

*Research Council on  
Mathematics Learning  
41<sup>st</sup> Annual Meeting*

*Reflections on Mathematics Learning*



*San Antonio, TX  
February 27-March 1, 2014*

*Photography by JWood Photography*



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## Founders Lecture



**Jon Engelhardt**, Dean, School of Education, Baylor University  
**Understanding and Helping Children with Learning Problems in Mathematics**

Friday, 11:00 - 12:00, Ballroom AB

**Abstract** As founder of one of the earliest university-based mathematics clinics (1974) and an early figure in RCML, much of my thinking in mathematics education has been heavily influenced by that clinical work, both then and in retrospect. This presentation addresses a variety of ideas I have found useful in understanding children's mathematics learning (or not) and how mathematics educators might help children learn, especially those experiencing difficulty. This includes notions of 'failure', 'meaning', a *pedagogical* definition of mathematics, a structure for thinking about the content of mathematics, and personal characteristics that impact how learners put those notions together

**Biography** Since July 2007, Dr. Jon Engelhardt has served as Dean of Baylor University's School of Education where he is also a professor of Curriculum and Instruction. Having served as a faculty member in mathematics education at Arizona State University for 16 years, he has since served for over 26 years as School/College of

Education Dean at the University of Texas at El Paso, Northern Arizona State University, Wichita State University as well as at Baylor.

His academic and research expertise is in the area of mathematics education where he has helped teachers understand how children come to understand mathematical ideas. His research interests have specifically targeted studying children's learning problems in mathematics and strategies that educators can pursue to help those children. He helped found two professional/research organizations and established one of the first clinics in the US that served to train inservice teachers, provide a community service, and study children's mathematics learning difficulties and strategies to address those difficulties. He has authored or co-authored 4 books and numerous journal articles and scholarly papers in mathematics education. In the senior years of his career, he has primarily emphasized cutting edge program development and innovation in teacher education.

Much of his work as a dean has included building partnerships between universities and public schools to improve the effectiveness of both schools and teacher preparation. He has served nationally in a variety of professional leadership roles, including helping to found two professional/research organizations, serving on the executive boards of national associations for teacher education (AACTE) and Education School accreditation (NCATE), and chairing a national representative organization (ACSR) in support of state associations of Education School. He has led major developments in redefining teacher education as a clinical enterprise and received a variety of recognitions, including the Distinguished Administrator award for Higher Education from the Arizona School Administrators Association. He has worked to develop an understanding of how Schools of Education are part of the systemic development and improvement of K-12 public education and the critical nature of community engagement and support for schools.

He has a variety of international professional experiences, teaching in universities in both England and Germany. At Baylor he has been an advocate for the development and definition of international experiences as part of the learning experience for education and health professionals to better understand the impact and influence of culture on professional practice and how such efforts/partnerships globally can serve to improve professional preparation internationally.

Dean Engelhardt received his bachelors and masters degrees from Arizona State before earning a Ph.D. in mathematics education from the University of Texas in 1972. He began his career in Education as a middle-school math teacher in Tempe, Arizona.

## Wilson Lecture



**James Epperson**, UT-Arlington

**The Complexities of Mathematics Learning: Burning Tents, Specious Algorithms, and Problems with Problems**

Friday, 5:30 - 6:30 PM, Ballroom AB

**Abstract** Mathematicians and mathematics educators approach the complexities of mathematics learning in many ways. Whereas mathematicians may focus on the preciseness of the mathematics, mathematics educators may center on the overall mathematical reasoning being conveyed. As investigators in mathematics learning and lifelong mathematics learners ourselves, where do we situate ourselves? We will investigate some fun examples that highlight issues in metacognition, problem solving, developing mathematical habits of mind, and understanding students' thinking.

**Biography** Dr. James A. Mendoza Epperson is an Associate Professor of Mathematics and Distinguished Teaching Professor at the University of Texas at Arlington. He received a B.S. in Mathematics and Physics with Academic Distinction from Texas A & M University-Commerce and a Ph.D. in Mathematics from The University of Texas.

Currently, Dr. Epperson is the Governor for the Texas Section of the Mathematical Association of America (MAA) and serves on the MAA Board of Governors as well as the MAA Committee on Assessment. He is also Vice President of the Board of Directors for the Conference for the Advancement of Mathematics Teaching.

Dr. Epperson's research and professional interests in mathematics education focus on mathematical problem solving, mathematics-specific technology, increasing access to mathematics through improved preparation of mathematics teachers, program development, and curriculum development. He is a six-time recipient of a UT Arlington Provost's Research Excellence Award. His research and teaching have been supported by several grants from the National Science Foundation, the US Department of Education, the Texas Education Agency, and the Texas Higher Education Coordinating Board. These grants, totaling over \$6 million, support projects which include efforts aimed at increasing teacher content knowledge in mathematics, increasing student retention in gateway courses such as calculus and precalculus, linking mathematics taught in the K-12 schools to research in mathematics, and designing materials to support standards-based mathematics teacher preparation. From 2007 to 2010, he served on the College Board's Advanced Placement Calculus Test Development Committee and currently is the Graduate Director of the Master of Arts in Mathematics Program at UT-Arlington.

In April 2012, Dr. Epperson was inducted into UT Arlington's Academy of Distinguished Teachers. His teaching honors also include, the UT Arlington 2009 Innovations in Teaching Award, a 2010 UT System Regents' Outstanding Teaching Award, and the 2012 Texas Section MAA's Teaching Award for Distinguished College or University Teaching of Mathematics.

Dr. Epperson frequently lends his expertise in the writing and revising of mathematics standards, curriculum, and assessment for K-12 students at statewide and national levels. He is an advocate for increasing access to mathematics for all students and firmly believes that mathematicians and mathematics educators must work together to continue to expand opportunities for all.

## Mathematics Leadership in a Common Core World



**Suzanne Mitchell**, National Council of Supervisors of Mathematics

### **Mathematics Leadership in a Common Core World**

Saturday, 12:00 - 1:00, Minuet

**Abstract** Mathematics leaders need new tools to help transform teacher practice and to help leaders reach the highest peaks of leadership implementation. NCSM continues to develop and refine engaging activities such as Great Tasks, Coaching Corner, and Illustrating the Standards for Mathematical Practice. This session will integrate the newest NCSM position papers that exemplify current research to support NCSM's vision and progress. In addition, It's Time: Themes and Imperatives for Mathematics

Education-A Mathematics Leadership Framework will be discussed.

**Biography** Dr. Suzanne Mitchell is currently the Past-President of the National Council of Supervisors of Mathematics and served on the Board of Directors for the past seven years including representing the Southern 2 region. She served on numerous committees with the National Council of Teachers of Mathematics and served 10 years on the Board of the Triangle Coalition for Science and Technology Education in Washington DC, including one year as President in 2004. She presently teaches mathematics at Arkansas State University, manages the Improving Teacher Quality federal grant at the Arkansas Department of Higher Education, and is the Executive Director of the Arkansas STEM Coalition. The STEM Coalition coordinates P-16 partnerships and STEM resources through collaboration with business and education representatives and policymakers in Arkansas. During her teaching career, Dr. Mitchell taught a variety of mathematics courses, grades 7-12, and served as the secondary mathematics curriculum coordinator in Pulaski County Special School District in Little Rock, Arkansas, and as the mathematics and science coordinator for the magnet school program in the Kansas City, Missouri School District serving on the administrative team with responsibility for the planning, organizing, and implementing the mathematics and science, environmental science, and the health sciences themes.



### WELCOME!

Welcome to the 41<sup>st</sup> Annual Conference of RCML! We hope you have a wonderful time in San Antonio and that you gain valuable information you can take back to your university. Please let us know if we can assist you in any way during your stay.

We want to extend a special thank you to all of those contributing to this year's conference, including the session presenters, RCML Board, 2014 Conference Committee, and all those who helped with organizing this event.

**Conference Chair:** Sandra Browning, University of Houston Clear Lake

**Program Chair:** Eileen Faulkenberry, Tarleton State University

### SPECIAL THANKS!

A special thank you goes to Tarleton State University, the College of Science and Technology, and the Mathematics Department for their support of the RCML 2014 Conference. Together they donated the cost of registration materials and other miscellaneous conference materials.

A special thank you goes to TEAM – Tarleton Educators for the Advancement of Mathematics who donated the cost of printing the programs.

A huge thank you goes to Dr. Keith Emmert for working tirelessly to prepare the layout of the program!

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Great thanks go to ETA Hand2Mind for their support of the 2014 RCML Conference for donating bags for the attendees.

Thank you to Texas Instruments and McGraw Hill for door prizes.

We offer our heartfelt thanks to the following people who reviewed proposals submissions, made recommendations for program section assignments, and provided input throughout the review process: Keith Adolphson, Michelle Baker, Sandra Browning, Nancy Cerezo, Kansas Conrady, Bob Drake, Diana Early, Eileen Faulkenberry, Thomas Faulkenberry, Melanie Fields, Angela Krebs, Karl Kruczek, Travis Olson, Jenny Peters, Kathleen Otto, Julie Sutton, Tracy Thompson, and Julie Williams.



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Overview of Friday Morning Sessions			
Room	8:00 - 8:45	9:00 - 9:45	10:00 - 10:45
Cavalier	“Understanding multiplication through virtual continuous quantity models” Seungoh Paek, Fay Zenigami & Hannah Slovin	“Virtual Manipulatives Modality and Teaching Proportional Reasoning” Stephen W. Blessing	“The challenge of using virtual manipulative software to explore mathematical concepts” Seungoh Paek & Daniel L. Hoffman
Grant	“Impact of a Professional Development Conference on Mathematics Teachers’ Practice” Faye Bruun & Sarah Ives	“Results from a five-year middle-school teacher professional development project” Gary Harris, Raegan Higgins, Tara Stevens & Zenaida Aguirre	“Big Ideas in Measurement for Early Grades: Teachers’ Level of Understanding” Sandi Cooper & Shametria Routt
Kampman	“Beliefs of STEM Preservice Teachers toward Project-based Instruction” Cindy Watson	“Kinesthetic Learning in Mathematics: conducting research to determine the effectiveness of hands-on activities to stimulate learning mathematics.” Carolyn Luna	“What’s a Good Wager? Coordinating Students’ Surprising Solutions” Ryan D. Fox
Patio	“Academic Rigor in Single-Sex Public Education and Coeducational Classes” Traci L. Carter, S. Megan Che & William C. Bridges, Jr.	“Cognitive Rigor Matrix and Single-sex Classes” Stefani Mokalled & Megan Che	“The development of equitable practices: A study of teachers in after school settings” Tyrette Carter & Kerri Richardson
Poolside 1	“Broadening Our Knowledge of College Students’ Understanding of Limit” Taylor A. Jensen	“The Cart Before the Horse? Analyzing Student Learning of a Calculus Procedure” Kris H. Green & Bernard P. Ricca	“Re-Conceptualizing Procedural Knowledge in Calculus” Alan Zollman
Poolside 2	“Mathematical Confidence of Preservice Teachers in Developmental Mathematics” Dr. Lindsey Gerber	“Comparing Student Attitudes in College Algebra using the Emporium Model, Problem Solving, and Traditional Approach” Lane Young	“Placing students in a math course: what works best” Anna Lurie
Poolside 3	“Fractions 101: Addressing Teacher Candidates’ Misconceptions” Barba Patton & Estella De Los Santos	“Evaluating Instruction for Developing Conceptual Understanding of Fraction Division” Valerie Sharon & Mary Swarthout	“Teaching Proportional Reasoning to English Language Learners” Audra Cozart & Dr. Kathy Horak Smith
Renaissance	“Effects of a course on pre-service teachers to develop their knowledge and teach algebra for equity” LaToya Anderson	“A Bilateral, International Research Network for Algebraic Reasoning” Colleen Eddy, Eloise Kuehnert, Gabriel Matney, Melfried Olson, Sarah Pratt & Trena Wilkerson	“A Framework for Professional Development for Algebra I Teachers in High-Need Schools” Emily Bonner
Sam Houston	“Elementary Preservice Teachers Beliefs and the Level of Cognitive Demand of Mathematical Tasks” Kristen Apraiz	“Developing and Analyzing High Cognitive Demand Tasks with the Mathematical Practices in Mind” Kansas Conrady & Stacy Reeder	“Relationship Between Cognitive Types of Teacher Content Knowledge and Knowing-to act” Maria D. Cruz

Overview of Friday Afternoon Sessions				
Room	1:30 - 2:15	2:30 - 3:15	3:30 - 4:15	4:30 - 5:15
Cavalier	“How to impact a teacher’s geometry content knowledge with GSP: A single case study” Vecihi Serbay Zambak & Andrew M. Tyminski	“Teachers’ Understanding of Complex Number Arithmetic with Geometry Software” David Erickson	“Using a 3D Plotter to Improve Comprehension of Geometry for Blind Students” Carl Seaquist, Mark McVay & Kyle Steinle	“Extending Discourse through Podcasts” Keith Adolphson
Grant	“Utilizing iPads to Enhance College Algebra Instruction” Ann Wheeler & Brandi Falley	“The Use of iPads to Impact Inservice Teachers’ Beliefs about Mathematics Teaching” Ann Wheeler & Carole Hayata	“iPads in an Elementary Mathematics Education” Kansas Conrady	“Technology in Higher Education Mathematics” Dena Walker
Kampman	“Teacher TEAMS Study Vertical Alignment of Big Ideas in Common Core” Jean J. McGehee	“Implementing the CCSS-M: A case study of two high school teachers” Kwaku Adu-Gyamfi & Tony Thompson	“Teacher Beliefs: The Power of CCSSM to Shift Mindsets” Lynn Columba	“Task alignment to the Common Core? How our solution lens matters.” Travis A. Olson, Melfried Olson, Linda Venenciano & Hannah Slovin
Patio	“Integrating Social Justice Issues: Insights from a Graduate Mathematics Education and Undergraduate Mathematics courses” Rachel Bates & Dr. Stacey Reeder	“The Stuff of Stereotypes, Identities, and Students’ Mathematics Learning Experiences” Gregory V. Larnell	“Preparing Future Elementary Math Teachers to Teach Beyond ‘Pizza Party’ Math Lessons” Sylvia Taube	“Using Culturally Responsive Teaching to Support Student Engagement in a Mathematical Practice” Tashana Howse
Poolside 1	“Developing Preservice Math Teachers’ Diversity Awareness and Knowledge” S. Enrico P. Indigine, Gerald Kulm & Tugba Oner	“The Professional Notebook as a Vehicle for Continued Growth” Sarah Ives, Kim Moore & George Tintera	“A Snapshot of Preservice Teachers’ Beliefs: A Factor Analytic Method” Dr. Kathy Horak Smith, Dr. Beth Riggs, Dr. Eileen Faulkenberry & Dr. Thomas Faulkenberry	“Misconceptions with Fractions: A Study of Strategies to Remediate” Barba Patton & Estella De Los Santos
Poolside 2	“The Role of Teacher Questions in Support of Students’ Articulation of their Mathematical Reasoning” Tracey H. Howell	“Elementary Preservice Teachers and Questioning Strategies in Mathematics, Round 2” Sandra Browning	“Helping Teachers Improve the Questions They Ask Students” Sue Brown	“Assessing math learning via student constructed questions” Ramakrishnan Menon
Poolside 3		“Pre-service teachers’ conceptions of representations of equivalent fractions and of fraction units” Michael T. Muzheve		
Continued on next page.				

Overview of Friday Afternoon Sessions				
Room	1:30 - 2:15	2:30 - 3:15	3:30 - 4:15	4:30 - 5:15
Renaissance	“A Framework for Revising the Mathematics Teaching Efficacy Beliefs Instrument” Elizabeth K. Ward & Elisabeth Johnston	“Draw Yourself Learning and Teaching Mathematics: A Collaborative Analysis” Benjamin R. McDermott & Mourat Tchoshanov	“Understanding the Connection: Students’ Mathematical Thinking and Teachers’ MKT” Carol Seaman	“The Evolution of a Conceptual Model for Algebra Teacher Self-Efficacy” Colleen M. Eddy, William Jasper, Trena L. Wilkerson, M. Alejandra Sorto, Sandi Cooper, Elizabeth K. Ward, Winifred A. Mallam & Yolanda A. Parker
Sam Houston	“Opportunities to Engage in the Standards for Mathematical Practice” Jonathan Bostic & Gabriel Matney	“Prospective teachers’ conceptions of engagement in mathematics classroom: A Mixed Methods Study” Jessie Store	“Implementing the edTPA in Mathematics Education at East Carolina University” Tony Thompson & Kwaku Adu-Gyamfi	“Mathematics in an Early Childhood Special Education Setting” Kay A. Wohlhuter

Overview of Saturday Morning Sessions				
Room	8:00 - 8:45	9:00 - 9:45	10:00 - 10:45	11:00 - 11:45
Cavalier	“Improving School Performance in Mathematics” Bob M. Drake	“Co-Teaching and Elementary Mathematics Teacher Education” Kansas Conrady	“Mathematical Immersion: Paralleling Experiences of Instructor and Graduate Students” Trena Wilkerson	“Mirror Effect: Teacher and Student Self-Positioning Toward Mathematics” Ruby Lynch-Arroyo & Mourat Tchoshanov
Grant	“Inquiry Based Learning in Collegiate Mathematics” Oscar Chavez	“Math Efficacy and Utility as Predictors of American Indian Math Achievement” Cynthia Orona	“Building and Repairing Conceptual Foundations to Teach Polynomial Long Division” Rachel M. Bachman	“Developing the Mathematical Writing Skills of Elementary Preservice Teachers” Kelli Slaten & Sarah Ives
Kampman		“As Mathematicians, How Do English Language Learners Communicate Mathematically?” Kathy Horak Smith, Molly Weinburgh, Cecilia Silva & Natalie Smith	“A Recursive Approach to Develop Discourse in Mathematics Classrooms” Lianfang Lu	
Patio	“Mathematics content knowledge, anxiety, and efficacy among elementary teachers” Brian R. Evans	“A Model for Mathematics Teacher Preparation” Daniel Brahier & Jonathan Bostic	“Conceptual Tasks in Secondary Mathematics” Sarah Pratt, Gabriel Matney & Kerri Richardson	“Attitude Adjustment: How Can We Change Students’ Attitudes about Statistics?” Melanie Autin, Summer Bateiha & Hope Marchionda
Poolside 1	“What Do 9th Grade Students Know About Algebra?” Derrick Saddler	“Impact of A Modeling Approach to Algebra on Teachers and Students.” Judith Olson, Melfried Olson, Fay Zenigami & Hannah Slovin	“Flipping Algebra” Cherie Ichinose	“Three-Column Proofs for Algebraic Reasoning and Justification” Sean Yee
Poolside 2		“Pedagogical Decision-making about Teaching Mathematics On-Line” Lynae Sakshaug	“Pre-Service Teachers and the Representativeness Heuristic: Preparing for Probability Instruction and Associated Misconceptions” Julie Cronin & William McGalliard	“Teaching Mathematics with Music” Rachel Schuster & Beth Riggs
Poolside 3		“Career intention, Academic math level and Educational supply chain for Math Major Students” Ping-Jung Tintera & Timothy Nelson		
Continued on next page.				

Overview of Saturday Morning Sessions				
Room	8:00 - 8:45	9:00 - 9:45	10:00 - 10:45	11:00 - 11:45
Renaissance	“Support for High School Math Teachers Through Induction” Melanie Fields	“Snapshot of a State’s Mathematics Teacher Workforce” Juliana Utley & Stacy Reeder	“Elementary Teachers’ Perceptions of Mathematical Applications in Engineering” Juliana Utley & Toni Ivey	“30-years of NAEP Reports - Have We Really Made Any Progress?” Pat Lamphere Jordan
Sam Houston	“Dynamics among three domains in forming pre-service teachers’ dispositions” Benjamin R. McDermott, Ruby Lynch Arroyo & Mourat Tchoshanov	“Examining Preservice Teachers’ Professional Noticing” Leigh Haltiwanger & Amber Simpson	“Unlived Math Experiences” Rebecca Yeaman, Sarah Wheeler & Darlinda Cassel	“Where They Come From: Understanding Millennial Pre-service Teacher’s Reasons for Becoming Math Teachers” Glenn Allen Phillips

Academic Rigor in Single-Sex Public Education and Coeducational Classes			Patio 8:00-8:45
Traci L. Carter	Clemson University	tracic@clermson.edu	
S. Megan Che	Clemson University	sche@clermson.edu	
William C. Bridges, Jr.	Clemson University	wbrdgs@clermson.edu	
In this presentation, we examine one aspect of our study of single-sex public education mathematics classes by analyzing the academic rigor of middle grades single-sex and coeducational mathematics classes through the Instructional Quality Assessment (IQA) instrument (Junker et al., 2006). Two teachers for each type of classroom (all girls, all boys, and coeducational) were videotaped for 10 instructional sessions. Each of these instructional sessions was then rated for academic rigor by research team members with whom inter-rater reliability was established using videos of teachers in the pilot study. Results of the analysis and supporting video clips will be shared and discussed.			

Effects of a course on pre-service teachers to develop the knowledge to teach algebra for equity			Renaissance 8:00-8:45
LaToya Anderson	Texas A & M University	latoyacanderson@gmail.com	
This article revealed preliminary results from pre-service teachers who participated in the Knowledge for Teaching Algebra Equitably Project at Texas A & M University in the fall of 2011. An analysis of the test scores from the pre-service teachers (PTs) from the pre-test to the post-test was done comparing scores from PTs. The effects of the course on (a) beliefs about equity, (b) problem solving, and (c) teaching problem solving was reported in confidence intervals. A MANOVA was used to determine the difference in scores from the variables. The adjusted R squared values were reported to provide the correlation between the independent and dependent variables.			

Understanding multiplication through virtual continuous quantity models			Cavalier 8:00-8:45
Seungoh Paek	University of Hawaii	spaek@hawaii.edu	
Fay Zenigami	University of Hawaii	zenigami@hawaii.edu	
Hannah Slovin	University of Hawaii	hslovin@hawaii.edu	
This research investigates how efficiently and effectively the manipulation of digital objects facilitates young children's understanding of the concept of multiplication through models using continuous quantities. The research discusses the following questions: How efficiently do young students complete activities using a virtual manipulative application compared to using only physical objects in the real world? How do visual indications of progress and product, provided by the virtual manipulative application, enable students to think in terms of mathematical structures? How does using the virtual manipulative application facilitate students' ability to model multiplication concepts and set a foundation for multiplicative thinking?			

Elementary Preservice Teachers Beliefs and the Level of Cognitive Demand of Mathematical Tasks			Sam Houston 8:00-8:45
Kristen Apraiz	University of Florida	kapraiz@coe.ufl.edu	
This study explores how elementary preservice teachers' beliefs about mathematics and mathematics instruction affect the classification of mathematical tasks based upon levels of cognitive demand. The Integrating Mathematics and Pedagogy (IMAP) Beliefs Survey is utilized to evaluate the preservice teachers' beliefs. Preservice teachers are enrolled in an Elementary Mathematics Methods Course that focuses on the use of discussions about mathematics in order to strengthen mathematical-task knowledge. Participants in the treatment group are exposed to learning about the task analysis guide, analyzing the cognitive demand of mathematical tasks, and creating tasks that are implemented with elementary school students.			



Impact of a Professional Development Conference on Mathematics Teachers' Practice			Grant 8:00-8:45
Faye Bruun	Texas A & M University-Corpus Christi	faye.bruun@tamucc.edu	
Sarah Ives	Texas A & M University-Corpus Christi	sarah.ives@tamucc.edu	
With the existing economic conditions, mathematics teachers have fewer opportunities to travel to conferences. Consequently, a local affiliate of NCTM was organized to sustain a regional conference for teachers' professional development. Ongoing research to evaluate the impact of this conference is being conducted through teacher surveys aimed at their learning, application of methods, behavior, and ultimately impact to students (Mulling Lepicki, & Glandon, 2010). The research will focus on two of Guskey's (2009) five levels of evaluation for professional development: (1) participants' reactions and (2) participants' use of new knowledge and skills. Emergent themes and representative quotes will be presented.			

Broadening Our Knowledge of College Students' Understanding of Limit			Poolside 1 8:00-8:45
Taylor A. Jensen	Fort Hays State University	tajensen2@fhsu.edu	
Introductory calculus students conceptual difficulties with the material are well-known, and these difficulties extend to the limit concept. In order to measure students' understanding of limit at a significantly broader and deeper level than what is typically measured by traditional tests of the concept, the Limit Understanding Assessment (LUA) was designed and then given to students enrolled in a traditional science-based calculus course. The results of the LUA data will be presented as a springboard to a discussion as to how future research projects can generate new knowledge of effective calculus teaching and successful calculus learning.			

Mathematical Confidence of Preservice Teachers in Developmental Mathematics			Poolside 2 8:00-8:45
Dr. Lindsey Gerber	Utah Valley University	lindsey.gerber@uvu.edu	
The contemporary mathematics education paradigm used at most schools rely on instructors transmitting mathematical content knowledge to students through didactic discourse; whereas, the developmental mathematics program at Texas State University implements standards-based best practices. In understanding the mathematical content knowledge of preservice teachers who have taken developmental mathematics compared to those deemed college ready, a sample of 22 students were assessed using the Early Indicators of Effective Teachers instrument-a modified Mathematical Knowledge for Teaching assessment, a lesson plan writing activity, and interview. In this session, results comparing participants' performance on the modified assessment will be discussed.			

Fractions 101: Addressing Teacher Candidates Misconceptions			Poolside 3 8:00-8:45
Barba Patton	University of Houston-Victoria	pattonb@uhv.edu	
Estella De Los Santos	University of Houston-Victoria	delossantose@uhv.edu	
Misconceptions children have with fractions have been long documented in both the USA and UK (Ashlock; Galbreth & Haines; Ryan & Williams. etc). To help prevent misconceptions from re-occurring and passing from teacher candidate to classroom students, it is believed to be important to rectify and remediate prior to the teacher candidate's entry into teaching profession. Transfer of learning, context and problem-solving represent key issues with regard to successful mathematics learning (Schoenfeld, Lave) was the basis for some of the remedial instruction. In this presentation, researchers will share Pre/Post tests and results along with examples of the remedial teaching.			

Beliefs of STEM Preservice Teachers toward Project-based Instruction			Kampman 8:00-8:45
Cindy Watson	Teach North Texas	cindy.woods@unt.edu	
Project-based instruction provides an authentic, collaborative, and rigorous alternative instructional model for 21st century learners. This research explores the beliefs of five preservice mathematics teachers about project-based learning as a model as they encounter and implement a project-based unit of instruction in a project-based high school. Four main dilemmas are encountered as preservice teachers experience and are exposed to project-based learning—a pedagogical dilemma, a cultural dilemma, a political dilemma, and a conceptual dilemma. These dilemmas will be discussed and are certain to stimulate and generate deep thinking among the audience as it pertains to mathematics instructional practices.			

Cognitive Rigor Matrix and Single-sex Classes			Patio 9:00-9:45
Stefani Mokalled	Clemson University	smokall@g.clemson.edu	
Megan Che	Clemson University	sche@clemson.edu	
This study, part of a larger NSF-funded project, investigates classroom discourse in single-sex and coeducational mathematics classes by focusing on questions asked by teachers and students. We use a recently-formulated instrument, the Cognitive Rigor Matrix (Hess et.al., 2009) to analyze, on two dimensions, the level of questions asked in two teachers' classrooms. This analysis illuminated an aspect of the academic classroom environment in the all-girls, all-boys and coeducational classes these two teachers taught—what kinds of questions are being asked, by whom, and at what levels. In addition, we have found that the questions being asked by the teacher are largely consistent across classroom type and cluster at the lower cognitive levels.			

A Bilateral, International Research Network for Algebraic Reasoning			Renaissance 9:00-9:45
Colleen Eddy	University of North Texas	colleen.eddy@unt.edu	
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Trena Wilkerson	Baylor University	Trena_Wilkerson@baylor.edu	
Researchers from the United States who participated as the initial delegation in the U.S.-Thailand Research Network to Advance the Teaching and Learning of Algebraic Reasoning share their collaborative efforts. The stages for this network include: 1) planning and development of a face-to-face roundtable; 2) initial virtual meetings that occurred prior to the roundtable; 3) agenda and results of the roundtable; and, 4) the projects that have begun as a result of this research network project. The panel will conclude with a summary of the creation and alignment of research agendas focused on algebraic reasoning across the network.			

Virtual Manipulatives Modality and Teaching Proportional Reasoning			Cavalier 9:00-9:45
Stephen W. Blessing	Middle Tennessee State University	blessing@mtmail.mtsu.edu	
Several research studies support virtual manipulatives as effective teaching tools in the mathematics classroom. This session will share information from a research study in progress which focuses upon differences between touch technology and mouse technology when teaching proportional reasoning in a middle school setting.			

Developing and Analyzing High Cognitive Demand Tasks with the Mathematical Practices in Mind			Sam Houston 9:00-9:45
Kansas Conrady	University of Oklahoma	kansas.conrady@ou.edu	
Stacy Reeder	University of Oklahoma	reeder@ou.edu	
Mathematics teachers and undergraduate mathematics teacher candidates were brought together for a unique workshop wherein they worked together to develop high cognitive demand tasks that would engage their students in the development of one or more of the mathematical practices. Both the workshop format and activities will be shared as well as the high cognitive demand tasks that were developed. Further, the results of research conducted in conjunction with the workshop and the implementation of the tasks will be presented.			

Results from a five-year middle-school teacher professional development project			Grant 9:00-9:45
Gary Harris	TTT Math	Gary.harris@ttu.edu	
Raegan Higgins	TTU Math	Raegan.higgins@ttu.edu	
Tara Stevens	TTU EdPsy	Tara.Stevens@ttu.edu	
Zenaida Aguirre	TTU Curric and Ins	zenaida.aguirre@ttu.edu	
In this paper we describe our five-year professional development project targeting middle-school math teachers. The primary focus of the project is providing the teachers with a deep conceptual understanding of the mathematics taught in the middle grades. Our analysis, to date, of the quantitative data indicates a positive impact on the teachers' math knowledge for teaching and teaching self-efficacy. Preliminary finding from the qualitative data suggest a positive impact on teachers' classroom practices. Our analysis and findings will be discussed in detail in the paper.			

The Cart Before the Horse? Analyzing Student Learning of a Calculus Procedure			Poolside 1 9:00-9:45
Kris H. Green	St. John Fisher College	kgreen@sjfc.edu	
Bernard P. Ricca	St. John Fisher College	bricca@sjfc.edu	
Longitudinal data can be useful for examining the development of student understanding. However, it is often difficult to find a method by which those data can be analyzed to get the most insight. This study examines how students come to understand techniques of integration in a first year calculus course by collecting student work at various points in time. Novel approaches to the analysis of the data, based on ideas from graph theory provide insight into how student learning progresses. These approaches to data analysis are widely applicable; application to other situations will be presented.			

Comparing Student Attitudes in College Algebra using the Emporium Model, Problem Solving, and Traditional Approach			Poolside 2 9:00-9:45
Lanee Young	Fort Hays State University	lmyoung@mail.fhsu.edu	
Many students take College Algebra because it is required but they never see the application of the content to their lives or potential careers. Using three different methods of instruction, the researchers compared student attitudes toward mathematics at the beginning and end of three semesters. Student success was also measured in the three classes to determine any relationships between method of instructions, student attitude, and student success in this general education course.			

Evaluating Instruction for Developing Conceptual Understanding of Fraction Division			Poolside 3 9:00-9:45
Valerie Sharon	Sam Houston State University	vvs001@shsu.edu	
Mary Swarthout	Sam Houston State University	swarthout@shus.edu	
We designed a series of lessons geared towards promoting conceptual understanding of fraction division. We evaluated the effectiveness of these lessons by examining the nature of prospective elementary teachers' understanding of the division algorithm before and after instruction based on the measurement model of division. We will share the results of our study with audience participants, along with the instruments used to measure understanding of division by a fraction and the instructional strategies we used.			

Kinesthetic Learning in Mathematics: conducting research to determine the effectiveness of hands-on activities to stimulate learning mathematics.			Kampman 9:00-9:45
Carolyn Luna	University of Texas at San Antonio	carolyn.luna@utsa.edu	
During this presentation, participants will be introduced to mathematics lessons being conducted at the San Antonio Virtual and Interactive Geometry Lab (SAVIG lab) at the Institute of Texan Cultures for school children in grades K through 12. Mathematics lessons at the SAVIG lab are highly interactive and include tactile learning activities to stimulate higher order thinking; lessons include working with soap films and mobius bands. Proposed research at the SAVIG lab will investigate the effectiveness of these kinesthetic lessons on stimulating student learning and interest in mathematics. The presentation will discuss means of data collection and interpretation.			

The development of equitable practices: A study of teachers in after school settings			Patio 10:00-10:45
Tyrette Carter	North Carolina A & T State University	tscarte1@ncat.edu	
Kerri Richardson	The University of North Carolina at Greensboro	kdricha2@uncg.edu	
Our research focuses on a growth model of how teachers developed their content knowledge to create equitable instruction for students in informal school settings within the context of algebraic reasoning. We describe data collected as part of a study focusing on the mathematical reasoning of students in grades, 3, 4, and 5. Our research context took place in six elementary schools located in both rural and urban settings. We describe how teachers began their instruction and over time, how they increased their equitable practices to ensure that students obtained access to algebraic reasoning, mathematical content, and discourse.			

A Framework for Professional Development for Algebra I Teachers in High-Need Schools			Renaissance 10:00-10:45
Emily Bonner	University of Texas at San Antonio	emily.bonner@utsa.edu	
This session will focus on a two-year, equity-focused professional development program for algebra I teachers. We will discuss specific aspects of the professional development framework, and will share data that have been collected in these areas. Further, we will share our results and provide an opportunity for participants to discuss implications. Lastly, we will share some political and institutional issues that arose in the course of the project, and the ways in which these peripheral findings impact mathematics teacher education.			

The challenge of using virtual manipulative software to explore mathematical concepts			Cavalier 10:00-10:45
Seungoh Paek	University of Hawaii at Manoa	spaek@hawaii.edu	
Daniel L. Hoffman	University of Illinois at Urbana-Champaign	dlh2109@illinois.edu	
This study investigates interface and usability challenges experienced by children working with virtual manipulatives. For the study, a clinical interview was conducted with a second grade student. Given a laptop with a computer mouse, the participant was asked to solve addition problems using the Base Ten Blocks activity from the National Library of Virtual Manipulatives. Observations of the student's manipulations and a video recording of the computer screen were analyzed. The presentation will share the findings from the study and discuss implications for the design of future virtual manipulative environments.			

Relationship Between Cognitive Types of Teacher Content Knowledge and Knowing-to act			Sam Houston 10:00-10:45
Maria D. Cruz	University of Texas at El paso	mdcruzquinones@miners.utep.edu	
This study will provide understanding and meaning of the relationship between teacher "knowing-to" act and teacher content knowledge. I propose to conduct a mixed methods explanatory sequential research design which implies the sequential implementation of a quantitative phase followed by a qualitative phase. In the quantitative phase, numerical data will be collected from 100 mathematics middle school teachers through the administration of two surveys: teacher content knowledge survey (TCKS) and knowing-to act survey (KtAS). Based on the results of these surveys, 4 teachers will be selected to be interviewed and observed.			

Big Ideas in Measurement for Early Grades: Teachers' Level of Understanding			Grant 10:00-10:45
Sandi Cooper	Baylor University	sandra_cooper@baylor.edu	
Shametria Routt	Round Rock ISD	metria8991@yahoo.com	
Measurement is a key topic in the elementary grades that builds a foundation for more advanced understanding in the middle and secondary grades. How well do elementary teachers understand the importance of the big ideas in the conceptual development of measurement - zero point, partitioning, and units? In this presentation, results will be shared from a study conducted during an elementary teacher academy where these big ideas were explored.			

Re-Conceptualizing Procedural Knowledge in Calculus			Poolside 1 10:00-10:45
Alan Zollman	Northern Illinois University	zollman@math.niu.edu	
What do students need to know and understand to succeed in college calculus? Three new research dissertations investigate the knowledge level of students on pre-requisite and co-requisite skills concerning derivatives, continuity and series convergence. Together their findings lead us to re-conceptual procedural and conceptual knowledge. Why do even our best students not retain knowledge? Is it just a question of conceptual knowledge not being attained, or is there more for us to understand in the learning of calculus?			

Placing students in a math course: what works best			Poolside 2 10:00-10:45
Anna Lurie	St. Mary's University	alurie@stmarytx.edu	
In this presentation we consider various methods of placement of undergraduate first-time freshmen in mathematics courses. COMPASS, a computer-adaptive testing program, has been used at our university to help place students in appropriate courses for the past few years. Because it is costly and time-consuming to conduct it on campus at the time of student orientation, a proposal to use student SAT/ACT test scores instead was considered by the enrollment management. We conducted a comparative analysis of COMPASS versus SAT/ACT for placing students in suitable courses, insuring their subsequent success. The results of the statistical analysis are presented and discussed.			

Teaching Proportional Reasoning to English Language Learners			Poolside 3 10:00-10:45
Audra Cozart	Tarleton State University	audra.cozart@go.tarleton.edu	
Dr. Kathy Horak Smith	Tarleton State University	ksmith@tarleton.edu	
This presentation reports on findings from a micro-study concerning middle school ELL students' learning of proportional reasoning. This micro-study is part of a larger study concerning academic language acquisition in mathematics and science involving ELL middle school students, ages 9 - 15, who have been in the United States less than 3 years. During the presentation, the speakers will describe the three-week summer school program of study and discuss the pre- and post-test results. Handouts of the lessons used during the three-week program will be given.			

What's a Good Wager? Coordinating Students' Surprising Solutions			Kampman 10:00-10:45
Ryan D. Fox	Penn State-Abington	rdfl6@psu.edu	
Using a moment from a television game show as the basis for a contextual problem, I wanted, as a teacher, to see and hear how students generated their own solutions to the problem. The students' surprising solutions created two areas of investigation as a researcher. First, how does a teacher keep productive mathematical classroom conversations going when faced with unexpected and fascinating solutions worth additional exploration? Second, what is the combination of mathematical and pedagogical knowledge a teacher employs to keep worthwhile discussion moving and focused on mathematics? This presentation will attempt to provide answers to both questions.			

Understanding and Helping Children with Learning Problems in Mathematics			Ballroom AB 11:00-12:00
Jon Engelhardt	Baylor University	Jon_Engelhardt@baylor.edu	
As founder of one of the earliest university-based mathematics clinics (1974) and an early figure in RCML, much of my thinking in mathematics education has been heavily influenced by that clinical work, both then and in retrospect. This presentation addresses a variety of ideas I have found useful in understanding children's mathematics learning (or not) and how mathematics educators might help children learn, especially those experiencing difficulty. This includes notions of 'failure', 'meaning', a pedagogical (italics) definition of mathematics, a structure for thinking about the content of mathematics, and personal characteristics that impact how learners put those notions together.			

Integrating Social Justice Issues: Insights from a Graduate Mathematics Education and Undergraduate Mathematics courses			Patio 1:30-2:15
Rachel Bates	Redlands Community College	rachel.bates@redlandsccl.edu	
Dr. Stacey Reeder	The University of Oklahoma	reeder@ou.edu	
Using social justice issues, that are rich in numbers and replete with data, as context for learning mathematics and problem solving can help to create authentic experiences and meaningful learning opportunities for students who are often disengaged with mathematics. Our efforts to include social justice contexts in both a graduate level mathematics education course as well as undergraduate mathematics and statistics courses will be shared. Participants will also be engaged in one of more example activities and resources will be shared.			

A Framework for Revising the Mathematics Teaching Efficacy Beliefs Instrument			Renaissance 1:30-2:15
Elizabeth K. Ward	Texas Wesleyan University	ekward@txwes.edu	
Elisabeth Johnston	Slippery Rock University	elisabeth.johnson@sru.edu	
This session describes the theoretical underpinnings used to revise the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI). The MTEBI is commonly used in research with elementary mathematics teachers and has remained unchanged since it was developed. However, current research suggests the need for modifications to the instrument to better measure the self-efficacy construct. Presenters will review the research that supports these changes, and provide a comparison between items from the original and new instrument. The session will include an interactive discussion with participants to discuss possible uses for the new instrument and implications for researchers and professional development providers.			

How to impact a teacher's geometry content knowledge with GSP: A single case study			Cavalier 1:30-2:15
Vecihi Serbay Zambak	Clemson University	vzambak@clemson.edu	
Andrew M. Tyminski	Clemson University	amt23@clemson.edu	
The development of Common Core State Standards for mathematics has accelerated the need for mathematics teachers who had strong mathematics background with deep conceptual understanding. In this interpretation of deep understanding, prospective teachers know more than simply how to "do" school mathematics, and now also develop a special kind of mathematical content knowledge, germane specifically to the work of teaching mathematics, which is referred as Specialized Content Knowledge (SCK). This single case study examines one pre-service teacher's development of SCK within a technology-enhanced middle grade graduate level geometry course, and how factors such as attitudes about mathematics, teaching and technology affect this development process. The presentation will focus on findings from classroom observations and task-based interviews.			

Opportunities to Engage in the Standards for Mathematical Practice			Sam Houston 1:30-2:15
Jonathan Bostic	Bowling Green State University	bosticj@bgsu.edu	
Gabriel Matney	Bowling Green State University	gmatney@bgsu.edu	
First, we will briefly describe the purpose of a grant-funded yearlong professional development (PD) program supporting grades K-5 mathematics teachers. Within this program, teachers videotaped their instruction at the beginning and end of this yearlong PD. Evidence of students' engagement in the Standards for Mathematical Practice was analyzed using a protocol (Fey, Kobett, Wray, 2013). Results of this analysis will be shared as well as implications for mathematics-focused Common Core State Standards PD and instruction.			

Utilizing iPads to Enhance College Algebra Instruction			Grant 1:30-2:15
Ann Wheeler	Texas Woman's University	awheeler2@twu.edu	
Brandi Falley	Texas Woman's University	bfalley@twu.edu	
During this session, attendees will learn how the use of iPads in an honors college algebra class enhanced student instruction of linear and quadratic functions. Student projects will be discussed, including sample student work.			

Developing Preservice Math Teachers' Diversity Awareness and Knowledge			Poolside 1 1:30-2:15
S. Enrico P. Indigine	Texas A & M University	hindiogine@gmail.com	
Gerald Kulm	Texas A & M University	gkulm123@gmail.com	
Tugba Oner	Texas A & M University	tugbaone@gmail.com	
Preservice teachers should be equipped with the knowledge of math teaching (Kulm, 2008) and equity consciousness (McKenzie & Skrla, 2011) necessary to be effective in diverse middle grades classrooms. We will present results from recent work of a 5-year NSF-funded design experiment that employs several strategies to enhance middle grades preservice teachers' knowledge of teaching algebra problem solving for equity. The participants are middle grade mathematics preservice teachers enrolled in a required Problem Solving course. We will present data and analyses to address the question: What instructional activities contribute to growth in problem solving, teaching problem solving, and cultural beliefs?			

The Role of Teacher Questions in Support of Students' Articulation of their Mathematical Reasoning			Poolside 2 1:30-2:15
Tracey H. Howell	The University of North Carolina at Greensboro	thhowell@uncg.edu	
To better understand the ways in which teachers support students in articulating their mathematical reasoning, I examine the questioning practices of five high school Algebra I teachers and the students' mathematical discourse surrounding their questions. Conducted at the end of a successful six-year mathematics project and with a sample of teachers who consistently obtained high student growth on year-end measures, this study uses the framework of Franke and colleagues (2009) to analyze teacher questions and explore the ways in which different types of questions encouraged different levels of student responses.			

Teacher TEAMS Study Vertical Alignment of Big Ideas in Common Core			Kampman 1:30-2:15
Jean J. McGehee	University of Central Arkansas	jeanm@uca.edu	
Common Core Curriculum implementation presents important opportunities in professional development research. It is interesting to compare middle and high school level teachers in this transition. The TEAMS grant project extended past year grants that focused on algebra and geometry for high school teachers. Past participants brought middle school teachers on board. The NCTM Essential Understandings series and modules developed by researchers in conjunction with the Arkansas Department of Education were the project material resources. The session will present pre-post test instruments, observation protocols, survey instruments, the excellent ADE modules online as well as the data analysis for all parts.			

The Stuff of Stereotypes, Identities, and Students' Mathematics Learning Experiences			Patio 2:30-3:15
Gregory V. Larnell	University of Illinois	glarnell@uic.edu	
The purpose of this paper is to unpack and better understand the roles of students' mathematics identities and identity contingencies-those social treatments or predicaments that accompany one's identity in a particular learning setting or situation. Toward that end, the paper is based on two studies of African American students' mathematics learning experiences in a non-credit-bearing remedial mathematics course at a four-year university. Using vignettes from the study, the paper includes a theoretical framing of mathematics identity as a narrative construct and a discussion of identity threats embedded in students' narratives about their mathematics learning experiences.			



Draw Yourself Learning and Teaching Mathematics: A Collaborative Analysis		Renaissance 2:30-3:15
Benjamin R. McDermott	University of Texas at El Paso	brmcdermott@utep.edu
Mourat Tchoshanov	University of Texas at El Paso	mouratt@utep.edu
To examine pre-service elementary teachers' enduring and dynamic aspects of disposition toward mathematics teaching and learning, participants were asked to draw themselves: 1) learning mathematics and 2) teaching mathematics, at the beginning and end of a mathematics methods course. Drawing methodology was employed because, as Mitchell, Theron, Stuart, Smith, and Campbell (2011) state, "In a very real sense, drawings make parts of the self . . . visible" (p. 19). Along with drawings, participants provided written explanations and participated in one-on-one interviews. This collaborative analysis technique has the potential for more authentic knowledge construction about teacher disposition.		

Teachers' Understanding of Complex Number Arithmetic with Geometry Software		Cavalier 2:30-3:15
David Erickson	The University of Montana	david.erickson@mso.umt.edu
Mathematics students learn complex number arithmetic and their geometric meaning as early as high school. However the geometric meaning of the operations is presented mostly in abstract and without a concrete representation. Later when these students become mathematics teachers they fail to present their students with a rich, meaningful and connected framework of these operations and hence repeating the cycle. In this paper we describe our efforts to help secondary mathematics teachers make sense of complex number arithmetic with the aid of geometry software. These efforts take place in a geometry class for prospective secondary mathematics teachers.		

Prospective teachers' conceptions of engagement in mathematics classroom: A Mixed Methods Study		Sam Houston 2:30-3:15
Jessie Store	Alma College	storejc@gmail.com
Teachers' understanding of what engagement is in mathematics classrooms determines the type of classroom contexts that they support and consequently the nature of mathematical understanding and dispositions supported in those classroom. Preparing teachers who can break the lack of persistence in mathematics classrooms requires an understanding of what pre-service teachers believe to be indicators of engagement, and how important the different indicators are. This presentation will report a mixed methods study of elementary pre-service teachers' notions on engaging mathematics classrooms. Data sources included analyses of classroom videos, free lists, and questionnaires.		

The Use of iPads to Impact Inservice Teachers' Beliefs about Mathematics Teaching		Grant 2:30-3:15
Ann Wheeler	Texas Woman's University	awheeler2@twu.edu
Carole Hayata	Southern Methodist University	cahayata@gmail.com
During this session, participants will learn how the use of iPads in mathematics education courses impacted 22 inservice middle school (Grades 6-8) teachers' beliefs about 1) mathematics teaching, and 2) the integration of iPad apps into mathematics lessons. Data collection consisted of background surveys, exams, written reflections, and iPad application assignments. Inservice teachers' successes and failures with iPad integration in the classroom will be discussed, including the teachers' favorite iPad applications and implementation strategies.		

The Professional Notebook as a Vehicle for Continued Growth		Poolside 1 2:30-3:15
Sarah Ives	Texas A & M University - Corpus Christi	sarah.ives@tamucc.edu
Kim Moore	Texas A & M University - Corpus Christi	kim.moore@tamucc.edu
George Tintera	Texas A & M University - Corpus Christi	george.tintera@tamucc.edu
The goal of all professional development is student learning. One way to achieve this is to help teachers analyze student thinking. They need to develop habits of mind which include the willingness to question, experiment, and reflect (Doerr, Goldsmith, & Lewis, 2010). The interactive notebook is a tool to organize pedagogical and content knowledge growth. Recognizing that teachers are creative and diverse learners, the notebook is a place to set goals, collect evidence of best practices, evaluate student learning, and plan for continuous improvement. Researchers will present preliminary findings from the analysis of 23 secondary teachers' notebooks from a two-year grant focused on algebraic thinking.		

Elementary Preservice Teachers and Questioning Strategies in Mathematics, Round 2			Poolside 2 2:30-3:15
Sandra Browning	University of Houston-Clear Lake	browning@uhcl.edu	
Research has demonstrated an interest in the relationship between teachers' questioning strategies and children's ability to reason (Baroody & Ginsburg, 1990; Buschman, 2001; Carpenter, Fennema, Peterson, Chiang & Loeff, 1989; Fennema, Carpenter, Franke, & Carey, 1993; Fennema, Franke, Carpenter & Carey, 1993, Sousa, 2000). Helping preservice teachers develop effective questioning strategies is an important component of a teacher education program. This session describes an exploration designed to determine if 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 using Webb's Depth of Knowledge.			

Pre-service teachers' conceptions of representations of equivalent fractions and of fraction units			Poolside 3 2:30-3:15
Michael T. Muzheve	Texas A & M University - Kingsville	michael.muzheve@tamuk.edu	
This presentation reports on a qualitative investigation of pre-service elementary school teachers' ability to find and demonstrate equivalency of fractions using diagrams and on conceptions of representations of discrete and continuous wholes. Although a majority of the participants were able to find equivalent fractions, classify quantities as being discrete or continuous, and represent a fraction with a continuous whole, only a few successfully demonstrated equivalencies of fractions using diagrams and a only a few correctly represented a fraction of a discrete whole. Representations and explanations provided by some of the participants and implications on teacher education are discussed.			

Implementing the CCSS-M: A case study of two high school teachers			Kampman 2:30-3:15
Kwaku Adu-Gyamfi	East Carolina University	adugwamfik@ecu.edu	
Tony Thompson	East Carolina University	thompsonan@ecu.edu	
This research involves case studies of two high school teachers' effort to teach Math I in a manner that they understood to be consistent with the CCSS-M (including the Standards of Mathematical Practice). Data were collected via observations, interviews, surveys, and classroom artifacts (e.g., lesson plans, activities, student work.) The teachers initially found implementing the CCSS-M too overwhelming; however, as the year progressed, both teachers made significant changes to their teaching; this included increased attention to (a) higher level reasoning, (b) vocabulary / academic language, and (c) the use of performance assessments. Before and after examples will be provided.			

Preparing Future Elementary Math Teachers to Teach Beyond "Pizza Party" Math Lessons			Patio 3:30-4:15
Sylvia Taube	Sam Houston State Univ	taube@shsu.edu	
This paper describes the research and implementation of a methodology to help future teachers understand critical factors (e.g., poverty, learning disabilities) impacting the mathematics achievement of diverse students and to challenge them to develop strategies to teach learners at a higher level of thinking through civic engagement and social justice. By experiencing the basic processes in a project based learning (PBL) methodology, the future teachers were expected to gain a strong commitment as well as competencies in adapting higher level math instruction and to go way beyond "pizza party" math lessons. Preliminary data and future research will be discussed.			

Understanding the Connection: Students' Mathematical Thinking and Teachers' MKT			Renaissance 3:30-4:15
Carol Seaman	University of North Carolina Greensboro	ceseaman@uncg.edu	
In a first iteration of a year-long professional development (PD) for K-5 teachers focused on the learning trajectories that underlie the CCSSM, we discovered that teachers' mathematical knowledge for teaching (MKT) showed statistically significant increases as measured on the Learning Mathematics for Teaching instrument (Hill & Ball, 2004). Now, in a second iteration of the PD, we investigate possible factors present in the PD that influence this increase in teachers' MKT. In the talk, we will describe the PD curriculum, present results from the first iteration, and give opportunities for session attendees to provide feedback, suggestions, and discuss related ideas.			

Using a 3D Plotter to Improve Comprehension of Geometry for Blind Students			Cavalier 3:30-4:15
Carl Seaquist	Texas Tech University	carl.seaquist@ttu.edu	
Mark McVay	Texas Tech University	mark.mcvay@ttu.edu	
Kyle Steinle	Texas Tech University	kyle.j.steinle@ttu.edu	
This talk describes an ongoing effort to use 3D plotter technology to produce tactile objects annotated with braille to communicate geometric ideas to blind mathematicians and students. Although advances in technology have improved access to textual information through screen reading software; the ability to communicate geometric information at higher mathematical levels is still limited. Our goal is to address this situation by creating tactile models of both two- and three-dimensional figures. As a first step we are creating a version of Book I of Euclid's Elements with text in a braille ready file (.brf) and figures in a stereo lithography file (.stl). The first of these can drive an embosser while the second can drive a 3D plotter.			

Implementing the edTPA in Mathematics Education at East Carolina University			Sam Houston 3:30-4:15
Tony Thompson	East Carolina University	thompsonan@ecu.edu	
Kwaku Adu-Gyamfi	East Carolina University	adugwamfik@ecu.edu	
The ECU mathematics education program began using the edTPA (Teacher Performance Assessment) in the 2012-2013 academic year. The edTPA evaluates interns through three tasks: 1) lesson planning, 2) instruction, and 3) assessment. This presentation discusses: (1) pre-service teacher and university faculty perceptions of the edTPA; (2) aspects of the edTPA (i.e., tasks, rubrics) that posed challenges for pre-service teachers and university faculty; and (3) the impact of the edTPA on ECU's mathematics education program (e.g., new course assignments). Despite the initial concerns over the edTPA, the majority of interns and faculty felt implementation of the edTPA was a positive experience.			

iPads in an Elementary Mathematics Education			Grant 3:30-4:15
Kansas Conrady	University of Oklahoma	kansas.conrady@ou.edu	
Students were first asked to identify and categorize a variety of iPad apps that they perceived as useful for the mathematics classroom and then were asked to write a one page narrative requesting approval from a technology committee at their future school to use an app of their choice with the students of their future classrooms. The assignment was then followed by a brief open ended survey and class discussion about their anticipated use of iPads in their classrooms. Findings from the overall assignment will be shared during this session.			

A Snapshot of Preservice Teachers' Beliefs: A Factor Analytic Method			Poolside 1 3:30-4:15
Dr. Kathy Horak Smith	Tarleton State University	ksmith@tarleton.edu	
Dr. Beth Riggs	Tarleton State University	eriggs@tarleton.edu	
Dr. Eileen Faulkenberry	Tarleton State University	efaulkenberry@tarleton.edu	
Dr. Thomas Faulkenberry	Tarleton State University	faulkenberry@tarleton.edu	
How do beginning elementary and middle school pre-service teachers perceive mathematics? Analysis of pre-service students enrolled in the first semester of a series of three mathematics education courses were requested to respond to a prompt asking them to discuss their K-16 mathematics experiences and what they believe it means to teach mathematics. A factor analytic method approach was used to analyze pre-service teachers' responses to identify trends in their perceptions. Results from this two-semester long project will be shared.			

Helping Teachers Improve the Questions They Ask Students			Poolside 2 3:30-4:15
Sue Brown	University of Houston-Clear Lake	browns@uhcl.edu	
This presentation will discuss a project implemented with 16 middle school teachers who created a questioning portfolio. They videotaped themselves teaching a mathematics lesson to their middle school students and then edited a 10-minute clip from the lesson where they focused on questioning their students. They reviewed the clip, listed each question they asked, and categorized each question according to one of the three Costa's categories. During class, each teacher presented the clip and the list of questions they asked to their tablemates who provided suggestions for asking higher-level questions. This process was repeated for a total of five videos.			

Teacher Beliefs: The Power of CCSSM to Shift Mindsets			Kampman 3:30-4:15
Lynn Columba	Lehigh University	hlc0@lehigh.edu	
This study explored pre-service elementary teachers' perceptions of the CCSSM and their beliefs on teaching mathematics. Teacher beliefs and mindsets are key determinants of instructional practices and classroom environments. The professional development model implemented was: Set Goals, Plan, Do, and Reflect. Based on survey analysis the largest growth was found in the teachers acquiring an understanding of how and why the CCSSM are important in teaching.			

Using Culturally Responsive Teaching to Support Student Engagement in a Mathematical Practice			Patio 4:30-5:15
Tashana Howse	Daytona State College	tashana.howse@gmail.com	
Research literature highlights the need to reform teaching practices in a way to transform instruction that raise the performance of all students. A reformation of instructional practices with a focus on teachers' use of CRT practices is key to establishing learning environments that promote the level of engagement consistent with CCSSM. This study found that a shift toward the use of CRT can be enhanced by purposeful professional development along with reflective practice. Moreover, this instructional shift is impacted by classroom management and the teacher's knowledge of CRT and SMP3.			

The Evolution of a Conceptual Model for Algebra Teacher Self-Efficacy			Renaissance 4:30-5:15
Colleen M. Eddy	University of North Texas	Colleen.Eddy@unt.edu	
William Jasper	Sam Houston State University	jasper@shsu.edu	
Trena L. Wilkerson	Baylor University	Trena_Wilkerson@baylor.edu	
M. Alejandra Sorto	Texas State University	as45@txstate.edu	
Sandi Cooper	Baylor University	sandra_cooper@baylor.edu	
Elizabeth K. Ward	Texas Wesleyan University	ekward@txwes.edu	
Winifred A. Mallam	Texas Woman's University	wmallam@twu.edu	
Yolanda A. Parker	Tarrant County College	Yolanda.Parker@tccd.edu	
There is documented belief that algebra is a major predictor of academic success in college and career readiness (National Governors Association 2010; Stein, Kaufman, Sherman, & Hillen 2011). Therefore, producing algebra teachers who are confident and competent in their abilities is essential for student success. A group of secondary mathematics educators banded together to address a gap in the research related to teachers' sense of self-efficacy in knowing and teaching algebra. This presentation focuses on the evolution of the conceptual model for algebra teacher self-efficacy and seeks feedback from the audience on the current conceptual model.			

Extending Discourse through Pencasts			Cavalier 4:30-5:15
Keith Adolphson	Eastern Washington University	kadolphson@ewu.edu	
Technology can provide a vehicle for pre-service elementary education students reconsider their characteristically narrow views of mathematics and what it means to teach mathematics. This session discusses a study of how technology can be used to further discourse among pre-service elementary mathematics methods students. Student reasoning was captured in a digital form called pencasts and used in ensuing discussions within and between classes. Specific examples of student-originated pencasts are examined. The results will serve as a vehicle for discussing the potential of pencasts for developing discourse and enriching mathematical understanding.			

Mathematics in an Early Childhood Special Education Setting			Sam Houston 4:30-5:15
Kay A. Wohlhuter	University of MN Duluth	kwohlhut@d.umn.edu	
This session is a discussion of a research project that attempted to answer the following questions: What does mathematics look like in early childhood special education settings? Are teachers aware of the mathematics they are doing in their classrooms? Is there more mathematics that teachers could be doing with their children?			

Technology in Higher Education Mathematics		Grant 4:30-5:15
Dena Walker	Northwestern Oklahoma State University, Oklahoma State University Doctoral Student	dewalker@nwosu.edu
This session will discuss the findings of a study that focused on technology use in higher education mathematics classrooms. University faculty members have some hard questions to ask themselves. What technology is being used and how is it being used to meet the needs of the digital native students in our classrooms? How must the instructional techniques and strategies change? The purpose is to have an open discussion concerning the results of the survey and semi-structured interview data and receive feedback from attendees concerning the findings and implications.		

Misconceptions with Fractions: A study and Strategies to Remediate		Poolside 1 4:30-5:15
Barba Patton	University of Houston-Victoria	pattonb@uhv.edu
Estella De Los Santos	University of Houston-Victoria	delossantose@uhv.edu
Misconceptions with fractions by both students and teacher candidates have been documented repeatedly in research. This study focused on EC-6 teacher candidates. Remediation with the teacher candidates was effort to stop the spirally negative effect resulting in EC-6 students having many of these misconceptions. Teacher candidates were given pre/post tests as well as given appropriate instruction to rectify the misconceptions with fractions. Data from both pre and post tests as well as examples of remediation techniques will be shared. The EC-6 students must gain a working knowledge if they are to be successful in higher education and in life experiences.		

Assessing math learning via student constructed questions		Poolside 2 4:30-5:15
Ramakrishnan Menon	Georgia Gwinnett College	rmenon@ggc.edu
Assessing student learning of math is important, and one way of assessing such learning—namely via student constructed questions—was studied with a group of preservice elementary school teachers (candidates) taking the course, Geometry for Elementary Teachers. These candidates prepared questions on geometry topics related to their course, as well as those geometry topics related to elementary school students. Feedback on interviews, and survey questions based on whether they found preparing such questions useful for themselves and for their subsequent teaching, was collected and analyzed. This presentation discusses some of the results of this study.		

Task alignment to the Common Core? How our solution lens matters.		Kampman 4:30-5:15
Travis A. Olson	University of Nevada, Las Vegas	travis.olson@unlv.edu
Melfried Olson	University of Hawaii	melfried@hawaii.edu
Linda Venenciano	University of Hawaii	lhirashi@hawaii.edu
Hannah Slovin	University of Hawaii	hslovin@hawaii.edu
We will discuss how the choice of solution strategy for a task relates to perceptions of the content of the task. Over 30 participants examined a geometry task for which numerous connections to common core standards for mathematical content can be made. We gathered data relative to which content standards teachers saw embedded in the task. We share data about the standards participants identified as related to the task and compare and contrast how the strategies they used to solve the task likely mirror their perceptions of the connection of the task to the standards.		

The Complexities of Mathematics Learning: Burning Tents, Specious Algorithms, and Problems with Problems		Ballroom AB 5:30-6:30
James Epperson	UT-Arlington	epperson@uta.edu
Mathematicians and mathematics educators approach the complexities of mathematics learning in many ways. Whereas mathematicians may focus on the preciseness of the mathematics, mathematics educators may center on the overall mathematical reasoning being conveyed. As investigators in mathematics learning and lifelong mathematics learners ourselves, where do we situate ourselves? We will investigate some fun examples that highlight issues in metacognition, problem solving, developing mathematical habits of mind, and understanding students' thinking.		

Mathematics content knowledge, anxiety, and efficacy among elementary teachers		Patio 8:00-8:45
Brian R. Evans	Pace University	bevans@pace.edu
The purpose of this study was to understand mathematical content knowledge, anxiety, and efficacy for mathematics elementary school traditional and alternative certification preservice and in-service teachers. The teachers in this study were given mathematics content examinations and mathematics anxiety and efficacy questionnaires in reform-based mathematics methods. Additionally, teachers were required to keep reflective teaching and learning journals throughout the semester. It was found that there were increases in content knowledge and efficacy, but not anxiety levels, over the course of the semester. There were no differences between traditional and alternative certification teachers in content knowledge, anxiety, and efficacy.		

Support for High School Math Teachers Through Induction		Renaissance 8:00-8:45
Melanie Fields	University of North Texas	melanie.fields@unt.edu
Teach North Texas (TNT) a program at the University of North Texas prepares math and science teachers for teaching high school. However, the work does not end once our preservice teachers graduate, we offer them support in their first years of teaching. Come hear the preliminary results and stories of two new teachers who have had support through the TNT induction program.		

Improving School Performace in Mathematics		Cavalier 8:00-8:45
Bob M. Drake	None	bob.drake@outlook.com
Too many teachers believe that teaching ‘mathematics’ is synonymous with teaching ‘algorithms.’ This study describes how to effectively support teachers to move from an emphasis on computational facility to one of developing mathematical understanding and problem solving skills. Data comes from three schools over a six year period.		

Dynamics among three domains in forming pre-service teachers’ dispositions		Sam Houston 8:00-8:45
Benjamin R. McDermott	University of Texas at El Paso	brmcdermott@utep.edu
Ruby Lynch Arroyo	University of Texas at El Paso	rllynch@miners.utep.edu
Mourat Tchoshanov	University of Texas at El Paso	mouratt@utep.edu
Mathematics learning is not exclusively influenced by an individual’s cognitive disposition. Rather, the dynamic interplay among the cognitive, affective, and conative domains construct a holistic mathematical disposition. Positioning Theory “... pictures a dynamic stability between actors’ positions, the social force of what they say and do, and the storylines that are instantiated in the sayings and doings of each episode” (van Langenhove & Harré, 1999, p.10). This study examines a pre-service elementary teacher’s historical transformation of and repositioning toward mathematics. In this case, the dynamic interplay of self-positioning and reactions to social forces culminated in a productive holistic mathematical disposition.		

Inquiry Based Learning in Collegiate Mathematics		Grant 8:00-8:45
Oscar Chavez	University of Texas at San Antonio	oscar.chavez@utsa.edu
In this presentation we address some preliminary considerations about designing mathematics courses that are appropriate for prospective secondary mathematics teachers and other mathematics majors. Specifically, we argue that it is particularly important to provide prospective mathematics teachers with opportunities to learn to write proofs and to engage in making conjectures and proving them. We give a justification for this approach as followed in the design of an abstract algebra course and offer some preliminary evidence of success, based on classroom data.		

What Do 9th Grade Students Know About Algebra?			Poolside 1 8:00-8:45
Derrick Saddler	University of South Florida	dsaddler@usf.edu	
The purpose of this study is to describe relationships between various subgroups of ninth grade students proficiency on a broad spectrum of algebraic concepts. The students enrolled in entry-level high school mathematics courses (i.e. Algebra 1, Integrated Mathematics 1), and were administered an algebra assessment at the beginning of their ninth grade year. Findings indicate significant differences exist on some algebraic concepts between students who took different eight grade mathematics courses. In addition, differences exist between male and females on some algebraic concepts, but differences exist ethnic groups on all algebraic concepts that were assessed.			

A Model for Mathematics Teacher Preparation			Patio 9:00-9:45
Daniel Brahier	Bowling Green State University	brahier@bgsu.edu	
Jonathan Bostic	Bowling Green State University	bosticj@bgsu.edu	
In this session, we will examine a unique mathematics (and science) teacher preparation program for middle and high school teachers that includes undergraduates conducting original research and community-based practicum experiences. Through five years of running the program, data were collected and analyzed to predict academic success in college and long-term success as a teacher. Elements of the program will be shared, as well as research results. Participants will be engaged in a discussion about how to build on this model to improve teacher education programs.			

Snapshot of a State's Mathematics Teacher Workforce			Renaissance 9:00-9:45
Juliana Utley	Oklahoma State University	juliana.utley@okstate.edu	
Stacy Reeder	University of Oklahoma	reeder@ou.edu	
Over the past year information from grades 6-12 mathematics teachers across the state related to their pathway to certification, teaching experience, why they became a teacher and their beliefs about teaching mathematics was collected. In this session, we will share our findings and solicit audience discussion of these findings including how the results might be used to impact state policy and to set the stage for a follow-up study to consider potential impacts of certification pathways on student level data.			

Co-Teaching and Elementary Mathematics Teacher Education			Cavalier 9:00-9:45
Kansas Conrady	University of Oklahoma	kansas.conrady@ou.edu	
The use of the co-teaching model during the student-teaching experience is being explored and adopted by many teacher preparation programs across the country. While on the surface this seems like a great way to share ideas and break the process of assimilation to traditional methods of mathematics instruction while increasing student achievement scores, there may be a need for concern that it actually speeds the process of assimilation. This session will present findings from a pilot study conducted with a small cohort of student-teachers paired with cooperating-teachers trained in a specific co-teaching model.			

Examining Preservice Teachers' Professional Noticing			Sam Houston 9:00-9:45
Leigh Haltiwanger	Clemson University	haltiwa@clemson.edu	
Amber Simpson	Clemson University	amsimps@g.clemson.edu	
A teacher's role in facilitating learning relies upon his/her ability to monitor student thinking in the moment and his/her ability to help students construct understanding that is connected to prior knowledge that is appropriately situated within the topic under consideration. A mixed-methods analysis was used to determine the ways in which secondary mathematics preservice teachers attend to, interpret, and respond to students' mathematical thinking in order to facilitate effective student learning. The results of this study will inform secondary mathematics preservice teacher courses of study.			



Math Efficacy and Utility as Predictors of American Indian Math Achievement			Grant 9:00-9:45
Cynthia Orona	University of Arkansas	orona@uark.edu	
Parents are an influence that students bring to the school environment. This study was conducted to determine the extent to which the relationships between students' and mothers' mathematical efficacy beliefs and utility values influence student mathematical achievement. A dyad of 148 mothers and students from 23 schools in northeastern Oklahoma completed the Fennema-Sherman Mathematics Attitude Scales (1976). In addition, children's results of the mathematics section of the Oklahoma Core Curriculum Test were used in a path analysis to determine direct and indirect effects of mothers' and students' efficacy beliefs and utility values on student mathematical achievement.			

Impact of A Modeling Approach to Algebra on Teachers and Students.			Poolside 1 9:00-9:45
Judith Olson	University of Hawaii	jkolson@hawaii.edu	
Melfried Olson	University of Hawaii	melfried@hawaii.edu	
Fay Zenigami	University of Hawaii	zenigami@hawaii.edu	
Hannah Slovin	University of Hawaii	hslovin@hawaii.edu	
In 2010, a national U.S. Department of Education study found that 80 percent of high school dropouts cited their inability to pass Algebra I as the primary reason for leaving school. A Modeling Approach to Algebra (AMAA) was developed to meet the needs of struggling students in 9th grade Algebra 1. This presentation will report on research on the implementation of the AMAA curriculum at two high schools in Hawaii in which four teachers are implementing AMAA materials with over 450 students. We will share the research design and data from classroom observations and student work.			

Pedagogical Decision-making about Teaching Mathematics On-Line			Poolside 2 9:00-9:45
Lynae Sakshaug	SUNY Empire	lynae.sakshaug@esc.edu	
Durng this session, the presenter's research pertaining to engaging learners in on-line settings in order to increase the learning of mathematics and math pedagogy will be shared. Work by students in several courses will be shared. An analysis of the results will be shared. Common threads across courses will be discussed. Concerns and issues will also be shared. Discussion among participants is encouraged.			

Career intention, Academic math level and Educational supply chain for Math Major Students			Poolside 3 9:00-9:45
Ping-Jung Tintera	Texas A & M University-Corpus Christi	ptintera@tamucc.edu	
Timothy Nelson	Alice High School	tnelson2@islander.tamucc.edu	
The purpose of this paper is to investigate whether the factors of how career intention, academic math level and educational supply chain for mathematics graduates are related. About 293 respondents were participated in this survey during spring and summer of 2013 at a four-year institution in South Texas. The objective of this research is to consider education as a supply chain providing mathematically competent students for society. The findings will lead to an understanding of how each sub-aspect of the educational supply chain essentially related on the overall performance of the math graduates. The purpose of this paper is to investigate whether the factors of how career intention, academic math level and educational supply chain for mathematics graduates are related. About 293 respondents were participated in this survey during spring and summer of 2013 at a four-year institution in South Texas. The objective of this research is to consider education as a supply chain providing mathematically competent students for society. The findings will lead to an understanding of how each sub-aspect of the educational supply chain essentially related on the overall performance of the math graduates.			

As Mathematicians, How Do English Language Learners Communicate Mathematically?			Kampman 9:00-9:45
Kathy Horak Smith	Tarleton State University	ksmith@tarleton.edu	
Molly Weinburgh	Texas Christian University	m.weinburgh@tcu.edu	
Cecilia Silva	Texas Christian University	c.silva@tcu.edu	
Natalie Smith	Texas Christian University	nmsmith9@gmail.com	
This study is a continuation of previous research as part of a larger study that focuses on English Language Learners (ELL) acquisition of academic language in mathematics and science. Upper elementary and middle school ELL students were involved in an intensive three-week summer school program focusing on communication in mathematics and science. The qualitative and quantitative analysis of pre- and post- student journal entries and of student work shows how students 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.			

Conceptual Tasks in Secondary Mathematics			Patio 10:00-10:45
Sarah Pratt	University of North Texas	sarah.pratt@unt.edu	
Gabriel Matney	Bowling Green State University	gmatney@bgsu.edu	
Kerri Richardson	University of North Carolina at Greensboro	kerri_richardson@uncg.edu	
The researchers in this session continue to find that secondary teachers of mathematics have a limited conceptual approach to teaching mathematics, in large part due to their formations of mathematical knowledge and how they understand secondary concepts. We share three different examples of tasks that we have used with secondary teachers to assist in their own conceptual development and how that has translated into their teaching. Participants will have an opportunity to examine their own conceptual knowledge as part of this session.			

Elementary Teachers' Perceptions of Mathematical Applications in Engineering			Renaissance 10:00-10:45
Juliana Utley	Oklahoma State University	juliana.utley@okstate.edu	
Toni Ivey	Oklahoma State University	toni.ivey@okstate.edu	
Elementary teachers' perceptions of engineers will be explored through the analysis of teachers' drawings on the Draw an Engineer at Work Test. From this drawing, teachers described how they perceived engineers use of mathematics. Findings from this analysis will be shared and discussed.			

Mathematical Immersion: Paralleling Experiences of Instructor and Graduate Students			Cavalier 10:00-10:45
Trena Wilkerson	Baylor University	Trena_Wilkerson@baylor.edu	
This proposal examines a mathematical immersion experience with graduate students pursuing studies in mathematics education while paralleling that experience with the instructor's. A qualitative phenomenological approach was utilized as both the instructor and students were immersed in the experience. Data sources included mathematical investigations, journal reflections and field notes. Various factors influenced the mathematical learning of instructor, graduate students and their K-12 students. The paper follows a phase comparison used by Curcio and Artzt (2003) paralleling the instructor's story as a mathematics teacher educator with her graduate students. Approach, findings and structure will be discussed as well as implications.			

Unlived Math Experiences			Sam Houston 10:00-10:45
Rebecca Yeaman	University of Central Oklahoma	ryeaman@uco.edu	
Sarah Wheeler	University of Central Oklahoma	swheeler5@uco.edu	
Darlinda Cassel	University of Central Oklahoma	dcassel2@uco.edu	
Two undergraduate researchers surveyed their peers in order to discover their K-16 mathematical experiences. From the surveys the researchers found factors that had positive or negative effects on their mathematical learning. The researchers describe some of the personal stories that were shared so we can better understand ways that will positively affect mathematics learning.			

Building and Repairing Conceptual Foundations to Teach Polynomial Long Division			Grant 10:00-10:45
Rachel M. Bachman	Weber State University	rachelbachman1@weber.edu	
This presentation details the instructional methods used in a sequence of two remedial mathematics courses to build and repair the conceptual understanding undergirding the polynomial long division algorithm. The presenter will explain how the students were prepared to learn polynomial long division by linking each division subtopic to the meaning of division and by conceptually studying the long division of whole numbers. The presentation will include hands-on work with base ten blocks and algebra tiles in order to arrive at the polynomial long division algorithm. Results from pretest/posttest analysis will be shared to document student growth with polynomial long division.			

Flipping Algebra			Poolside 1 10:00-10:45
Cherie Ichinose	CSU Fullerton	cichinose@fullerton.edu	
Traditionally, introductory College Algebra courses are offered in a traditional face-to-face model. Instructors present the material in a lecture based environment with little interaction from their students. This study will focus on the transformation from the current traditional instruction into an online flipped blended module. The sample was drawn from three classes: two traditional and one hybrid. Academic gains and mathematical beliefs were measured to study the differences between the traditional and the flipped hybrid environments. Participants will walk away with a blue print of a working hybrid model in hopes to build one of their own.			

Pre-Service Teachers and the Representativeness Heuristic: Preparing for Probability Instruction and Associated Misconceptions			Poolside 2 10:00-10:45
Julie Cronin	University of Central Missouri	jxc95660@ucmo.edu	
William McGalliard	University of Central Missouri	mcgalliard@ucmo.edu	
In this study, sixty-six pre-service teachers were surveyed and interviewed regarding the presence of the representativeness heuristic. Through written task surveys and follow-up interviews, two trends emerged. First, was a narrow focus on a 50/50 chance that neglected other necessary concepts like sample space. The other trend represented a view of equal uncertainty as opposed to an equal likelihood. These trends are similar to other research findings and continue to indicate the necessity for more statistics and probability instruction and, specifically, comprehensive teacher preparation in this content area.			

A Recursive Approach to Develop Discourse in Mathematics Classrooms			Kampman 10:00-10:45
Lianfang Lu	University of Arkansas at Little Rock	lxlu@ualr.edu	
This paper focuses on recursion in discourse, discussing it in the context of problem-solving in pre-service teachers' mathematics methods classes. Discourse around one solution to a problem functions as a basic unit of discourse in a classroom. In the discourse, students proposed solutions to a problem, explained their processes, defended or revised their solutions. Different approaches were analyzed and used to generate new understanding and new ideas of solving the problem. The discourse in a classroom is a communication network around mathematical problem-solving.			

Attitude Adjustment: How Can We Change Students' Attitudes about Statistics?			Patio 11:00-11:45
Melanie Autin	Western Kentucky University	melanie.autin@wku.edu	
Summer Bateiha	Western Kentucky University	summer.bateiha@wku.edu	
Hope Marchionda	Western Kentucky University	hope.marchionda@wku.edu	
People's typical response to finding out someone teaches statistics often reflects their disdain for the subject, including statements such as "I hated that class." Similarly, many students that enroll in introductory statistics courses do not have positive attitudes about the subject. A recent wide-ranging study showed that student attitudes do not tend to improve after completing an introductory statistics course. In this talk, we will present findings about the changes in student attitudes about statistics in both a teacher-centered lecture-based class and in a student-centered collaborative-learning class. Session participants will then discuss possible ways to improve student attitudes towards statistics.			

30-years of NAEP Reports - Have We Really Made Any Progress?			Renaissance 11:00-11:45
Pat Lamphere Jordan	Oklahoma State University	patricia.jordan@okstate.edu	
NAEP began in 1969 and results have served as a benchmark of students' understanding of mathematics for over 30 years. Each administration included more and more students and interpretation of the results extended beyond a simple reporting of student scores to more in-depth analyses of the students themselves. This research study focused on the question: what differences exist among the students' scores as described by ethnic group, by NSLP eligibility, as ELL or students with disabilities, and by school environment? The results were analyzed and descriptive statistics will be presented for each comparison. Although students' scores have improved over-all, the gaps among groups remains of grave concern.			

Mirror Effect: Teacher and Student Self-Positioning Toward Mathematics			Cavalier 11:00-11:45
Ruby Lynch-Arroyo	University of Texas at El Paso	rllynch@miners.utep.edu	
Mourat Tchoshanov	University of Texas at El Paso	mouratt@utep.edu	
Teachers' self-positioning might be challenged by students' indirect positioning of the teacher. Survey research (open-ended questionnaire and metaphor prompts) of 458 middle school students and their linked mathematics teachers (n=22) revealed transphenomenality of teacher self-positioning as reflected in students' disposition. This simultaneity of transphenomenality or "events or phenomena that exist or operate at the same time" (Davis, 2005, p.14) was recognized in the dynamic, multifaceted nature of disposition and characteristics which contributed to emergent and shifting mathematical disposition and positioning of teachers and students.			

Where They Come From: Understanding Millennial Pre-Service Teacher's Reasons for Becoming Math Teachers			Sam Houston 11:00-11:45
Glenn Allen Phillips	Texas A & M University	glennallenphillips@gmail.com	
To encourage, instruct, or reprimand teachers, we must first understand why they teach. Building on past research that investigated pre-service teacher motivation, this project examines qualitative data taken on pre-service teachers over multiple semesters. Asking both why they want to teach mathematics and what their experience was with mathematics, the project offers new insights into why some of tomorrow's teachers choose the honorable but sometimes difficult job of middle-grade mathematics instruction. The results of this study will help administrators, current teachers, incoming teachers, and teacher educators.			

Developing the Mathematical Writing Skills of Elementary Preservice Teachers			Grant 11:00-11:45
Kelli Slaten	University of North Carolina Wilmington	slatenk@uncw.edu	
Sarah Ives	Texas A & M University - Corpus Christi	sarah.ives@tamucc.edu	
Many mathematics content courses for preservice elementary teachers include the development of written communication skills as a learning objective. Writing in mathematics has not traditionally been a widespread pedagogical practice, but is gaining attention as a promising tool for helping students learn and also informing instructors of what students know. How can we assess this learning objective in an informative way? In this presentation we will describe how we incorporated and assessed writing activities in our mathematics content courses. We hope our efforts will help mathematics teacher educators incorporate meaningful writing assignments in their content courses for preservice teachers of all levels.			

Three-Column Proofs for Algebraic Reasoning and Justification			Poolside 1 11:00-11:45
Sean Yee	California State University, Fullerton	syee@fullerton.edu	
This study implemented three-column proofs as a means to aid pre-service teachers (PSTs) in reasoning and justifying algebraically. Three-column proofs were implemented in a capstone mathematics course for secondary school PSTs focusing on algebra, functions, and probability. PSTs used three-column proofs within the course, and voluntarily participated in a ten-question survey discussing implementation of three-column proofs into secondary education. The results demonstrated that PSTs value three-column proofs above standard solve for x problems because students must explicitly justify why each step involved in solving an equation. PST survey results and PST performance will be discussed in the proceedings.			

Teaching Mathematics with Music			Poolside 2 11:00-11:45
Rachel Schuster	Tarleton State University	rmschuster1@gmail.com	
Beth Riggs	Tarleton State University	eriggs@tarleton.edu	
Many students struggle with mathematics and sometimes find the subject difficult, boring, and irrelevant. What if we could change students' outlooks on mathematics by incorporating some of their favorite things - such as music - and give them a glimpse of how mathematics can be used to do extraordinary things in real world situations? This project was designed to investigate effective implementation strategies for using music to teach the mathematics of transformations. Preliminary results from the study will be shared, along with future plans for the project.			

Mathematics Leadership in a Common Core World			Minuet 12:00-1:00
Suzanne Mitchell	National Council of Supervisors of Mathematics	suzmitch@comcast.net	
Mathematics leaders need new tools to help transform teacher practice and to help leaders reach the highest peaks of leadership implementation. NCSM continues to develop and refine engaging activities such as Great Tasks, Coaching Corner, and Illustrating the Standards for Mathematical Practice. This session will integrate the newest NCSM position papers that exemplify current research to support NCSM's vision and progress. In addition, It's Time: Themes and Imperatives for Mathematics Education-A Mathematics Leadership Framework will be discussed.			

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