function and limit. Since these concepts are essential to the notion of continuity, it makes sense that misconceptions in these areas contribute to misconceptions of continuity. This study uses a mixed methods model to investigate collegiate calculus students' understanding of continuity within the framework of APOS theory.

Session 82 (*2nd Floor Conference Room*)

Algebra: Gatekeeper or Gateway?

Pat Jordan, *Oklahoma State University*

A historical review of algebra curriculum as it has been influenced by the 2000 Standards and the impending changes that arise under the Common Core Curriculum Standards. Will algebra continue to be a gatekeeper or will changes encourage the success of more students and serve as a gateway to future endeavors?

Saturday, March 2, 2013

Saturday, March 2, 2013 Lunch & Keynote Speaker 12:00 p.m.-1:30 p.m.

Linda Gojak



Building Teacher Content Knowledge through Reasoning and Making Sense

The content standards and mathematical practices of the Common Core State Standards support the learning of mathematics through providing students with opportunities to reason and make sense of the mathematics they are learning. Strategies comparable to those used with students can help teachers to develop a deeper understanding of the content of the common core while encouraging development of the mathematical practices. Let's look at some specific examples.

Boxed Lunch

Located in the Council Oak Foyer and Ballroom

Presenter's Index

| Presenter Name | Affiliation | Email | Session Number |
|-----------------------|--|------------------------------|-----------------------|
| Abney, Angel | <i>Georgia College</i> | angel.abney@gcsu.edu | 13 |
| Adolphson, Keith | <i>Eastern Washington University</i> | kadolphson@ewu.edu | 75 |
| Aichele, Douglas | <i>Oklahoma State University</i> | aichele@math.okstate.edu | 37 |
| Baker, Mary | <i>University of North Dakota</i> | mary.baker@email.und.edu | 21 |
| Bannerjee, Pragati | <i>Roy Miller HS Metropolitan School of Design</i> | Pragati.Bannerjee@ccisd.us | 57 |
| Bateha, Summer | <i>Western Kentucky University</i> | summer.bateiha@wku.edu | 44 |
| Bates, Rachel | <i>The University of Oklahoma</i> | rachel.m.bates-1@ou.edu | 20 |
| Bostic, Jonathan | <i>Bowling Green State University</i> | bosticj@bgsu.edu | 39, 45 |
| Brahler, Daniel | <i>Bowling Green State University</i> | brahier@bgsu.edu | 39, 45 |
| Bridges, William | <i>Clemson University</i> | wbrdgs@clemson.edu | 32 |
| Brown, Sue | <i>University of Houston Clear Lake</i> | browns@uhcl.edu | 4 |
| Browning, Sandra | <i>University of Houston Clear Lake</i> | browning@uhcl.edu | 76 |
| Carter, Tyrette | <i>North Carolina A&T State University</i> | tscarte1@ncat.edu | 30 |
| Carter, Traci | <i>Clemson University</i> | tracic@clemson.edu | 68 |
| Carver, Lin | <i>Saint Leo University</i> | melinda.carver@saintleo.edu | 9 |
| Cassel, Darlinda | <i>University of Central Oklahoma</i> | dcassel2@uco.edu | 12 |
| Cerezo, Nancy | <i>Saint Leo University</i> | nancy.cerezo@saintleo.edu | 9 |
| Che, Megan | <i>Clemson University</i> | sche@clemson.edu | 32, 68 |
| Columba, Lynn | <i>Lehigh University</i> | hlc0@lehigh.edu | 25, 47, 70 |
| Conrady, Kansas | <i>University of Oklahoma</i> | kansas.conrady@ou.edu | 55, 60 |
| Cuevas, Gilbert | <i>Texas State University</i> | gc24@txstate.edu | 74 |
| Davis, Kimberly | <i>Oklahoma State University</i> | kimbeed@okstate.edu | 64 |
| Disabato, Sharyn | <i>Saint Leo University</i> | sharyn.disabato@saintleo.edu | 9 |
| Drake, Bob | <i>University of Cincinnati</i> | bob.drake@uc.edu | 47, 70 |
| Eddy, Colleen | <i>University of North Texas</i> | colleen.eddy@unt.edu | 7 |

Presenter's Index

| Presenter Name | Affiliation | Email | Session Number |
|-----------------------|---|---------------------------------|-----------------------|
| Evans, Brian | <i>Pace University</i> | bevans@pace.edu | 54 |
| Faulkenberry, Eileen | <i>Texas A&M University-Commerce</i> | Eileen.Faulkenberry@tamuc.edu | 26 |
| Faulkenberry, Thomas | <i>Texas A&M University-Commerce</i> | Thomas.Faulkenberry@tamuc.edu | 40, 61 |
| Fields, Melanie | <i>University of North Texas</i> | melanie.fields@unt.edu | 3 |
| Foster, Lucas | <i>Oklahoma State University</i> | fosterlb@nsuok.edu | 22 |
| Gojack, Linda | <i>NCTM/John Carroll University</i> | lgojak@sbcglobal.net | 39, 45 |
| Green, Kris | <i>St. John Fisher College</i> | kgreen@sjfc.edu | 42 |
| Greeno, Clyde | <i>MAEI Mathematics Institute</i> | greeno@malei.org | 49 |
| Hanlon, Adele | <i>Jacksonville University</i> | ahanlon@ju.edu | 12 |
| Harper, Mary | <i>East Central Univeristy</i> | mharper@ecok.edu | 15 |
| Hayata, Carole | <i>Texas Woman's University</i> | chayata@twu.edu | 19 |
| Heitz, Layne | <i>Southeastern Oklahoma State University</i> | lheizt@se.edu | 7 |
| Hughes, Teresa | <i>Prairie View A&M University</i> | tannah3@hotmail.com | 1 |
| Ichinose, Cherie | <i>California State University, Fullerton</i> | cichinose@fullerton.edu | 11 |
| Ives, Sarah | <i>Texas A&M University- Corpus Christi</i> | sarah.ives@tamucc.edu | 57, 71, 77 |
| James, Wendy | <i>University of Central Oklahoma</i> | wmjames@okstate.edu | 60 |
| Jiang, Zhonghong | <i>Texas State University</i> | zj10@txstate.edu | 67 |
| Jordan, Pat | <i>Oklahoma State University</i> | patricia.jordan@okstate.edu | 51 |
| Krebs, Angela | <i>University of Michigan Dearborn</i> | askrebs@umd.umich.edu | 23 |
| Lewis, Mary Barbara | <i>Oklahoma State University</i> | mary.b.lewis@okstate.edu | 78 |
| Lillard, Joan Eileen | <i>University of Oklahoma</i> | Joan.E.Lillard-1@ou.edu | 8 |
| Lu, Lianfang | <i>University of Arkansas at Little Rock</i> | lxlu@ualr.edu | 27, 53 |
| Lucas, Carol | <i>University of Central Oklahoma</i> | clucas@uco.edu | 12 |
| Ma, Vania | <i>Paul Laurence High School</i> | vaniam@stu.fayette.kyschools.us | 79 |
| Mallam, Winifred | <i>Texas Woman's University</i> | wmallam@twu.edu | 28 |

Presenter's Index

| Presenter Name | Affiliation | Email | Session Number |
|-----------------------------|---|------------------------------|-----------------------|
| Matney, Gabriel | <i>Bowling Green State University</i> | gmatney@bgsu.edu | 39, 45 |
| McGehee, Jean | <i>University of Central Arkansas</i> | jeanm@uca.edu | 58 |
| Menon, Ramakrishnan | <i>Georgia Gwinnett College</i> | rmenon65@gmail.com | 6 |
| Mikusa, Michael | <i>Kent State University</i> | mmikusa@kent.edu | 50 |
| Mitchell, Suzanne | <i>National Council of Supervisors of Mathematics</i> | suzmitch@comcast.net | 52 |
| Moseley, L. Jeneva | <i>University of Texas</i> | jmoseley@math.utk.edu | 56 |
| Nepal, Kedar | <i>Oklahoma State University</i> | knepal@math.okstate.edu | 37 |
| Nottingham, Maribeth | <i>Southeastern Oklahoma State University</i> | mnottingham@se.edu | 26 |
| Olson, Melfried | <i>University of Hawaii</i> | melfried@hawaii.edu | 31, 34, 65 |
| Olson, Judith | <i>University of Hawaii</i> | jkolson@hawaii.edu | 34 |
| Olson, Travis | <i>University of Nevada, Las Vegas</i> | travis.olson@unlv.edu | 31 |
| Orona, Cynthia | <i>Oklahoma State University</i> | cynthia.orona@okstate.edu | 16 |
| Pattison, George | <i>Independent Researcher</i> | bygapiiii@comcast.net | 48 |
| Phillips, Glenn | <i>Texas A&M University</i> | glennallenphillips@gmail.com | 73, 80 |
| Prugh, Lindsay | <i>Oklahoma Christian University</i> | lindsay.prugh@oc.edu | 33 |
| Redmond-Sanogo, Adrienne | <i>Oklahoma State University</i> | adrienne.redmond@okstate.edu | 63 |
| Reeder, Stacy | <i>University of Oklahoma</i> | reeder@ou.edu | 20, 66 |
| Reynolds, Anne | <i>Kent State University</i> | areynol5@kent.edu | 8 |
| Ricca, Bernard | <i>St. John Fisher College</i> | bricca@sjfc.edu | 42 |
| Sanchez-Leal, Lina | <i>Rutgers University- Newark</i> | linasanchezleal@gmail.com | 38 |
| Santarone, Doris | <i>Georgia College</i> | doris.santarone@gcsu.edu | 13 |
| Schell, Vicki | <i>Pensacola State College</i> | rcmleditor@cox.net | 82 |
| Sharon, Valerie | <i>Sam Houston State University</i> | vvs001@shsu.edu | 1 |
| Shiver, Janet | <i>Central Washington University</i> | shiverj@cwu.edu | 13 |
| Silva, Cecilia | <i>Texas Christian University</i> | c.silva@tcu.edu | 13 |

Presenter's Index

| Presenter Name | Affiliation | Email | Session Number |
|-----------------------|---|-----------------------------|-----------------------|
| Slovin, Hannah | <i>University of Hawaii</i> | hslovin@hawaii.edu | 10, 34 |
| Smith, Kathy Horak | <i>Tarleton State University</i> | ksmith@tarleton.edu | 36, 55 |
| Speer, William | <i>University of Nevada, Las Vegas</i> | william.speer@unlv.edu | 39, 45 |
| Store, Jessie | <i>Alma College</i> | store.jessie@gmail.com | 24 |
| Stotz, Megan | <i>Lehigh University</i> | med710@lehigh.edu | 25 |
| Strayer, Jeremy | <i>Middle Tennessee State University</i> | jeremy.strayer@mtsu.edu | 14, 29 |
| Thompson, Anthony | <i>East Carolina University</i> | thompsonan@ecu.edu | 72 |
| Turegun, Mehmet | <i>Barry University</i> | mturegun@mail.barry.edu | 41 |
| Utlely, Juliana | <i>Oklahoma State University</i> | juliana.utley@okstate.edu | 66 |
| Waldron, Rahel | <i>Georgia College</i> | rachel.waldron@bobcats.gcsu | 13 |
| Walker, Dena | <i>Northwestern Oklahoma State University/Oklahoma State University</i> | dewalker@nwsu.edu | 59 |
| Wall, Ed | <i>City College of New York</i> | ewall@ccny.cuny.edu | 5 |
| Wangle, Jayleen | <i>Northern Illinois University</i> | wangle@math.niu.edu | 81 |
| Wasserman, Nicholas | <i>Southern Methodist University</i> | nwasserman@smu.edu | 62 |
| Weinburgh, Molly | <i>Texas Christian University</i> | m.weinburgh@tcu.edu | 36 |
| Wescoatt, Benjamin | <i>Oklahoma State University</i> | ben.wescoatt@gmail.com | 17 |
| Wheeler, Ann | <i>Texas Woman's University</i> | awheeler2@twu.edu | 46 |
| Xing, Cong-Cong | <i>Nicholls State University</i> | cong-cong.xing@nicholls.edu | 2 |
| Yee, Sean | <i>California State University, Fullerton</i> | syee@fullerton.edu | 35 |
| Young, Elaine | <i>Texas A&M University- Corpus Christi</i> | elaine.young@tamucc.edu | 77 |
| Zenigami, Fay | <i>University of Hawaii at Manoa, CRDG</i> | zenigami@hawaii.edu | 10, 34, 65 |
| Zollman, Alan | <i>Northern Illinois University</i> | zollman@math.niu.edu | 69 |

Notes

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Notes

Hotel Map

