School Science Mathematics Association Annual Convention

Intersecting the Past and the Future of Science and Mathematics Integration

Oklahoma City, Oklahoma
October 29- 31, 2015

SSMA 2015 Annual Convention
Oklahoma City, Oklahoma
October 29 – 31

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SSMA President Welcome

On behalf of the Board of Directors of School Science and Mathematics Association, I welcome you to the 114th Annual Convention at the Skirvin Hilton Hotel in Oklahoma City, Oklahoma. We are an international organization that continues to nurture new researchers and practitioners through our meetings. As an intimate, nurturing professional association comprised of a mixture of researchers and practitioners, the activities of SSMA are defined by four goals:

1. To build and sustain a community of educators and researchers in STEM fields.

2. To advance knowledge through research in science and mathematics education, and in their integration and application in the real world.

3. To inform practice through the dissemination of scholarly works in science and mathematics, in our journal, *School Science and Mathematics*.

4. To influence policy in science and mathematics education at all levels of government.

In celebrating 114 years of existence, please extend invitations to your new and experienced science and mathematics colleagues to join our family.

As you involve yourself in the convention sessions, meals and committee meetings, realize that it is people like you who can make a difference in the quality of our educational systems. Join in the friendly discussions about the research, development, teaching and learning of mathematics and science at all levels.

If we have not met, be sure to introduce yourself when you see me.

Enjoy your time in Oklahoma City as you network with friends and new acquaintances in your field.

Gil Naizer

In Memory of John Park

SSMA lost a long-time member and friend this year. John who had a long history of involvement in SSMA was serving as Past-President at the time of his passing. Recognizing SSMA as one of his professional homes, John joined as a 'life member' early in his academic career. John was actively involved in SSMA, a continual presence at the conventions, conducting insightful presentations as well as encouraging and engaging colleagues.

John's long-time service to SSMA included: Convention Program Chair, multiple terms on the Board of Directors, SSMJ Reviewer, SSMA President from 2012-2014 and Past President. John had a national reputation as a teacher-educator and served in leadership roles within the profession beyond SSMA. John was a beloved SSMA member and will truly be missed by all.

In honor of John and his interest in encouraging new researchers, SSMA established the John Park Graduate Student Award and will be awarding the first recipients at the 2015 convention.

Intersecting the Past and the Future of Science and Mathematics Integration

SSMA Leadership

President, Gil Naizer, Texas A&M University – Commerce, 2014-2017
Past-President, John Park, Baylor University, 2014-2015

Co-Executive Directors and Convention Chairs

Melanie Shores, University of Alabama Birmingham, 2014-2019
Tommy Smith, University of Alabama Birmingham, 2014-2019

Directors-at-Large

Margaret Mohr-Schroder, University of Kentucky, 2012-2015
Stacy Reeder, University of Oklahoma, 2012-2015
Timothy Laubach, University of Oklahoma, 2013-2016
Ron Zambo, Arizona State University, 2013-2016
Charles Emenaker, University of Cincinnati Blue Ash, 2014-2017
Elaine Tuft, Utah Valley University, 2014-2017

School Science Mathematics Journal Editors

Shelly Harkness, University of Cincinnati, 2011-2021
Carla Johnson, Purdue University, 2011-2021

Newsletter Editor

Georgia Cobbs, University of Montana, 2013-2016

2015 Program Chairs and Local Arrangements Chairs

Timothy Laubach, University of Oklahoma
Stacy Reeder, University of Oklahoma

Special thank you to Wendy Martin and Adam Stroud, both of the University of Oklahoma, for their various contributions to the convention program.

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Convention Overview

Thursday	Friday	Saturday
8:00-9:00 **Continental Breakfast**	**7:30-9:00** **Full Breakfast Buffet** **Awards and Business Meeting**	**8:00-9:00** **Continental Breakfast**
9:10-10:00 Breakouts	9:10-10:00 Breakouts	9:10-10:00 Breakouts
10:10-10:35 Breakouts	10:10-10:35 Breakouts	10:10-11:00 Breakouts
10:45-11:10 Breakouts	10:45-11:10 Breakouts	
11:20-11:45 Breakouts	11:20-11:45 Breakouts	11:10-12:00 Breakouts
11:45-1:00 **Lunch on your own**	**11:45-1:00** **Luncheon** **General Session**	**12:10-1:00** **Innovations Showcase** **Boxed Lunch**
1:10-1:35 Breakouts	1:10-1:35 Breakouts	Explore OKC
1:45-2:35 Breakouts	1:45-2:35 Breakouts	Safe Travels!
2:35-2:55 PM Snack Break	**2:35-2:55 PM Snack Break**	
2:55-3:45 Breakouts	2:55-3:45 Breakouts	
3:55-4:20 Breakouts	3:55-4:20 Breakouts	
4:20-5:15 Transition to V2 in Devon Tower	4:30-4:55 Breakouts	
5:15-6:15 General Session	4:55-5:55 Committee Meetings	
6:15-8:00 Reception	Dinner on your own/Explore OKC	
Explore OKC	**8:00-10:00 SSMA President Graduate Student Reception Room #1203**	

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Convention Schedule Overview

THURSDAY Morning, October 29				
	9:10-10:00	**10:10-10:35**	**10:45-11:10**	**11:20-11:45**
Centennial Ballroom 1	**Research Session** *Environmental Education Teaching Efficacy Belief Instrument: Preservice Teachers' Environmental Education Teaching Efficacy* C. Moseley, Utley, Angle	**Research Session** *Finding Common Ground: Interactions Between Pre and Inservice Teachers* **No Show** Watkins	**Research Session** *Integrating Pedagogy and Content With Pre-Service Teachers* **Canceled** Roberts-Harris	**Research Session** *The Extinction and Future Evolution of Dinosaurs in Science Curricula* Lyons
Centennial Ballroom 2	**Research Session** *The Use of MET and MET2 in Mathematics Education Literature* Conrady, Bowman	**Research Session** *Using an After-School Garden Club to Examine Science Attitudes of K-2nd Graders* Stewart	**Research Session** *Hybrid Language of Science: What Is the Manual-Technical Part?* Weinburgh, Stewart	**Research Session** *Science and Literacy Integration to Foster Deeper Levels of Scientific Understanding* Morrison, Milner
Centennial Ballroom 3	**Research Session** *The Problem-Size Effect: An Effective Tool in Investigating Computational Estimation* Liu	**Research Session** *The Issues of Integrating Digital Games in K-12 Mathematics Education* Joung, Byun	**Research Session** *Elementary Math Specialists: How Do We Encourage More to Step Up* Shobert	**Research Session** *Navigating the Video Stream* L. Foster
Grand Ballroom A	**Research Session** *Modeling: Are Today's Teachers Prepared?* Enderson, Watson	**Research Session** *The Influence of a College Calculus Course on Students' Self-Efficacy* Nicolescu	**Research Session** *Mathematics Classroom Environment and Student Self-Efficacy in Elementary, Middle, and High School* Croissant, Naizer	**Research Session** *Cooperative Learning in a Community College Classroom* Zambo
Grand Ballroom B	**Regular Session** *Can You Convince a Sixth Grader?* Kimmins, Winters	**Research Session** *Impact of a Professional Development Conference on Science and Mathematics Teachers' Practice* Bruun, Moore	**Research Session** *Impact of Educational Robotics on PK-12 STEM Teacher Education: A Research Synthesis* Laubach	**Research Session** *A Closer Look at Women in STEM* Shores
Grand Ballroom C	**Regular Session** *More Than a Story: Integrating Literature in the Math and Science Classroom* Cerrato Fisher	**Research Session** *Changing Perceptions of Scientists and Engineers Through a University/ Elementary School Partnership* McCann, Marek	**Research Session** *Professional Development and Its Impact on PST's Technological Pedagogical Content Knowledge (TPACK)* Olivares	**Research Session** *Pre-Service Teacher's Confidence in Teaching Science, Technology, Engineering, and Mathematics (STEM)* Orona
Balinese Room	**Regular Session** *Using Learning Styles to Become Better Teachers* Selitto		**Research Session** *A Study of STEM Implementation Practices for High School Teachers and Students* Hall	

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THURSDAY Afternoon, October 29				
	1:10-1:35	**1:45-2:35**	**2:55-3:45**	**3:55-4:20**
Centennial Ballroom 1	**Research Session** *NASA Preservice Teacher Institutes (PSTI): Comparing Four Preservice Science Teacher Training Models* Ivey	**Hot Topic Session** *Plugging the Leak: Recruiting and Retaining Female Students in Science and Mathematics* Sparks, Cavallo	**Symposium** *Evaluation of a Middle School Problem-Based Learning Course: A STREAM School* Scogin, Jekkals, Kruger	**Research Session** *Project-Based Learning: Effect on Attitude, Motivation, and Achievement of 6th Grade Students* Hart
Centennial Ballroom 2	**Research Session** *Guided-Inquiry Experiences and Writing Improves Motivation to Learn Science, Especially Females* Caukin	**Research Session** *Using Self-Study to Navigate Tensions in a Science Course for Preservice Teachers* Bloom, Quebec Fuentes	**Research Session** *Classroom Assessment Practices and Student Achievement in Mathematics* Walcott, Mohr	**Research Session** *ASSURE Model: An Innovative Way for Teaching Mathematics Education Courses Via Distance* Hu
Centennial Ballroom 3	**Research Session** *"Math Talk" in Preschool Classrooms: Effect of Book Type and Teacher Training* Columba	**Research Session** *Elementary Mathematics Specialist Program: Developing Teacher Leaders* Reeder, Utley	**Research Session** *Survivor Math: Fibonacci Sequence and Golden Ratios* Cannon, L. J. Moseley	**Research Session** *The Presence of Equity Inside a Virtual Simulation Mathematics Classroom* Ortiz
Grand Ballroom A	**Research Session** *Transdisciplinary Preparation of Preservice Secondary Math and Science Teachers* Lemmon	**Research Session** *Patterns of Mathematics Teachers' Instructional Performance: A Concurrent Embedded Mixed Methods Study* Cetin, Matteson	**Regular Session** *Increasing Science Literacy Skills by Engaging in Collaborative Nature of Science Activities* Angle	**Research Session** *Mobilizing STEM Education Through Leadership, Partnership, and Apprenticeship: A Doctoral Student's Perspective* Cavalcanti, Mohr-Schroeder
Grand Ballroom B	**Research Session** *Developing STEM Educators through Project-Based Instruction* Chavez	**Research Session** *Thinking Differently About Preservice Teacher Field Experiences: Benefits of Math Camp* Matney, Sullivan	**Regular Session** *Proportional Reasoning: A Theme Across Middle Grades Science and Mathematics* Chavout, Sun, Kurban	**Research Session** *Perceptions of Mathematics and Science Teachers of an Early Online Graduate Program* Hicks **No Show**
Grand Ballroom C	**Research Session** *What STEM Principals Want and Need* Browning **Canceled**	**Research Session** *A Case for Collaboration* Vincent	**Regular Session** *Will Mathematics Send You to an Early Grave?* Emenaker	
Balinese Room		**Regular Session** *How to Publish in the School Science and Mathematics Journal* Johnson, Milner, Breiner	**Regular Session** *Faculty Jobs: Finding, Securing, and a Being Successful New Faculty Member* Barrow	
V2 Events Center at Vast	**5:15-6:15** **General Session** Magruder			

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FRIDAY Morning, October 30

	9:10-10:00	10:10-10:35	10:45-11:10	11:20-11:45
Centennial Ballroom 1	**Hot Topic Session** *Integrating Science, Mathematics, and Literacy: How Can We Do This Well?* Middleton, Woodhall	**Research Session** *Multi-Literacies and Scientific Practices: Student Voices in Action* Allison, Goldston	**Research Session** *Chemistry and Physics Teachers' Perspectives of Teaching State-Tested and Non-Tested Subject Areas* Pearce	**Research Session** *Changes in STEM Dispositions and Content Knowledge for Middle School Science Students* Knezek, Christensen, Tyler-Wood
Centennial Ballroom 2	**Research Session** *Teaching for Conceptual Understanding: What Pre-Calculus Teachers Have to Say* Cimbricz, Wade	**Research Session** *Understanding the Nature of Science Through Integrating the History of Science* Biddy, Laubach	**Research Session** *How Do Preservice Teachers Describe Citizens in the Context of Socio-Technical Controversies?* Groleau	**Research Session** *In-Service Secondary Science Teachers' Beliefs and Classroom Practices: A Two-Part Study* Ivey, Weinbrecht Canceled
Centennial Ballroom 3	**Research Session** *Elementary Teachers' Perceptions of Mathematics/Science Integration as Revealed Through a Summer Academy* Sa. Cooper, Nesmith	**Research Session** *Classroom Environments in Single-Sex and Coeducational Mathematics and Science Middle Grades Classes* Che	**Research Session** *Plugging the Hole in the Dam: Keeping Innovative Mathematics Teachers Teaching* Bowman	**Research Session** *Virtual Manipulatives and Math Talk: An Examination of Techno-Mathematical Discourse* Anderson-Pence
Grand Ballroom A	**Regular Session** *Food Chain Jenga: Using Models to Test Predictions* Biffi, Patterson, Hartweg, Stewart, Weinburgh	**Research Session** *Spanning Astronomical and Atomic Spaces in Middle School Classrooms Through Project-Based Instruction* Wilhelm, Cole	**Research Session** *Big Ideas in Measurement for Early Grades: Teachers' Level of Understanding* Sa. Cooper	**Research Session** *The Effects of Mathforward Intervention on Middle School Students' Mathematics Achievement* Kopparla, Hill, Foran
Grand Ballroom B	**Roundtable Discussion** *Getting to the Core (The Common Core): Collaboration in a Rural State* Cobbs *Integration of Technology in Mathematics Teacher Professional Development* Lin *Professional Development of Informal Educators* Patrick *Middle School Science and Mathematics Teachers' Understanding of Nature of Science* Ronduen, Wong, Chauvot	**Research Session** *Elementary Teachers' Perceptions of Engineering, Design, and Their Abilities to Teach Engineering* Hammack, Ivey	**Research Session** *The Effectiveness of 3D Modeling on Students' Spatial Ability and Creativity* Oner No Show	**Research Session** *How Does the STEAM Model of Interdisciplinary Teaching Affect Pre-Service Teacher Efficacy?* Hutson, Gupta

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FRIDAY Morning, October 30, Continued				
	9:10-10:00	**10:10-10:35**	**10:45-11:10**	**11:20-11:45**
Grand Ballroom C	**Regular Session** *Helping Elementary Students Understand and Become Fluent With Basic Addition and Subtraction* Tuft	**Research Session** *Perceptions of Minority Science, Technology, Engineering, and Mathematics (STEM) Majors* Meador	**Research Session** *Navigating Preservice Teachers' Developing Conceptions of Torque: Intersections Between Mathematics and Science* Fortney, Matteson	**Research Session** *Pre-Service Secondary Teachers' Conceptions of Interdisciplinary Mathematics and Science Education* Willingham, Bonner, Caukin
Balinese Room	**Regular Session** *Past President's Session*	**Research Session** *Engineering is Elementary (EiE) And Elementary Teachers' Scientific Reasoning and Self-Efficacy* Malone, Giasi	**Research Session** *Honors vs. Non-Honors: How Are They Involved in STEM?* Shores	**Research Session** *Publishing for Tenure, Promotion and Enjoyment: Rocky & Bullwinkle Return to SSMA* Zollman
Grand Ballrooms E-F	**11:45-1:00** **Lunch and General Session** *Robots, It's More Than a Competition* Goodgame			

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FRIDAY Afternoon, October 30					
	1:10-1:35	**1:45-2:35**	**2:55-3:45**	**3:55-4:20**	**4:30-4:55**
Grand Ballrooms E-F	**Regular Session** *Robots, It's More Than a Competition, continued* Goodgame				
Centennial Ballroom 1	**Research Session** *The Impact of Science Teacher Professional Development on Student Achievement* Naizer, Sinclair	**Hot Topic Session** *Co-Teaching Strategies With Pre-Service Teachers in STEM Education* Zollman	**Symposium** *Social Discourse Analysis: What Are They Saying in Informal Institutions?* Patrick, Uzick, Idema	**Research Session** *Elementary Science Methods Students' Emerging Professional Identities* Hathcock, Ivey	**Research Session** *Addressing Student Misconceptions About Diffusion and Osmosis Through Direct and Inquiry Instruction* Dixon, Nesmith
Centennial Ballroom 2	**Research Session** *Developing an Environmental Science Inventory for Middle School Students* Christensen, Knezek, Tyler-Wood	**Research Session** *Mathematical Knowledge of Middle School Students Related to the LCM* Telese	**Hot Topic Session** *What's Your View? A Discussion of Accountability Systems on STEM Instruction* A. Foster, Jasper	**Research Session** *Teachers' Understanding and Implementation of Project-Based Instruction in High School Science Classrooms* Cole, Wilhelm	**Research Session** *Assessing K–12 Teachers' of Mathematics Knowledge About the Nature of Mathematical Modeling* Asempapa
Centennial Ballroom 3	**Research Session** *Cognitive and Neuro-Scientific Components of Dyscalculia: A Systematic Review* Kopparla, Foran, Boedeker, Ortiz, Hill	**Research Session** *Profession Development for Growth in Middle-Grades Teachers' Classroom Discourse* Matney	**Research Session** *Student Insights and Experiences in Non-Traditional Undergraduate Mathematics* Bates	**Research Session** *Summer Program Does Make a Difference: Increasing Under-represented Minority Students' Science Interest* Singh	**Research Session** *Advancing the Field: Development and Validation of Algebra Teachers' Self-Efficacy Instrument* Gupta, Jasper, Quebec Fuentes, Sa. Cooper, Mallam
Grand Ballroom A	**Research Session** *Flipping the Secondary Mathematics Classroom* Smith, Ingram	**Regular Session** *Advancing Scientific Literacy With Inquiry Lesson Plans Using Science Reading Materials* Su. Cooper	**Regular Session** *Using Great Three-Act Video Tasks and Using Them Well!* Mills, NCSM President	**Research Session** *Beliefs About Social Justice Among Elementary Mathematics Teachers* Evans	**Research Session** *Beyond Engagement: Inductive Evaluation of a 21st Century Educational Board Game* Perkins, Stuessy
Grand Ballroom B	**Research Session** *Mathematics Embedded in Real-World Contexts* L. J. Moseley, Maher-Boulis	**Regular Session** *Modeling With Mathematics: Linking Classroom Mathematics and Statistics to Everyday Life* Hakansson, TODOS President	**Regular Session** *The Development/ Validation/ Reliability of a Mathematics and Science Integration Rubric* Laubach, Neill, Patrick	**Research Session** *Preservice Teachers and Their Use of Invented Strategies* Brown	**Research Session** *Taking Advantage of the Dragging and Measuring Features of Dynamic Geometry Software* Jiang

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FRIDAY Afternoon, October 30, Continued					
	1:10-1:35	**1:45-2:35**	**2:55-3:45**	**3:55-4:20**	**4:30-4:55**
Grand Ballroom C	**Research Session** *Teachers' Stories: Becoming and Remaining Effective in Successful and Diverse High Schools* Leblanc, Stuessy	**Regular Session** *STEM Road Map (6-8): Integrated STEM Modules* Utley, Ivey, Redmond-Sanogo, Johnson, Weaver	**Regular Session** *Serving as a Reviewer for the School Science and Mathematics Journal* Johnson, Milner, Breiner	**Research Session** *Problem-Based Learning in the Mathematics Classroom* Ingram, Smith	**Research Session** *Q-Tips: Quality of Teachers in the Perception of Students* Foran, Hill, Kopparla
Balinese Room	**Research Session** **SSMA 2015 Dissertation Award Winner** *Early Elementary Students' Fractional Understanding: Examination of Cases From a Multi-Year Longitudinal Study* Gupta	**Regular Session** *Bolstering Preservice Teachers' STEM Literacy Via Informal Learning Experiences* Mohr-Schroeder, Jackson, Schroeder, Cavalcanti, Lemmon		**Research Session** *How Successful Preservice Teachers Address Their Teaching Experience* Ortiz	

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SATURDAY Morning, October 31			
	9:10-10:00	**10:10-11:00**	**11:10-12:00**
Centennial Ballroom 1	**Hot Topic Session** *Examining Cognitive Demand and Content of Early Number and Fraction iPad Apps* Redmond-Sanogo, Adkins	**Research Session** *ETEAMS: Elementary Teachers Engaged in Authentic Math and Science-Year 2* Jeffery, McCollough, Moore	**Regular Session** *Coaching as a Professional Development Model: At What Cost?* Hartweg, de la Fuente, Pearce, Weinburgh
Centennial Ballroom 2	**Research Session** *Communication, Metacognition, and Teaching Mathematics: A Plausibility Probe* Raymond, M. Gunter	**Research Session** *Correlated Science and Mathematics* **Canceled** Browning	**Regular Session** *Blurring the Lines Between Disciplines: Is It Math or Is It Science?* Higgins, Hargrove
Centennial Ballroom 3	**Regular Session** *Elementary Science Teacher Preparation: The Importance of Breadth and Depth of Content* McCall, Nesmith	**Regular Session** *Enhancing Middle School Mathematics Teachers' Pedagogical Content Knowledge With a Summer Institute* Orona, Gist	**Regular Session** *Changing Cultural Perceptions and Misconceptions Through Family Math and Science Learning Events* McCollough, Ramirez
Grand Ballroom A	**Regular Session** *Connecting NGSS and the Common Core Through Integration in the Elementary Classroom* Riley, Figgins	**Regular Session** *Practices Make Perfect: Preparing Teachers to Teach Core STEM Practices* Nadelson	**Regular Session** *Integrating Content and Pedagogy Within and Beyond STEM for Secondary Pre-Service Teachers* Blount, Fields
Grand Ballroom B	**Regular Session** *Avatars and Online Professional Development in STEM and College Career Readiness Skills* Stuessy, Killough, LeBlanc, Lyons, Perkins	**Syllabus Share** *Let's Talk Methods for Intermediate Mathematics: A Syllabus Share* Conrady, Redmond-Sanogo *Elementary Mathematics Methods Syllabus Share* de la Cruz *Foundations of Number and Algebraic Reasoning (K-6)* Hargrove *Foundations of Teaching Geometry, Data and Measurement (K-6)* Higgins	
Grand Ballroom C	**Regular Session** *Modeling in CCSSM and NGSS: Finding Common Ground for Teaching and Research* Groshong		

SATURDAY Afternoon, October 31	
	12:10-1:00
Grand Ballrooms E-F	**Innovations Showcase** *"Clouds Have Names?" Science Literacy and Elementary GLOBE* Cobbs *History of Mathematics in the Classroom: A Focus on Cultures* Evans *Integration Across Disciplines: Math, Science and Physical Education in Elementary Classrooms* Cason, Gupta, Hutson *STEM Activities for the Elementary Classroom* Orona *Practical Practices: Integrating Mathematical Standards of Practice into Content Lessons* Raymond, D. Gunter *What Are You Doing? Mixing up Science With Engineering* Ronduen *Exploring Spatial Sense Using OSMO* Thompson, Redmond-Sanogo

Thursday Morning – Continental Breakfast (Grand Ballrooms E-F) 8:00 – 9:00

Thursday Morning Sessions 9:10 – 10:00

#1 **Centennial Ballroom 1** **Research: Science**

Environmental Education Teaching Efficacy Belief Instrument: Preservice Teachers' Environmental Education Teaching Efficacy

Christine Moseley, Juliana Utley, Julie Angle

Because teacher efficacy is content specific, there is a need for valid and reliable content specific teacher efficacy scales. An initial review of the literature did not yield an established survey instrument to measure teacher efficacy beliefs of preservice teachers as related to environmental education. Thus, the Environmental Education Teaching Efficacy Belief Instrument (EETEBI) was developed. This presentation will present research that determined the face, criterion, and construct validity of the EETEBI and baseline data of the personal teaching efficacy and outcome expectancy of preservice teachers in environmental education.

#2 **Centennial Ballroom 2** **Research: Mathematics**

The Use of MET and MET2 in Mathematics Education Literature

Kansas Conrady, Elayne Bowman

The Conference Board of Mathematical Sciences provided guidance not only for the necessary mathematics content knowledge needed by teachers of mathematics, but also for how both preservice and inservice teachers should acquire this knowledge. Findings from this review of literature will share information about who is using the document and how, as well as discuss overall themes from this body of literature. From the analysis there is a clear need for continued exploration of the impact these recommendations have on course design, program design, and overall teacher development.

#3 **Centennial Ballroom 3** **Research: Mathematics**

The Problem-Size Effect: An Effective Tool in Investigating Computational Estimation

Fuchang Liu

This study investigated the nature of computational estimation by using the problem-size effect, the phenomenon that arithmetic problems become more difficult, namely, both reaction times and error rates increase as the size of operands increases. Twenty-six participants estimated 27 two-digit by two-digit multiplication problems. Results indicate that as problem size increases, the time it takes for solving such problems does not significantly increase, nor does the rate of unreasonable answers. This absence of the problem-size effect in estimation, in contrast with its presence found in exact calculation, suggests that computational estimation and exact calculation are essentially different cognitive processes.

#4 **Grand Ballroom A** **Research: STEM**

Modeling: Are Today's Teachers Prepared?

Mary Enderson, Ginger Watson

The mathematics and science standards movements present a strong case for teachers to embrace modeling in classroom instruction. These efforts motivated this research, which was designed to determine what kinds of modeling experiences pre-service teachers have had and how they impact their ability to incorporate modeling in teaching. A survey was used to determine the level of understanding participants had related to modeling and to what degree they were able to transfer this understanding into classroom instruction. Researchers will discuss findings and implications that suggest new teachers need greater support and education in implementing modeling practices in future classroom instruction.

Thursday Morning Sessions 9:10 – 10:00

#5 **Grand Ballroom B** **Regular: Mathematics**

Can You Convince a Sixth Grader?

Dovie Kimmins, Jeremy Winters

What are 6th grade students' beliefs about whether outcomes such as (5,6) and (6,5) are different or the same outcome when rolling two die? If they are the same, the probability of a sum of 11 is 1/21 ~ .0476. If different, the probability is 1/18 ~ .0556. For those 6th graders who believe (5,6) and (6,5) are the same outcome, will a simulation of rolling 2 die 10,000 times and observing whether the experimental probability is approximately .0476 or. 05556 convince them? This session reports on a five-day probability unit to answer these questions while teaching common core standards related to probability.

#6 **Grand Ballroom C** **Regular: STEM**

More Than a Story: Integrating Literature in the Math and Science Classroom

Elaine Cerrato Fisher

Content area literacy is a growing trend across elementary and secondary school curriculum in alignment with the Principles and Standards for School Mathematics (NCTM, 2000) and NGSS Framework for K-12 Science Education (2011). The purpose of this presentation is to share ways in which preservice teachers (PSTs) integrated trade books in the elementary math and science classroom to improve literacy skills while introducing and supporting math and science topics. The session will include examples of content and teaching connections, sample literature books, resources, lesson ideas, and both student and PSTs excerpts sharing their experiences.

#7 **Balinese Room** **Regular: General**

Using Learning Styles to Become Better Teachers

Greg Selitto

In this session, teachers will be provided with a hands-on activity they can use with their students to help them identify their learning style and to use their individual style to learn better and to make that learning fun. When teachers have a better sense of how their students learn, and students understand better their preferred learning styles, activities can be planned with those styles in mind. When we can help our students become active learners in our classrooms, we all benefit. This session will provide some of the tools to achieve this goal.

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#8 **Centennial Ballroom 1** **Research: Science**

Finding Common Ground: Interactions Between Pre and Inservice Teachers

Kathryn Watkins

NO SHOW

Pre-service and inservice teachers do not traditionally take university classes together. Yet inservice teachers would and should have a great deal of practical and privileged knowledge to contribute to the development of preservice teachers and perhaps the reverse exists. What kinds of communications, interactions, and relationships could develop between inservice and preservice when engaged in a course together? Both groups of teachers will be taking a class identified as seminar in science teaching. Data on communication formats, observations of interactions, and personal descriptions of relationships will be collected and analyzed.

#9 **Centennial Ballroom 2** **Research: Science**

Using an After-School Garden Club to Examine Science Attitudes of K-2nd Graders

Morgan Stewart

This qualitative study looked at the changes in attitudes towards science in an informal setting on a school ground garden. Through participation in a garden club that met once weekly for an hour in the spring semester of 2015, three students in kindergarten, first grade, and second grade were interviewed before the implementation of the club, during, and after the conclusion of the club to determine how participation affected attitudes towards science. The results from this study are being used to implement a STEM club for kindergarten to fifth graders in the same school.

#10 **Centennial Ballroom 3** **Research: Mathematics**

The Issues of Integrating Digital Games in K-12 Mathematics Education

Eunmi Joung, JaeHwan Byun

In 2000, National Council of Teachers of Mathematics has emphasized the importance of integrating technology in K-12 mathematics education. Since then, this has made researchers direct their attention to digital games as an appealing method to teach K-12 students mathematics. Numerous research studies have increasingly shown that digital games are effective in improving students' motivation and performance in mathematics education. The current study presents the issues from existing research studies and discusses the direction of future research about digital games in K-12 mathematics education.

#11 **Grand Ballroom A** **Research: Mathematics**

The Influence of a College Calculus Course on Students' Self-Efficacy

Radu Nicolescu

The differences between HS and college-level teaching and learning environments are expected to impact students' mathematics self-efficacy. The purpose of this mixed methods research case study was to discuss the impact of a Calculus I course on students pursuing a degree in engineering. Research questions: 1. Is there a significant change in students' mathematics self-efficacy before/after taking a Calculus course? 2. How do students view the transition from previous HS mathematics classes to college-type instruction? Two stages of quantitative data collection, observations, and interview sessions were performed. The results of this study were presented along with conclusions and future implications.

Thursday Morning Sessions 10:10 – 10:35

#12 **Grand Ballroom B** **Research: STEM**

Impact of a Professional Development Conference on Science and Mathematics Teachers' Practice

Faye Bruun, Kim Moore

With the existing economic conditions, mathematics and science 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. Research to evaluate the impact of this conference was conducted through teacher surveys aimed at their learning, application of methods, behavior, and ultimately impact to students (Mulling Lepicki, & Glandon, 2010). The research focused 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.

#13 **Grand Ballroom C** **Research: STEM**

Changing Perceptions of Scientists and Engineers Through a University/Elementary School Partnership

Florence McCann, Edmund A. Marek

A partnership between a university science educator and a teacher at an elementary school changed fifth grade girls' perceptions of scientists and engineers. The girls maintained pre-existing, traditional images of scientists, modified, however, to include more female images after participation in a STEM Club led by the university and elementary school educators. The girls' perceptions of engineers changed dramatically from non-existent or mechanics/repairmen to realistic images of engineers, including female images, involved in design, laboratory investigation, and testing activities. The percentage of female images drawn by the girls increased by 30% and 42% for scientist images and engineer images, respectively.

Thursday Morning Sessions 10:45 – 11:10

#14 **Centennial Ballroom 1** **Research: Science**

Integrating Pedagogy and Content With Pre-Service Teachers

Deborah Roberts-Harris

CANCELED

Preservice teachers frequently comment that they do not see science instruction in their student teaching placements, and many claim to have had limited science experiences in their K-12 education. In their science methods course, they are exposed to the scientific concepts of decomposition and water cycle with the crosscutting concept of matter and energy. Pedagogy and content work go hand in hand. This study looks at PST reflections on their new understandings of the importance of pedagogy and content. Pedagogy is modeled through instruction and video analysis, content is shared via hands-on experiences, class discussion, and other resources.

#15 **Centennial Ballroom 2** **Research: Science**

Hybrid Language of Science: What Is the Manual-Technical Part?

Molly Weinburgh, Morgan Stewart

Lemke (2004) introduced the idea that "the language of science is a unique hybrid" (and posited that the language of science can be conceptualized as having four components that complement and enhance each other: natural language, mathematical symbols, visual representations, and manual-technical operations. Our aim in this paper is to further articulate a theory of manual-technical that treats this part of the hybrid language of science as a useful component for communication. It is our hope that the theoretical model proposed will allow researcher to interpret the facts that you have and predict future facts.

#16 **Centennial Ballroom 3** **Research: Mathematics**

Elementary Math Specialists: How Do We Encourage More to Step Up

Nicole Shobert

In this session, I will share initial findings of a research project focused on the Oklahoma Elementary Mathematics Specialist Program. As a new program, our IHEs are working to recruit elementary teachers in order to develop and support them as specialists. The goal of this research was to discover common experiences and opportunities that current elementary teachers have had that encouraged them to pursue additional certification as a mathematics pedagogy and content leader, including but not limited to their own experiences as a math learner in college, undergraduate methods courses, as well as their experiences as an elementary teacher.

#17 **Grand Ballroom A** **Research: Mathematics**

Mathematics Classroom Environment and Student Self-Efficacy in Elementary, Middle, and High School

Hillary Croissant, Gil Naizer

This study aimed to determine whether gender and classroom environment characteristics of public school math classrooms could significantly predict high and low self-efficacy of students. This quantitative study used a simple linear regression to determine if a relationship existed between five different constructs of classroom environment (cohesiveness, difficulty, satisfaction, competitiveness and friction) and student self-efficacy in elementary, middle, and high schools in conjunction with gender. Gender was not a significant predictor of self-efficacy at any level, but friction, difficulty, and satisfaction were significant at some grade levels.

Thursday Morning Sessions 10:45 – 11:10

#18 **Grand Ballroom B** **Research: STEM**

Impact of Educational Robotics on PK-12 STEM Teacher Education: A Research Synthesis

Timothy A. Laubach

Educational Robotics is steadily permeating the PK-12 educational system initially through extracurricular pathways (e.g., competitions and after school programs) and more recently through intracurricular pathways. Several research syntheses have been recently published on the effectiveness of ER on PK-12 student learning. What appears to be missing in the literature is a synthesis of research on the impact of ER on PK-12 teacher education. The purpose of this session is to discuss the systematic search of the literature, the synthesis of results, and the implications for potential practice of PK-12 teacher educators and practitioners and for future research by academic scholars.

#19 **Grand Ballroom C** **Research: STEM**

Professional Development and Its Impact on PST's Technological Pedagogical Content Knowledge (TPACK)

Vida Olivares

This study aims to explore what impact a concentrated professional development intervention in technology has on secondary pre-service teacher s' technological pedagogical content knowledge. Using the instrument developed by Schmidtt et al., (2009), data was collected from seven students who attended a weekend-long conference on teaching with technology, and compared them with their peers who were unable to attend the conference. The survey was administered to all PST's immediately following the conference and then again six weeks later. The results will be explored in this session.

#20 **Balinese Room** **Research: STEM**

A Study of STEM Implementation Practices for High School Teachers and Students

Alfred Hall

This session will review findings from research that analyzed STEM teaching and learning strategies and implementation practices for high school teachers and students in Shelby County, TN. The study collected data across five different STEM programs of study in two separate high schools in the district, and the results compare findings from classroom and school observation measurement instruments. Implications from this study can be used to help guide teachers and administrators at the school and district level regarding the types of STEM teaching and learning experiences being implemented in classrooms and the supports needed to ensure their effectiveness.

Thursday Morning Sessions 11:20 – 11:45

#21 **Centennial Ballroom 1** **Research: Science**

The Extinction and Future Evolution of Dinosaurs in Science Curricula

Luke Lyons

The objective of this study is to shed a light on the disappearance of dinosaurs from the current science K-12 curricula and where experts could envision dinosaurs fitting into current standards. Dinosaurs are prevalent in everyday pop culture and multiple times a year there are discoveries, new revelations and deeper understandings of these prehistoric animals in the scientific community. Dinosaurs are not mentioned in current science curriculum standards, including the Next Generation Science Standards. An extensive review of dinosaurs place in the science curriculum, along with interviews with science education and dinosaur experts illuminates their place in current science standards.

#22 **Centennial Ballroom 2** **Research: Science**

Science and Literacy Integration to Foster Deeper Levels of Scientific Understanding

Vanessa Morrison, Andrea R. Milner

Many elementary classroom teachers are frustrated about the enormous amount of time they are required to teach reading at the same time they struggle to find sufficient time to teach science and conduct inquiry-based investigations. This presentation discusses the science-literacy integrated instructional practices of one teacher as she engages her students in studying variation and relatedness in living organisms. More specifically, we share detailed moment-by-moment examples of one specific lesson showing how the scientific understanding of elementary students can be deepened when the teacher integrates literacy skills during a science lesson.

#23 **Centennial Ballroom 3** **Research: Mathematics**

Navigating the Video Stream

Lucas Foster

The effectiveness and value of video presentations in the mathematics education classroom has long been researched and debated, with disparate results. This paper examines the results of incorporating videos into a mathematics education classroom, including the benefits and pitfalls that exist when attempting to utilize video streaming as a part of the course curriculum.

#24 **Grand Ballroom A** **Research: Mathematics**

Cooperative Learning in a Community College Classroom

Ron Zambo

This action research study investigated the effects of implementing cooperative learning strategies in a community college developmental mathematics course. Introductory algebra was typically taught in a lecture-based format, and as such, regularly had a low course completion rate. To create a more engaging learning environment, cooperative learning activities were integrated into the curriculum. As a result, there was an increase in student attendance and a decrease in student withdrawal rates. Students collaborated and supported each other both inside and outside of class. Using cooperative learning practices served as a vehicle to motivate students to learn and to persist.

Thursday Morning Sessions 11:20 – 11:45

#25	Grand Ballroom B	Research: STEM

A Closer Look at Women in STEM

Melanie Shores

The greatest obstacles females in STEM careers face include emotional and psychological issues in the work place and negative perceptions and stereotyping. This research will help us gain a better idea of the challenges that future women might potentially face as a result of choosing STEM careers while enabling us to try to provide preventive measures for use upon entering the career. It will also help to work with K-12 educators to identify females interested in STEM and provide resources and supports to meet their goals. Implications for leadership and teacher preparation programs include curriculum, supervision, mentoring, and support services.

#26	Grand Ballroom C	Research: STEM

Pre-Service Teacher's Confidence in Teaching Science, Technology, Engineering, and Mathematics (STEM)

Cynthia Orona

Pre-service teachers enrolled in the Master of Arts in Teaching (MAT) program have the option of obtaining a graduate certificate in Science, Technology, Engineering, and Mathematics (STEM). These pre-service teachers rate their confidence in teaching the four areas of STEM at the beginning and end of their student teaching experience. In their graduate coursework during the student teaching experience, the pre-service MAT students create STEM lessons that emphasize mathematics or science that will be taught in their elementary student teaching placements as part of course requirements. The change in their ratings in each area will be discussed.

Thursday Lunch On Your Own 11:45 – 1:00

Thursday Afternoon Sessions 1:10 – 1:35

#27 **Centennial Ballroom 1** **Research: Science**

NASA Preservice Teacher Institutes (PSTI): Comparing Four Preservice Science Teacher Training Models

Toni Ivey

NASA's PSTI seeks to increase the number and diversity of individuals who complete teacher programs by providing content-based training at NASA centers. The purpose of this mixed-methods study was to analyze the effectiveness of four face-to-face (F2F) and hybrid (F2F and online) PSTI models. Results suggested that F2F workshops that provided participants with a teaching experience, positively influenced participants' science teaching self-efficacy. Additionally, the sequencing of the online and F2F components of the hybrid PSTI models may have affected learning and attitude outcomes. Findings of this study suggest that preservice teachers may benefit more in a F2F learning environment.

#28 **Centennial Ballroom 2** **Research: Science**

Guided-Inquiry Experiences and Writing Improves Motivation to Learn Science, Especially Females

Nancy Caukin

This NSF Funded (Robert Noyce Grant #0934731) study determined if employing a science writing heuristic (SWH) in secondary chemistry classes for a semester impacted students' motivation to learn science. A SWH is a writing-to-learn teaching strategy that allows students to design their own lab experiences. It is unique in its use of engagement, communication, research, and reflection. All students' motivation to learn science and science self-efficacy increased from pre to post study, however females' scores increased by a greater degree overall and in certain subscales of the Student Motivation Towards Science Learning questionnaire (Tuan, Chin, & Shieh, 2005).

#29 **Centennial Ballroom 3** **Research: Mathematics**

"Math Talk" in Preschool Classroom: Effect of Book Type and Teacher Training

Lynn Columba

The purpose of the study was (1) to examine the effect of book type on teacher use of mathematical vocabulary during shared book reading in preschool classrooms and (2) to examine the effect of training teachers specifically to use mathematical vocabulary during shared book reading. A multi-element design with two preschool teachers was used. Training and instructional supports appeared to result in an increase in math talk over that achieved by mathematical storybooks alone.

#30 **Grand Ballroom A** **Research: STEM**

Transdisciplinary Preparation of Preservice Secondary Math and Science Teachers

Marla Lemmon

There is currently minimal research about transdisciplinary preparation of preservice secondary math and science teachers. This was investigated during the summer of 2015 at a weeklong professional development funded by the Kentucky Center for Mathematics (KCM). The findings from the professional development will be presented. Participants' beliefs and attitudes towards STEM (science, technology, engineering, and mathematics) integration were examined. The experience culminated with lessons developed by the preservice teachers and were evaluated using a STEM lesson rubric.

SSMA 2015 Annual Convention
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Thursday Afternoon Sessions 1:10 – 1:35

#31 **Grand Ballroom B** **Research: STEM**

Developing STEM Educators Through Project-Based Instruction

Oscar Chavez

In this session we will present findings related to the South Texas STEM Center, a professional development project focused on engaging secondary STEM teachers in project-based learning (PBL). Over two years, 50 teachers engaged in a series of PBL workshops while implementing PBL in their mathematics and science classrooms. Our data show that over the 2-year project period, teachers' attitudes, beliefs, and abilities to engage in PBL increased, and student engagement was positively affected, particularly for traditionally underserved populations. We will share our framework for the professional development program, and discuss the implications for mathematics and science education.

#32 **Grand Ballroom C** **Research: STEM**

What STEM Principals Want and Need

Sandra Browning

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This is a four-year study of principals who participated in a PD model, Correlated Science and Math, which is designed to train them how to understand and support effective science and math instruction. During a two-week summer session they trained with their grades 5-8 teacher teams leaning how to integrate science and math. The additional separate principals' training focused on research and best practices in the two disciplines. A commitment of 2-3 years was required.

Thursday Afternoon Sessions 1:45 – 2:35

#33 **Centennial Ballroom 1** **Hot Topic: STEM**

Plugging the Leak: Recruiting and Retaining Female Students in Science and Mathematics

David Sparks, Ann M. L. Cavallo

A number of factors may contribute to the trend of female underrepresentation in mathematics and science-related careers. Research suggests these factors could include intended or unintended teacher bias, stereotype threat among female students, sex discrimination in male-dominated careers, and messages in the media leading them to believe they do not belong in the field of mathematics and science. Female students of color, specifically African American and Latino/a students, face even greater challenges. A summary of research and best practices for gender equity will be shared, along with discussion on future research directions and practical ideas to increase participation.

#34 **Centennial Ballroom 2** **Research: Science**

Using Self-Study to Navigate Tensions in a Science Course for Preservice Teachers

Mark Bloom, Sarah Quebec Fuentes

This presentation describes a conflict, which arose in a teacher education course, and the use of self-study to reflect upon and adjust the teacher educator's (TE) practice in response to the resulting tensions. The purpose of the course was to increase preservice teachers' science content knowledge and help them develop the skills to identify and synthesize content knowledge with a teacher's perspective. The presenters will provide a theoretical framework, which grounds the research in self-study, describe the methodology employed to examine the TE's practice, and share findings, which contribute to the pedagogy of science teacher education.

#35 **Centennial Ballroom 3** **Research: Mathematics**

Elementary Mathematics Specialist Program: Developing Teacher Leaders

Stacy Reeder, Juliana Utley

The Oklahoma Elementary Mathematics Specialist (OkEMS) program aimed to develop mathematical expertise in the elementary teacher workforce through graduate level coursework focused on mathematics content knowledge and pedagogical content knowledge. Additional emphasis was placed on the notion of developing teacher leadership skills and capacity. The findings of this research study demonstrate the impact of the OkEMS programs at two institutions on teacher leadership. Specifics related to program requirements and field experience components related to teacher leadership will be shared in addition to the research findings.

#36 **Grand Ballroom A** **Research: Mathematics**

Patterns of Mathematics Teachers' Instructional Performance: A Concurrent Embedded Mixed Methods Study

Ceyhun Cetin, Shirley M. Matteson

The study aimed to reveal the pattern of structure of mathematics teachers' instructional performance. The areas of Standards and Objectives, Presenting Instructional Content, Lesson Structure and Pacing, Activities and Materials, Academic Feedback, Grouping Students, and Teacher Content Knowledge were analyzed in 426 reports created from 175-videotaped middle grade mathematics lessons. The findings indicated a structured pattern of relationships among the instructional performances. According to multiple group analysis, the differences between beginning and experienced teachers presented different paths regarding Activities and Materials, Grouping Students, Standards and Objectives, and Lesson Structure and Pacing. The study has implications for teacher professional development.

Thursday Afternoon Sessions 1:45 – 2:35

#37 **Grand Ballroom B** **Research: Mathematics**

Thinking Differently About Preservice Teacher Field Experiences: Benefits of Math Camp

Gabriel Matney, Connie Sullivan

This session will describe a systemic programmatic action to involve preservice mathematics teachers in a service learning field experience simply named: Math Camp. Throughout their program preservice teachers work together to learn about and enact successful math camps for K-12 students in local area schools. During these math camps the K-12 students experience an energizing camp-like atmosphere with grade level appropriate mathematics learning, problem solving, and social skills interwoven throughout. Example activities directly from the camps will be discussed as well as a time for questions about getting this started at other institutions.

#38 **Grand Ballroom C** **Research: STEM**

A Case for Collaboration

Daniel Vincent

Presenters share processes of developing collaborative relationships on several levels: faculty collaborating in a mathematics and science methods courses for pre-service teachers (including co-teaching and concurrent enrollment), using collaborative school partners for clinical experiences, and being more collaborative with pre-service teaching on clinical experiences. Presenters discuss research findings involving efficacy and students' journals.

#39 **Balinese Room** **Regular: General**

How to Publish in the School Science and Mathematics Journal

Carla C. Johnson, Andrea Milner, Jonathon Breiner

This session will provide an overview of the requirements for publishing in the *School Science and Mathematics* journal. We will also share information regarding our new *Research to Practice* online companion publication.

Thursday Afternoon Snack Break 2:35 – 2:55

Thursday Afternoon Sessions 2:55 – 3:45

#40 | **Centennial Ballroom 1** | **Symposium: STEM**

Evaluation of a Middle School Problem-Based Learning Course: A STREAM School

STREAM School is a 7th grade program provided through a partnership between a rural school district and a non-profit environmental education organization in the Midwest. STREAM (Science, Technology, Reading, Engineering, Art, Mathematics) School takes a non-traditional approach by connecting students to the outdoors through a project-based learning (PBL) approach. STREAM teachers work with local professionals to develop learning experiences for students that connect state-mandated content to real-world projects. Projects are designed to be authentic, engaging, and educational within a framework allowing students to express their passions and interests. STREAM School places education outside the walls of the classroom and into authentic environments where students have opportunities to connect critical content with job skills. The purpose of this symposium is to share research related to this innovative program from four different perspectives including student achievement, students' attitudes and motivation, and program orchestration.

Assessing an Innovative Program's Effect on Students' Attitudes in Math and Science

Regan Jekkals

Lecture-based math and science classrooms sometimes contribute to students' poor attitudes about STEM learning. In an effort to address this problem, a middle school in the Midwest developed a project-based learning course combining science, technology, reading, engineering, art, and mathematics (STREAM). STREAM School takes a non-traditional approach while maintaining state-mandated content standards. This study uses mixed methods to investigate changing attitudes about science and math in seventh graders enrolled in the program's inaugural year. Attendees to this session will learn about this unique program and its effects on students' attitudes toward math and science.

The Effects of Outdoor, Project-Based Learning on Middle School Students' Science and Math Achievement and Collaborative Skills

Chris Kruger

Project-based learning (PBL) is an evolving instructional method with the potential to improve collaborative skills and content knowledge in science and math. STREAM School, a seventh grade program at a rural Midwest school district, offers an innovative approach to PBL by connecting students and their learning to the outdoors through a partnership with a non-profit environmental education organization. This mixed methods study uses data from standardized tests and interviews with students, teachers, and parents to investigate this program's influence on student's content knowledge and collaborative skills. The results contribute to ongoing conversations about authentic science learning and social cognition.

Opportunities and Pitfalls: Developing and Orchestrating an Outdoor-Based, PBL Middle School Science Learning Community

Stephen C. Scogin

The push for authentic learning in inquiry-driven courses makes programs like STREAM School appealing as a model for 21st century learning. STREAM developers combined project-based learning, outdoor education, and authentic science activities with the goal of engaging middle school students in relevant learning while meeting state standards. However, development of the program has been challenging, and this study investigates orchestration issues associated with the launch and first-year implementation. Key stakeholders including teachers, parents, students, and administrators were interviewed and surveyed, and this mixed methods analysis uncovers specific items that will be of interest to educators seeking to reform science education.

Thursday Afternoon Sessions 2:55 – 3:45

#41 **Centennial Ballroom 2** **Research: Mathematics**

Classroom Assessment Practices and Student Achievement in Mathematics

Crystal Walcott, Doris Mohr

Results of NAEP assessments include teacher-reported data covering various aspects of instructional practice. As part of the teacher questionnaire, teachers of fourth- and eighth-grade students are asked to report on the frequency of assessment practices, such as the use of multiple-choice and short/long written-response assessments. In this session, we examine the relationship between students' achievement on standardized assessments, in particular, the NAEP Main Mathematics Assessment, and the frequency of specific types of classroom assessment items. We will share how teachers' responses about assessment practices have shifted historically. Finally, insights will be shared regarding how these findings can inform instructional practices.

#42 **Centennial Ballroom 3** **Research: Mathematics**

Survivor Math: Fibonacci Sequence and Golden Ratios

Philip Cannon, Lauren Jeneva Moseley

This presentation will explain the game "Survivor Math". The game combines jigsaw II teaching technique and the survivor game show into a group game. This presentation will include an explanation of the game, how to incorporate it into a classroom, and an explanation results of research on past lesson plans which incorporated this game into them.

#43 **Grand Ballroom A** **Regular: Science**

Increasing Science Literacy Skills by Engaging in Collaborative Nature of Science Activities

Julie Angle

Science literacy is a goal of science education. Constructs of science literacy include scientific content knowledge, scientific practices, and nature of science (NOS). While most teachers address the first two constructs, NOS often goes untaught or taught through an implicit approach. Research suggests that NOS should be taught through an explicit approach. In an effort to strengthen science literacy skills, this presentation provides participants with engaging activities that can be used to explicitly address aspects of nature of science. Participants will receive handouts that can be used in 6 -16th grade science classrooms and in teacher preparation courses.

#44 **Grand Ballroom B** **Regular: Mathematics**

Proportional Reasoning: A Theme Across Middle Grades Science and Mathematics

Jennifer Chauvot, Li Sun, Karman Kurban

This session shares how a course about proportional reasoning was used as a catalyst for teaching teachers about science/mathematics integration in the middle grades. We will share activities and assignments, such as the oil spill problem and the viewing tube problem that provide opportunities to teach teachers about integrating science, mathematics, and technology while adhering to district-mandated curricula.

Thursday Afternoon Sessions 2:55 – 3:45

#45	**Grand Ballroom C**	**Regular: Mathematics**

Will Mathematics Send You to an Early Grave?

Charles Emenaker

Mathematics can make student's blood run cold, but who ever thought that could be fun! In this session we will look at a variety of mathematics problems and projects, including some based on YouTube and movies that are ready to use in your mathematics classes or methods courses. The activities and projects will be related to the season at hand. Appropriate assessment will also be considered. Come ready to have some fun, but keep an eye over your shoulder because … who knows what evil lurks in the heart of math. The Shadow knows!

#46	**Balinese Room**	**Regular: General**

Faculty Jobs: Finding, Securing, and Being a Successful New Faculty Member

Lloyd Barrow

This session will address topics to graduate students looking for faculty positions – the job market, creating a vita, and the interview process. In addition, strategies to help new faculty being successful in their new higher education position will be shared.

Thursday Afternoon Sessions 3:55 – 4:20

#47 **Centennial Ballroom 1** **Research: Science**

Project-Based Learning: Effect on Attitude, Motivation, and Achievement of 6th Grade Students

Robin Hart

Project-Based Learning (PBL) is a method of instruction in which students engage in collaborative, hands-on discovery learning guided by a driving question. The methods for answering the question are undetermined and at the discretion of the student. This type of inquiry learning encourages creativity and real life experience with the scientific method. In this study, 6th grade science students at a middle school in West Texas participated in a STEM-based composting project using paper waste from classrooms and food waste from the school cafeteria. The researcher examined the effect this project had on attitude, motivation, and achievement.

#48 **Centennial Ballroom 2** **Research: Mathematics**

ASSURE Model: An Innovative Way for Teaching Mathematics Education Courses Via Distance

Hsing Wen Hu

Distance teaching has been emphasized in the UAA (University of Alaska Anchorage) Strategic Priorities, which recognizes the high demand of credit-bearing internet courses in higher education. This study builds off that work and proposes that teaching mathematics education courses (via distance) using the ASSURE model (a model that leads educators to plan systematically for the effective use of technology and media) could lead to more positive learning results and assist in developing pre-service teachers' capacity to transfer pedagogical content knowledge to mathematics teaching.

#49 **Centennial Ballroom 3** **Research: Mathematics**

The Presence of Equity Inside a Virtual Simulation Mathematics Classroom

Nickolaus Ortiz

The Knowledge for Algebra Teaching for Equity Project has at the core of its mission pre-service teachers designing problem-solving lessons based on teaching for equity approaches in mathematics classrooms. Specifically, pre-service teachers (PSTs) chose a conceptual scheme identified as either critical pedagogy, culturally relevant pedagogy, or situated learning while designing and teaching their math lessons inside a virtual simulation classroom environment. The research presented in this session will examine the results of intended versus actual conceptual schemes employed, from both the PST and lesson evaluator perspectives. PSTs' lesson plans and respective lesson recordings will be examined.

#50 **Grand Ballroom A** **Research: STEM**

Mobilizing STEM Education Through Leadership, Partnership, and Apprenticeship: A Doctoral Student's Perspective

Maureen Cavalcanti, Margaret Mohr-Schroeder

Research, teaching and learning, and outreach are part of the work of a professor of STEM Education. Leadership of the faculty in these three areas can influence partnerships (university, community, industry) and apprenticeship (undergraduate and graduate students). This has been one preliminary account from research conducted by a doctoral student in STEM Education, related to the work of a department within a College of Education. The purpose of this session is to highlight practices of STEM Education faculty that are supportive of and supported by partnerships an apprenticeships, and how such efforts help mobilize visions for STEM education.

Thursday Afternoon Sessions 3:55 – 4:20

#51 **Grand Ballroom B** **Research: STEM**

Perceptions of Mathematics and Science Teachers in a Fully Online Graduate Program

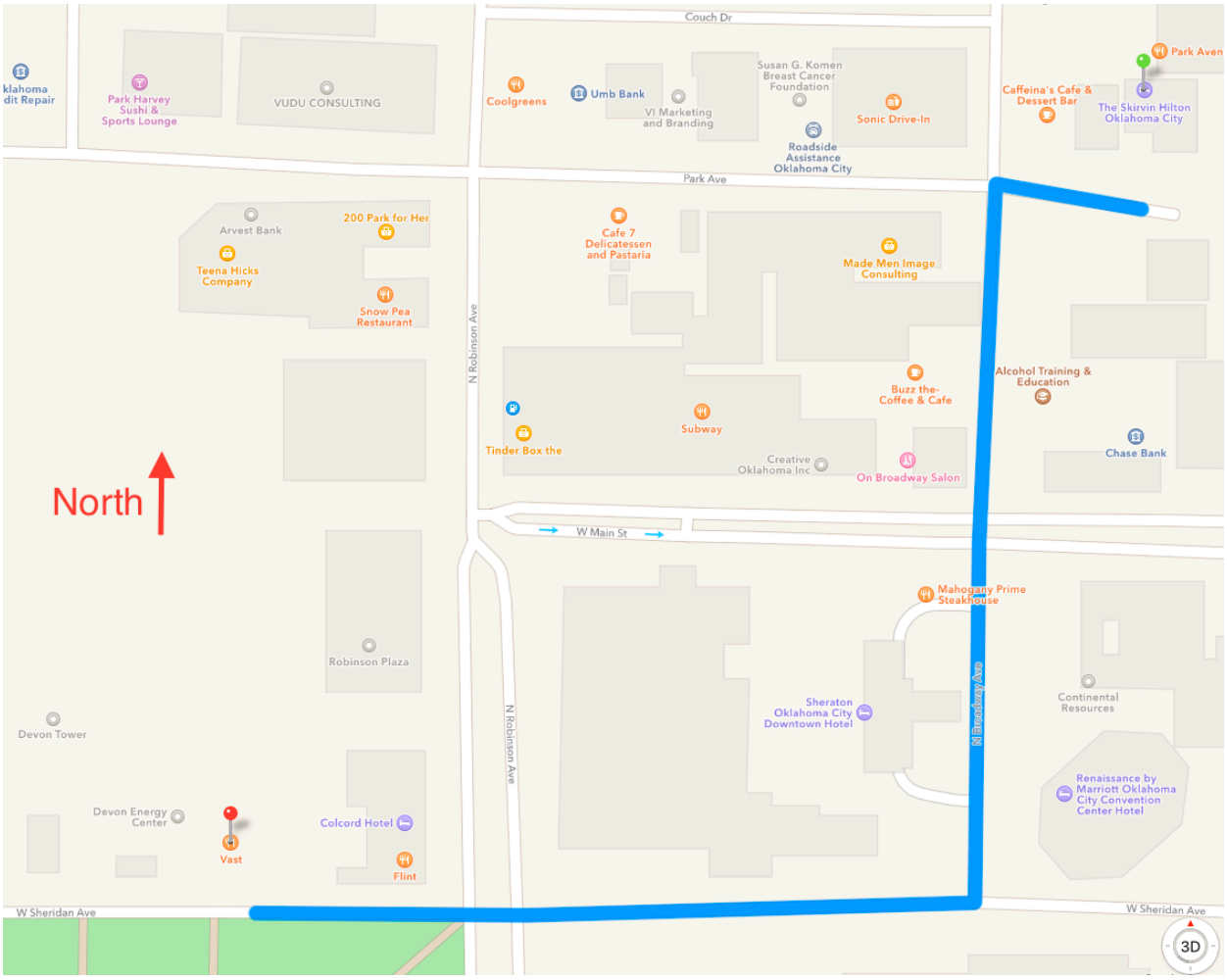
Kimberly Hicks

Online instruction has emerged as a widespread method of delivering instruction for in-service teachers. The online instructional activities of a fully online master's program for science and mathematics teachers that combines both synchronous and asynchronous activities focusing on STEM integration will be highlighted. Additionally, the instructional strategies, technological tools, and assessments of one course designed to develop teachers' proportional reasoning skills and science and mathematics knowledge for the teaching of middle school children will be discussed. Lastly, research found after analyzing course documents, instructional notes, & instructor interviews will be discussed to give a holistic perspective of online learning.

NO SHOW

Transition to the Thursday Evening General Session and Reception at the V2 Events Center at Vast in the Devon Tower 4:20 – 5:15

Whether you choose to walk or take the complimentary shuttle service with Kings Worldwide Transportation (roundtrip every 10-15 minutes from the Skirvin Hilton to the Devon Tower), the V2 Events Center at Vast is located on the 50th floor of the Devon Tower at 333 W. Sheridan Ave. A map is provided for your reference. The main walking entrance to the Devon Tower is located on the south side of the building off of W Sheridan Ave. Once inside the Devon Tower, follow the signs for V2/VAST and the V2/VAST elevators, which are located in the southeast corner of the Devon Tower.



Thursday Evening General Session 5:15 – 6:15

Keynote Speaker
Kerry Magruder, PhD
Curator of the History of Science Collections
University of Oklahoma

Lessons from Galileo's World: The History of Science and Science Education

The University of Oklahoma's 125th Anniversary Galileo's World exhibition is a year-long event comprised of more than 20 exhibits across 7 different locations on all 3 OU campuses. The "Big Idea" of the Galileo's World exhibition is "Connections": Meaningful connections participants make between the various natural sciences, culture and modern life prompt surprise and wonder. The interconnectedness of science and culture, which characterized Galileo's world, offers opportunities for science education today. This presentation will discuss some of the lessons to be learned from Galileo and his world, and review Galileo's World resources being made available for educators through the OU Academy of the Lynx.

As curator of the University of Oklahoma Libraries History of Science Collections, Kerry Magruder pursues his love of helping others appreciate the beauty and creativity of natural science through personal encounters with rare books.

His responsibilities include facilitating special collections research, overseeing rare books acquisition, developing library exhibitions and digital initiatives in collaboration with national and international partners, coordinating outreach to educators in the OU Academy of the Lynx, teaching courses in the History of Science Department, and working with graduate students in various academic programs.

Both Kerry and his wife Candace have many years of experience in K-12 education. Kerry's four years of science teaching in the St. Louis area inspired him to embark upon graduate study in the history of science.

Thursday Evening Reception 6:15 – 8:00

Hors D'oeuvres will be served and one drink ticket will be provided.

A cash bar will also be available.

We would like to give a special thank you to the following sponsors of the reception:

Timothy Letzring, Dean
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The UNIVERSITY of OKLAHOMA

Friday Morning – Full Breakfast (Grand Ballrooms E-F) 7:30 – 9:00

Awards and Business Meeting

Friday Morning Sessions 9:10 – 10:00

#52 **Centennial Ballroom 1** **Hot Topic: Mathematics**

Integrating Science, Mathematics, and Literacy: How Can We Do This Well?

Catharina Middleton, Carmen Woodhall

This Hot Topic session will explore the integration of literacy in science and mathematics content areas to support students' building of a solid conceptual framework on which later learning can be built. The Next Generation Science Standards and the Common Core State Standards for Mathematics each emphasize the importance of asking questions, constructing arguments and explanations, and understanding the thinking of others. We will engage participants in a dialogue about how we might leverage literacy techniques in elementary classrooms to engage our students more deeply in the comprehension of mathematics and science concepts.

#53 **Centennial Ballroom 2** **Research: Mathematics**

Teaching for Conceptual Understanding: What Precalculus Teachers Have to Say

Sandra Cimbricz, Carol Wade

Quantitative findings gained from the Factors Influencing College Success in Mathematics (FICSMath) Study (carried out by the Harvard-Smithsonian Center for Astrophysics) suggests that high-school mathematics teachers' ability to teach for conceptual understanding is a significant and positive predictor of student performance in single-variable college calculus (tertiary calculus). Intrigued, we sought to understand what teaching for conceptual understanding means in practice. Accordingly, we will share findings gained from analysis of open-ended interviews with a representative and random sample of high-school precalculus teachers—across the U.S.—who were identified by students (on the FICSMath Survey) as requiring high conceptual understanding.

#54 **Centennial Ballroom 3** **Research: STEM**

Elementary Teachers' Perceptions of Mathematics/ Science Integration as Revealed Through a Summer Academy

Sandi Cooper, Suzanne Nesmith

The integration of mathematics and science in the elementary grades seems natural and more manageable, especially in a self-contained classroom setting. However, it certainly requires that teachers understand and embrace the process in order for it to occur effectively. Through participation in a summer academy focused on the integration of mathematics and science, a group of elementary teachers engaged in learning about the process and how it could be organized in their own classroom. Based on results from a pre and post survey, researchers determined how this experience impacted the teachers' perceptions of integration.

#55 **Grand Ballroom A** **Regular: Science**

Food Chain Jenga: Using Models to Test Predictions

Daniella Biffi, Melissa Patterson, Beau Hartweg, Morgan Stewart, Molly Weinburgh

Elementary students interact with models every day without thinking about how accurate or inaccurate the models are. They may not realize that scientists rely heavily on models to depict phenomena in the natural world, communicate thoughts, and to test ideas. We use the Jenga© tower as a model to represent an aquatic food chain. By building a model and enacting the consequences of environmental factors, students (and conference attendees) learn about the delicate balance of the chain

Friday Morning Sessions 9:10 – 10:00

#56 | **Grand Ballroom B** | **Roundtable Discussion: Science, Mathematics, and General**

Getting to the Core (The Common Core): Collaboration in a Rural State

Georgia Cobbs

How the Common Core Mathematics Standards were disseminated across a large, rural state with grant support is the focus of this discussion. Two universities worked together to develop and use a blended approach for the teachers' professional development. A state digital professional learning network provided the online learning platform, while specially trained teachers served as "Guides" to assist school districts in their professional learning. An overview of our approach, explaining details of the face-to-face sessions with online inquiry-based learning modules to examine Common Core content and pedagogy including Mathematical Practice. Teacher feedback and evaluation data will be shared.

Integration of Technology in Mathematics for Teacher Professional Development

Cheng-Yao Lin

This session will present some useful technology tools in mathematics instruction for K-12 teachers. Challenges and potentials that mathematics teachers may encounter when applying technology in teaching will be discussed through a summary of literature review on technology integration and mathematics teacher professional development. The presenters will demonstrate two tools: National Library of Virtual Manipulatives (NLVM) and Instructional Architect (IA). The demonstration will focus on mathematics content in elementary level (pre-K to 5). Interactive manipulatives will cover Number & Operations, Algebra, and Geometry. The process of creating lesson plans and searching useful mathematics educational resources through IA will be presented.

Professional Development of Informal Educators

Patricia Patrick

Because achievement has been directly tied to teacher ability, we should evaluate the teaching ability of informal educators and provide professional development that addresses good teaching techniques. Reflective practice requires the informal educator to study and evaluate their teaching, link theory with practice, and critically analyze their teaching. In order to aid informal educators as they develop the process of reflective practice, I propose developing an observation technique that incorporates videoing, self-assessment, and a teaching rubric. This roundtable discussion will focus on professional development and best practices for informal educators. What characteristics should informal education adopt from formal education?

Middle School Science and Mathematics Teachers' Understanding of Nature of Science

Lionnel G. Ronduen, Sissy S. Wong, Jennifer Chauvot

This research study examined the nature of science (NOS) knowledge of middle school science and mathematics teachers (N=21) as they engaged in an integrated online master's program. Findings show the teachers' views of NOS became more developed in the areas of scientific methods, scientific advancement, tentativeness of science, and the definitions of theories and laws after two years of explicit and reflective NOS instruction. Understanding practicing middle school science and math teachers' NOS conceptions is important for researchers and teacher educators to gain insight into how to foster, develop, and sustain NOS understanding in preservice and practicing teachers.

Friday Morning Sessions 9:10 – 10:00

#57	**Grand Ballroom C**	**Regular: Mathematics**

Helping Elementary Students Understand and Become Fluent With Basic Addition and Subtraction

Elaine Tuft

The operations of addition and subtraction are foundational to so much of mathematics. Whether one is teaching elementary students in the younger grades about addition and subtraction or helping prepare preservice teachers to teach these important concepts, a large repertoire of ideas that have proven to be successful in building conceptual understanding in children is invaluable. In this session, student-tested ideas for increasing conceptual understanding of and fluency with basic addition and subtraction will be shared. These ideas will include games and activities that align with the Common Core State Standards—Mathematics.

#58	**Balinese Room**	**Regular: General**

Past President's Meeting

All past presidents of SSMA are invited to attend this session. New initiatives of SSMA will be discussed, and advice from past presidents will be solicited. As with all sessions, this session is open to all membership.

Friday Morning Sessions 10:10 – 10:35

#59 **Centennial Ballroom 1** **Research: Science**

Multi-Literacies and Scientific Practices: Student Voices in Action

Elizabeth Allison, M. Jenice "Dee" Goldston

Today's global society with its instantaneous communication has and is currently changing the ways students interact with natural phenomena, textual information, and the social world around them. Such changes, always a part of learning, is influencing the way in which teaching and learning science takes place in the elementary classroom. This study explores what and how multiliteracies (technological, visual, and textual) influence student voice and the ownership of knowledge. Through a collective case study of two elementary classrooms, teachers and student perceptions give insight into how multiliteracies utilized alongside scientific and engineering practices are currently implemented in these elementary classrooms.

#60 **Centennial Ballroom 2** **Research: Science**

Understanding the Nature of Science Through Integrating the History of Science

Quentin L. Biddy, Timothy A. Laubach

Current educational reform in science education is continuing the call for more adequate student understanding of the Nature of Science (NOS) (National Research Council, 2012). Integrating the History of Science (HOS) in an inquiry-context may facilitate more adequate understanding of NOS and the processes of science itself (Abd-El-Khalick & Lederman, 2000). In this session, we will discuss how 8th grade student perceptions and understanding of NOS were altered after participating in a weeklong inquiry-based experience that was framed within an authentic earth science HOS context.

#61 **Centennial Ballroom 3** **Research: STEM**

Classroom Environments in Single-Sex and Coeducational Mathematics and Science Middle Grades Classes

Megan Che

We present findings from an NSF/GSE study investigating classroom environments in single-sex as compared to coeducational public settings in middle grades mathematics and science. Findings address three research questions: (1) What are the relationships between academic rigor in single-sex classes as compared to coeducational classes, (2) What are the relationships between academic performance of students in single-sex classes as compared to coeducational classes, and (3) What are the relationships between academic self-concept of students in single-sex classes as compared to students in coeducational classes.

#62 **Grand Ballroom A** **Research: STEM**

Spanning Astronomical and Atomic Spaces in Middle School Classrooms Through Project-Based Instruction

Jennifer Wilhelm, Merryn Cole

Teachers' understanding and implementation of Project-Based Instruction (PBI) was assessed through a teacher survey, interviews, and teacher-created PBI units. Teachers received monthly professional development, including instruction on PBI and time to create PBI units, for a year prior to data collection. Each was expected to implement their PBI unit during this time. Teacher attitudes toward and understanding of PBI varied, with some implementing quality PBI units, while others implemented pieces of a PBI unit, such as including a student project without the support of the PBI framework. Teachers cited time as an impediment to implementing PBI in their classrooms.

Friday Morning Sessions 10:10 – 10:35

#63 **Grand Ballroom B** **Research: STEM**

Elementary Teachers' Perceptions of Engineering, Design, and Their Abilities to Teach Engineering

Rebekah Hammack, Toni Ivey

The Next Generation Science Standards require that elementary teachers incorporate engineering practices into their science teaching. However, little research exists that describes elementary teachers' perceptions of the nature of engineering and K-5 engineering education. This explanatory sequential mixed methods study uses findings from a statewide survey of Oklahoma in-service elementary teachers to describe their current perceptions of engineering. Further, we describe their (a) personal knowledge of engineering, (b) abilities to teach engineering to children, and (c) barriers to teaching engineering at the K-5 level.

#64 **Grand Ballroom C** **Research: STEM**

Perceptions of Minority Science, Technology, Engineering, and Mathematics (STEM) Majors

Audrey Meador

This session will detail the results of a study conducted on minority student's perceptions and experiences as a major in a science, technology, engineering, or mathematics (STEM) field. This research sought to determine those factors that contribute to the selection and persistence in a STEM field by a minority student. Qualitative methods were utilized with stereotype threat and self-determination theories providing the framework for the study. This research may inform practices in the recruitment and retention of students to the STEM fields from minority populations.

#65 **Balinese Room** **Research: STEM**

Engineering is Elementary (EiE) and Elementary Teachers' Scientific Reasoning and Self-Efficacy

Kathy Malone, Trudy Giasi

This research examines how an Engineering is Elementary (EiE) workshop affects in-service elementary teachers' scientific reasoning skills and science teaching self-efficacy. The teachers participated in a two-week workshop that introduced them to two EiE curriculum units and the use of scientific modeling activities. The workshop took place one week in June with a follow-up week in August. The teachers were administered the Lawson's Classroom Test for Scientific Reasoning and the Science Teaching Efficacy Belief Instrument pre and post workshop. We will describe the professional development program, the science modeling activities developed, as well as the impact on the in-service teachers.

Friday Morning Sessions 10:45 – 11:10

#66 **Centennial Ballroom 1** **Research: Science**

Chemistry and Physics Teachers' Perspectives of Teaching State-Tested and Non-Tested Subject Areas

Erin Pearce

Effective for the 2013-2014 school year, the state of Texas suspended standardized science testing for 10th and 11th grade. With this policy change, chemistry and physics teachers went from teaching state-tested subjects to non-tested subjects. This study identifies the difference in teachers' perspectives about instructional practices, amount of curriculum covered, and administrator/student demeanor when teaching a state-tested subject versus a non-tested subject. Five teachers were interviewed and their responses were analyzed to identify common themes.

#67 **Centennial Ballroom 2** **Research: Science**

How Do Preservice Teachers Describe Citizens in the Context of Socio-Technical Controversies?

Audrey Groleau

Science education increasingly aims to develop citizens who will be able to participate in socio-technical controversies that concern them. We examined how 15 preservice elementary teachers described the roles, capacities, and incapacities of citizens in the context of such controversies. To this end, we invited them to fill out a questionnaire on their views regarding the way socio-technical controversies unfold and are managed. We then identified the roles, capacities, and incapacities that they attributed to citizens. This paper presents five capacities and one incapacity that the participants attributed to citizens and shows that they assigned them numerous and varied roles.

#68 **Centennial Ballroom 3** **Research: Mathematics**

Plugging the Hole in the Dam: Keeping Innovative Mathematics Teachers Teaching

Elayne Bowman

STEM teachers' premature exodus from the classroom is costly to communities, school districts, and students. Secondary mathematics and science teachers are in short supply and when they leave the classroom, they are difficult to replace. Colleges of education are preparing sufficient numbers of STEM teachers to meet attrition due to retirement; however, not sufficient to meet the number who leave prematurely. Through narrative inquiry this paper explores the stories of six teachers who quit teaching secondary mathematics and considers their motivations for quitting. Themes of educational politics, high-stakes testing, professional advancement, financial situation, and culture shock emerge from their stories.

#69 **Grand Ballroom A** **Research: Mathematics**

Big Ideas in Measurement for Early Grades: Teachers' Level of Understanding

Sandi Cooper

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.

Friday Morning Sessions 10:45 – 11:10

#70 **Grand Ballroom B** **Research: STEM**

The Effectiveness of 3D Modeling on Students' Spatial Ability and Creativity

NO SHOW

Ayse Tugba Oner

To have an effective teaching in classrooms, mathematics preparation of prospective teachers (PST) needs to be improved. One of the improvements that could be provided to PSTs is the creation of mock classrooms. Virtual learning environment could be one example for mock classrooms. Therefore, PSTs could have teaching experience prior to the field. In this study, PSTs taught in virtual environment and analyzed their teaching to address three questions: how successful they were in 1) understanding middle grade students' thinking from what the students did, 2) understanding the students' procedure by questioning, and 3) defining valued explanations in mathematics.

#71 **Grand Ballroom C** **Research: STEM**

Navigating Preservice Teachers' Developing Conceptions of Torque: Intersections Between Mathematics and Science

Brian Fortney, Shirley M. Matteson

Teacher understanding of topics such as balanced and unbalanced forces, levers, torque, or of interactions between distance, mass, and force in relation to a fulcrum, cross boundaries in mathematics and Physics. These topics and subjects are critical understandings for science teachers as they help students make sense of fundamental concepts and connections across disciplines. Through pre/post tests, critical reflections, and interviews, researchers explored the understanding of mathematics and science content knowledge of middle and secondary level preservice teachers (n=10) as they conceptualized torque set within elementary mathematical principles. Implications for preservice science teacher preparation are contextualized within National Standards.

#72 **Balinese Room** **Research: STEM**

Honors vs. Non-Honors: How Are They Involved in STEM?

Melanie Shores

The greatest obstacles females in STEM careers face include emotional and psychological issues in the work place and negative perceptions and stereotyping. This research will help us gain a better idea of the challenges that future women might potentially face as a result of choosing STEM careers while enabling us to try to provide preventive measures for use upon entering the career. It will also help to work with K-12 educators to identify females interested in STEM and provide resources and supports to meet their goals. Implications for leadership and teacher preparation programs include curriculum, supervision, mentoring, and support services.

Friday Morning Sessions 11:20 – 11:45

#73 **Centennial Ballroom 1** **Research: Science**

Changes in STEM Dispositions and Content Knowledge for Middle School Science Students

Gerald Knezek, Rhonda Christensen, Tandra Tyler-Wood

Students participating in Going Green! Middle Schoolers Out to Save the World (NSF ITEST #1312168) for 2013-14 came to think more deeply about conserving energy and became more aware of the impact increased levels of CO2 in the atmosphere can have on their lives and the Earth. Matched pre-post data confirmed large gains in knowledge of environmental science and vampire power ($p < .01$, effect size = .86). Attitudes toward science, mathematics, engineering, and technology became more positive for treatment students, while they became more negative in general for (comparison) students who did not participate ($p < .025$).

#74 **Centennial Ballroom 2** **Research: Science**

In-Service Secondary Science Teachers' Beliefs and Classroom Practices: A Two-Part Study

Toni Ivey, Luke Weinbrecht

CANCELED

Research examining the relationship between teachers' beliefs and classroom practice has been on the rise. This type of research remains important in order to a) determine factors that affect classroom instruction, b) improve professional development, and c) develop teacher preparation programs. Using the BARSTL questionnaire, this study explores in-service secondary science teachers' beliefs. As a result, cross-comparison case studies examined teacher practice using multiple data sources (M-SCOPS, semi-structured interviews, and lessons plans). Results will provide insight into a) the complex relationship between teachers' beliefs and classroom practice and b) areas of professional development for secondary science teachers.

#75 **Centennial Ballroom 3** **Research: Mathematics**

Virtual Manipulatives and Math Talk: An Examination of Techno-Mathematical Discourse

Katie Anderson-Pence

Students frequently use technology as a means and topic for conversation. What if we could leverage this technology-talk in mathematics instruction? This session will share results from a study designed to explore the nature of student-led mathematical discourse in the context of various virtual manipulative types. Results and videos of students' discourse will be presented and discussed, as well as instructional implications of the findings. The results a) extend the existing literature on the ways students discuss mathematical ideas while using technology, and b) offer a means for analyzing and interpreting aspects of social learning with technology during mathematics instruction.

#76 **Grand Ballroom A** **Research: Mathematics**

The Effects of Mathforward Intervention on Middle School Students' Mathematics Achievement

Mahati Kopparla, Kristina Hill, Alexandra Foran

Mathforward intervention, which includes using TI-Nspire and providing professional development for teachers, is designed to improve middle school students' algebra readiness. We examined students' ($n=523$) mathematics growth from 7th to 8th grade after one year of receiving the intervention. Students' performance on state level mathematics tests statistically significantly ($p < .05$) improved (Cohen's d of 0.263) and showed positive effects regardless of students' ethnicity and gender.

Friday Morning Sessions 11:20 – 11:45

#77 **Grand Ballroom B** **Research: STEM**

How Does the STEAM Model of Interdisciplinary Teaching Affect Pre-Service Teacher Efficacy?

Tommye Hutson, Dittika Gupta

With regard to teacher efficacy, it is well documented that pre-service and early career elementary teachers struggle with understanding and teaching various concepts of math and science. This presentation features a pilot study undertaken to discover if adding an interdisciplinary project (STEAM-based) to traditional math and science methods courses would produce higher efficacy in the form of better prepared and highly motivated pre-service teachers. The presenters will share the rationale, methodology, and results of the pilot study. Participants will be engaged in rich discussions while presenters disclose various findings in a practical setting.

#78 **Grand Ballroom C** **Research: STEM**

Pre-Service Secondary Teachers' Conceptions of Interdisciplinary Mathematics and Science Education

James Willingham, Jeffery Bonner, Nancy Caukin

Continuing from the pilot study presented last year, this study examines the correlation of pre-service secondary mathematics and science teachers' content knowledge with their ability to define and distinguish Interdisciplinary Mathematics and Science Education (IMSE) constructs. These working definitions and characterizations are used by teachers to operationalize content knowledge for teaching, and are significant indicators of their understanding of the field. These constructs are also seen as a key prerequisite to the design and delivery of IMSE lessons. This study characterizes those conceptions and serves as a participant selection program for future examination of the teachers' classroom implementations.

#79 **Balinese Room** **Research: General**

Publishing for Tenure, Promotion and Enjoyment: Rocky & Bullwinkle Return to SSMA

Alan Zollman

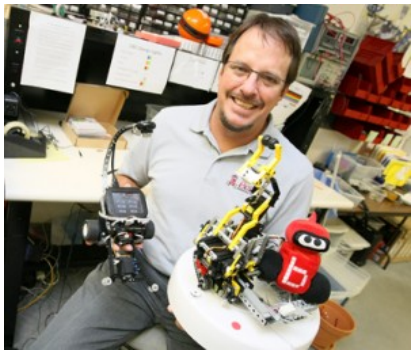
This is a quick, how-to workshop to mentor "young" professionals in writing for publication, budgeting time, getting a support group, and enjoying the vocation. Rocky & Bullwinkle return to SSMA to give hints on how to write for publication.

Friday Lunch and General Session (Grand Ballrooms E-F) 11:45 – 1:00

Keynote Speaker

Steve Goodgame
Executive Director
KISS Institute for Practical Robotics

Robots, It's More Than a Competition



Steve Goodgame is the executive director of the KISS Institute for Practical Robotics, an independent nonprofit organization based in Norman, Oklahoma. The organization uses autonomous robots to actively engage elementary, middle and high school students in computer science, technology, engineering, science, and mathematics.

The flagship program Botball® currently serves over 8,000 students and 1200 teachers nationwide and is being implemented in 16 countries. He is responsible for the development of the Junior Botball Challenge that focuses on empowering K-5 teachers to use robots to teach their students math and science concepts. He is passionate about empowering teachers to use inquiry-based activities with their students.

Mr. Goodgame has a bachelor's degree in agricultural and was an agricultural operations manager before receiving a Master's degree in education to start a second career as a math and science classroom teacher. He has experience at the elementary, middle, high school, and undergraduate levels. He has taught in the border areas of southern New Mexico, rural central New Mexico, and inner city Boston, MA. As a teacher he has mentored middle school and high school students for regional and national robotic competitions, Future City, Odyssey of the Mind, Science Olympiad, Lemelson MIT Inventeams and Intel Science Fair and Junior Academy of Sciences paper contests.

Friday Afternoon Sessions 1:10 – 1:35

#80 **Grand Ballrooms E-F** **Regular: STEM**

Robots, It's More Than a Competition

Steve Goodgame

…continued from the General Session.

#81 **Centennial Ballroom 1** **Research: Science**

The Impact of Science Teacher Professional Development on Student Achievement

Gil Naizer, Becky B. Sinclair

This study investigated the impact of a two-year science teacher professional development program on their students' state science assessment scores. Results indicated the 5th grade students, who attended underperforming schools, improved their scores.

#82 **Centennial Ballroom 2** **Research: Science**

Developing an Environmental Science Inventory for Middle School Students

Rhonda Christensen, Gerald Knezek, Tandra Tyler-Wood

A new fifteen-item environmental science inventory administered to 1569 students was found to have two factors with respectable reliability (.87 for Factor 1 and .70 for Factor 2). This inventory was developed to measure middle school student attitudes toward the environment. Factor 1 is related to the belief in global climate change while Factor 2 focuses on the belief that one can personally take actions to make a difference in our environment. This inventory was designed to assess pre-post changes resulting from the Middle Schoolers Out to Save the World project where students monitor standby power consumption in their homes.

#83 **Centennial Ballroom 3** **Research: Mathematics**

Cognitive and Neuro-Scientific Components of Dyscalculia: A Systematic Review

Mahati Kopparla, Alexandra Foran, Peter Boedeker, Nickolaus A. Ortiz, Kristina Hill

Mathforward intervention, which includes using TI-Nspire and providing professional development for teachers, is designed to improve middle school students' algebra readiness. We examined students' (n=523) mathematics growth from 7th to 8th grade after one year of receiving the intervention. Students' performance on state level mathematics tests statistically significantly ($p < .05$) improved (Cohen's d of 0.263) and showed positive effects regardless of students' ethnicity and gender.

Friday Afternoon Sessions 1:10 – 1:35

#84 **Grand Ballroom A** **Research: Mathematics**

Flipping the Secondary Mathematics Classroom

Tommy Smith, Sheila Ingram

This presentation will examine the topic of using flipped instruction in the secondary mathematics classroom. In seeking better ways to engage 21st century learners, technology and alternative ways of delivering instruction are being used by teachers in mathematics classrooms. The authors will share a review of the literature, which shows some empirical evidence that flipped instruction can have positive effects on student learning and attitudes toward learning mathematics. They will share examples of case studies involving grades 7-12 teachers in their classrooms. These studies will demonstrate the successes and challenges that flipped instruction has for teaching mathematics.

#85 **Grand Ballroom B** **Research: Mathematics**

Mathematics Embedded in Real-World Contexts

Lauren Jeneva Moseley, Caroline Maher-Boulis

How do in-service middle school mathematics teachers connect mathematical problems to the real world? A simple realistic scenario can challenge students to think creatively and reason within multiple domains. This session will reveal how middle school teachers' mathematical content knowledge can be influenced by embedding mathematics in real-world contexts. Also, pedagogical content knowledge can broaden as middle school teachers become more able to create original real-world problems that align with mathematical standards. Data were collected from participants in a professional development program called BLT Math (Bringing Life to Mathematics), funded by the Tennessee Higher Education Commission.

#86 **Grand Ballroom C** **Research: STEM**

Teachers' Stories: Becoming and Remaining Effective in Successful and Diverse High Schools

Jennifer LeBlanc, Carol Stuessy

Stakeholders continue to seek answers to questions about the underrepresentation of diverse students in the STEM pipeline. We chose to focus our research on what is working for diverse students rather than revisiting what is not working to alleviate persistent problems of science achievement and college/career readiness for diverse learners. We interviewed nine Texas teachers from highly diverse high schools identified as "successful in science " to tell us about their experiences in becoming and remaining science teachers in highly diverse high schools.

#87 **Balinese Room** **Research: Mathematics**

SSMA 2015 Dissertation Award Winner
Early Elementary Students' Fractional Understanding: Examination of Cases from a Multi-Year Longitudinal Study

Dittika Gupta

Fractions are considered critical and foundational, yet they represent a challenge. This presentation features a research study that investigated early elementary students' fractional understanding and growth in thinking about fractional concepts over multiple years. Using purposeful criterion sampling along with case-study methodology, fractional understanding of ten early elementary students that had participated in the 2007-2013 longitudinal research study for at least three years was examined. The researchers will share the findings of the research study along with discussing the implications in relation to curriculum, use of manipulatives, and development of students' understanding of fractions.

Friday Afternoon Sessions 1:45 – 2:35

#88 **Centennial Ballroom 1** **Hot Topic: STEM**

Co-Teaching Strategies With Pre-Service Teachers in STEM Education

Alan Zollman

The emphasis on using standardized test scores for teacher evaluation, teachers increasingly are hesitant to allow a pre-service teacher in their classrooms. We researched co-teaching strategies are research methodologies that may be able to coordinate the needs of classroom teacher and the pre-service teacher.

#89 **Centennial Ballroom 2** **Research: Mathematics**

Mathematical Knowledge of Middle School Students Related to the LCM

James Telese

This paper will report on the analysis of student work samples related to solving a real-world problem about finding the Least Common Multiple. The work samples were rated using an analytic, 5-point rubric for Procedural Fluency, Conceptual Understanding, and Problem Solving/Strategic Competency. A linear regression was conducted. It was found that Conceptual Understanding was the strongest predictor of Problem Solving/Strategic Reasoning scores. The student work samples were analyzed qualitatively for evidence of proportional reasoning. There was ample evidence to indicate that the prominent mathematical knowledge used to solve the problem was procedural knowledge and additive thinking.

#90 **Centennial Ballroom 3** **Research: Mathematics**

Profession Development for Growth in Middle-Grades Teachers' Classroom Discourse

Gabriel Matney

This session will describe a grant-funded yearlong professional development (PD) program supporting middle grades mathematics teachers. Next, we will offer an example of one activity from the PD and give attendees a brief opportunity to experience it as teachers did. We will then reflect on teachers' changes and their attributions of success. These reflections will be leveraged to engage the audience in a broader discussion about ways mathematics and science PD providers might support instructional changes, specifically in promoting classroom discourse practices.

#91 **Grand Ballroom A** **Regular: Science**

Advancing Scientific Literacy with Inquiry Lesson Plans Using Science Reading Materials

Susan Cooper

Science teachers at all grade levels are being asked to incorporate more literacy strategies into their lessons to support literacy in language arts. Teachers can also advance scientific literacy through reading and writing about science in the classroom using engaging articles that examine the science behind everyday life. Lesson plans were designed using the backward design process, by examining the standards to identify learning goals. The goal of these lessons is to help students think critically as they use interesting reading content to deepen their scientific understanding of how we know what we know.

Friday Afternoon Sessions 1:45 – 2:35

#92 **Grand Ballroom B** **Regular: Mathematics**

Modeling with Mathematics, Linking Classroom Mathematics and Statistics to Everyday Life

Susie Hakansson, President, TODOS: Mathematics For All

Math Practice 4 (MP4), Modeling with Mathematics, is mathematizing a situation or making use of a given or constructed model by interpreting or validating it in relation to the context. Participants will become more familiar with MP4 and engage in several modeling problems, many of which are linked with science and engineering. Included in the session will be strategies to provide English learners access to the mathematics content.

#93 **Grand Ballroom C** **Regular: STEM**

STEM Road Map (6-8): Integrated STEM Modules

Juliana Utley, Toni Ivey, Adrienne Redmond-Sanogo, Carla Johnson, John Weaver

Presenters will provide participants with an overview of a series of integrated STEM modules for middle school grades focusing on topics of Human Impacts on Our Climate, Population Density, Communication, and Learning from our Past. Additionally, presenters will share where to find these modules and how they connect to a new book "STEM Road Map: A Framework for Integrated STEM".

#94 **Balinese Room** **Regular: STEM**

Bolstering Preservice Teachers' STEM Literacy Via Informal Learning Experiences

Margaret Mohr-Schroeder, Christa Jackson, Craig Schroeder, Maureen Cavalcanti, Marla Lemmon

Before many students enter 8th grade, they conclude many of the STEM subjects are too challenging, boring, and/or uninteresting (PCAST, 2010). Research has shown that more exposure to a variety of STEM opportunities will have a long-term effect on individuals and the overall STEM education community (Wai, Lubinski, Benbow, & Steiger, 2010). The purpose of this session is to discuss how a teacher education program integrates informal learning experiences as a regular part of the program in order to increase prospective teachers' exposure to a variety of STEM learning experiences so they might integrate the opportunities into their own classrooms.

Friday Afternoon Snack Break 2:35 – 2:55

Friday Afternoon Sessions 2:55 – 3:45

#95 | **Centennial Ballroom 1** | **Symposium: General**

Social Discourse Analysis: What Are They Saying in Informal Institutions?

In this interactive symposium, the presenters will facilitate a discussion regarding the significance of social interactions in informal institutions. Each of the presenters used discourse analysis to identify the importance of conversations to learning. The researchers use the notion of social learning to describe how individuals interact, share information, and use higher order thinking skills to ask questions.

Robert Uzick

This study took place at an arboretum, where visitors take nature walks. Sociocultural learning theory was utilized to understand the dialog that occurs between family members during a nature trail hike. This qualitative study used a random convenience sample to identify nine families at an Arboretum in the southwestern United States and record their nature trail conversations. The data were analyzed to determine the level of questions being asked. The results indicated that adults asked some higher order thinking questions and probed children about the experience.

Jenn Idema

Little research has been completed that addresses visitor motivation for attending science-themed community events and the experiences that are most impactful. The present study utilized community of practice as a framework for understanding how the social experiences of 175 event patrons contribute to their knowledge. A qualitative design utilizing the methods of questionnaires, drawings, and interviews was chosen to define family members' experiences. The findings indicated that visitors were paying attention to the educational theme and the organisms being presented. However, when the families were interviewed three months later their focus changed to the entertainment aspects of the visit.

Patricia Patrick

This presentation focuses on the Interactions component of the Informal Learning Model from a sociocultural perspective and provides ideas about how informal educators may use questioning to inform their teaching. Social discourse is viewed as a tool that is used in the process of learning and learning is evidenced in the change of the discourse patterns over time. This presentation will specifically address the discourse that occurs between visitors and between visitors and staff in the form of questioning. Results indicate that questions in informal institutions take three paths: visitor-to-visitor, visitor-to-staff, and staff-to-visitor.

Friday Afternoon Sessions 2:55 – 3:45

#96 **Centennial Ballroom 2** **Hot Topic: STEM**

What's Your View? A Discussion of Accountability Systems on STEM Instruction

Andrea Foster, Bill Jasper

This hot topic session will provide open forum for participants to argue the good, the bad, and ugly issues related to state accountability systems and their impact on mathematics and science teaching and learning. The current culture of accountability clearly has influenced the classrooms of today in significant ways. Empirical evidence suggests that the use of flawed indicators produces unreliable and unrepresentative inferences and decisions. High-stakes testing produces teaching and testing practices that lead to inflated test scores and further disadvantage already disadvantaged students. Come share your view.

#97 **Centennial Ballroom 3** **Research: Mathematics**

Student Insights and Experiences in Non-Traditional Undergraduate Mathematics

Rachel Bates

Despite the various forms of research that has highlighted the cognitive understanding of how mathematical knowledge is acquired and utilized, students typically experience mathematics through years of fragmented encounters leading them to believe that mathematics is comprised of meaningless symbols, inflexible formulae and procedures. This presentation will provide participants with the opportunity to discuss pedagogical standards set forth by AMATYC, NCTM, and GAISE regarding mathematics education reform. The purpose of this study was to describe student's approaches to learning statistical concepts as they engaged in various problem based learning activities.

#98 **Grand Ballroom A** **Regular: Mathematics**

Using Great Three-Act Video Tasks and Using Them Well!

Valerie L. Mills, President, National Council of Supervisors of Mathematics

Participants will explore a new format for presenting rich open-ended tasks, the Three-Act Video. Using video tasks with especially designed teacher notes, we will consider the learning opportunities these tasks afford students and the challenges teachers face using them effectively. This session will highlight both mathematical practice and content standards with a particular focus on mathematical modeling and problem solving. The Three-Act Videos are a powerful engaging format to help students learn to pose questions from real world situations, to identify the mathematics needed to solve problems, and to complete the problem solving cycle by checking solutions and exploring errors.

#99 **Grand Ballroom B** **Regular: STEM**

The Development/Validation/Reliability of a Mathematics and Science Integration Rubric

Timothy A. Laubach, Tiffany N. Neill, Levi Patrick

Accompanying the release of the Common Core State Standards for Mathematics and the Next Generation Science Standards is a renewed interest in the integration of mathematics and science. Building on the Mathematics/Science Integration Continuum (Huntley, 1998) and using an iterative process of design, we developed, validated, and established the reliability of the Value of Integratedness Rubric for Mathematics and Science Integration. In this session, we will discuss this iterative process and the implications and applications of using this instrument. We will also provide an opportunity for participants to use the rubric to determine the level of integration in several lessons.

Friday Afternoon Sessions 2:55 – 3:45

#100 **Grand Ballroom C** **Regular: General**

Serving as a Reviewer for the School Science and Mathematics Journal

Carla C. Johnson, Andrea Milner, Jonathan Breiner

This session will provide an orientation for how to become a reviewer for the *School Science and Mathematics* journal.

Friday Afternoon Sessions 3:55 – 4:20

#101 **Centennial Ballroom 1** **Research: Science**

Elementary Science Methods Students' Emerging Professional Identities

Stephanie Hathcock, Toni Ivey

Pre-service teachers enter science methods courses with a dynamic identity composed of their perceptions, beliefs, goals, and action possibilities. This personal identity system then influences their developing professional identity as a teacher. In our semester with these students, we attempt to engage with their professional identity as they learn about teaching science to elementary students. In this session, we will present research on pre-service teachers' dynamic professional identity systems as they progress through our methods courses. Data include pre/post science autobiographies, STEBI-B, Draw-A-Scientist, and Draw-A-Science-Teacher tasks.

#102 **Centennial Ballroom 2** **Research: Science**

Teachers' Understanding and Implementation of Project-Based Instruction in High School Science Classrooms

Merryn Cole, Jennifer Wilhelm

Teachers' understanding and implementation of Project-Based Instruction (PBI) was assessed through a teacher survey, interviews, and teacher-created PBI units. Teachers received monthly professional development, including instruction on PBI and time to create PBI units, for a year prior to data collection. Each was expected to implement their PBI unit during this time. Teacher attitudes toward and understanding of PBI varied, with some implementing quality PBI units, while others implemented pieces of a PBI unit, such as including a student project without the support of the PBI framework. Teachers cited time as an impediment to implementing PBI in their classrooms.

#103 **Centennial Ballroom 3** **Research: Science**

Summer Program Does Make a Difference: Increasing Underrepresented Minority Students' Science Interest

Mamta Singh

The objective of this weeklong study was to inspire, engage, and educate minority, underprivileged, low-income middle school students in science. Students were introduced to the K'NEX Education Amusement Park Experience kit. Participants were challenged to use their critical thinking skills to design their individual group Roller Coaster project. Pre-and Post-content knowledge tests along with program satisfactory survey and reflection were collected. Results indicated that students' content knowledge significantly improved. Students' survey and reflective journal responses suggest that students who had no science interest prior to attending the program did increase their science interest as a result of this program.

#104 **Grand Ballroom A** **Research: Mathematics**

Beliefs About Social Justice Among Elementary Mathematics Teachers

Brian Evans

The purpose of this study was to measure teacher beliefs about social justice over the course of an elementary mathematics teaching methods course among three cohorts. Findings revealed that while there were no differences in beliefs over the course of the semester, one group of teachers had more positive beliefs about social justice than did other teachers. Teachers felt most positively about incorporating diverse cultures and experiences into classroom lessons and discussions; self-examination of attitudes and beliefs about race, class, gender, disabilities, and sexual orientation; and teaching students to think critically about government positions and actions.

Friday Afternoon Sessions 3:55 – 4:20

#105 **Grand Ballroom B** **Research: Mathematics**

Preservice Teachers and Their Use of Invented Strategies

Suzanne Brown

This session presents data on preservice teachers' ability to solve addition, subtraction, multiplication and division problems using invented strategies. Eighty five students enrolled in an EC-6 Mathematics Methods course were given four problems to solve and were told to solve the problems without using the standard algorithm. Data will be presented on how successful the preservice teachers were in inventing a strategy, the interventions implemented, and the results of intervention.

#106 **Grand Ballroom C** **Research: Mathematics**

Problem-Based Learning in the Mathematics Classroom

Shelia Ingram, Tommy Smith

Problem-based learning (PBL) consists of carefully selected and designed real-world problems that demand from the learner acquisition of critical knowledge, problem-solving proficiency, and self-directed learning strategies. Research has consistently shown that PBL, as an instructional approach, assists students in developing effective problem-solving skills, a flexible knowledge base, and lifelong learning skills. However, research on math teachers' perceptions of PBL is scarce. So, what are math teachers' perceptions regarding implementing PBL into their classroom? During this session, we will examine findings and implications of a survey research study on math teachers' (grades 6-12) perceptions of implementing PBL in the classroom.

#107 **Balinese Room** **Research: Mathematics**

How Successful Preservice Teachers Address Their Teaching Experience

Nickolaus A. Ortiz

To have an effective teaching in classrooms, mathematics preparation of prospective teachers (PST) needs to be improved. One of the improvements that could be provided to PSTs is the creation of mock classrooms. Virtual learning environment could be one example for mock classrooms. Therefore, PSTs could have teaching experience prior to the field. In this study, PSTs taught in virtual environment and analyzed their teaching to address three questions: how successful they were in 1) understanding middle grade students' thinking from what the students did, 2) understanding the students' procedure by questioning, and 3) defining valued explanations in mathematics.

Friday Afternoon Sessions 4:30 – 4:55

#108 **Centennial Ballroom 1** **Research: Science**

Addressing Student Misconceptions About Diffusion and Osmosis Through Direct and Inquiry Instruction

Erin Dixon, Suzanne Nesmith

An understanding of diffusion and osmosis provides a necessary foundation for more complex biological concepts. However, many high school students have misconceptions about diffusion and osmosis. Many science experts recommend inquiry as a powerful instructional method for addressing misconceptions and promoting conceptual change. Despite the emphasis on inquiry instruction, it is not widespread in K-12 classrooms. This presentation will share research results on ninth grade students' understanding of and misconceptions about diffusion and osmosis after participation in either direct or inquiry instruction. Two different instruments were used to assess student understanding, a multiple choice instrument, and an open-ended response instrument.

#109 **Centennial Ballroom 2** **Research: Mathematics**

Assessing K–12 Teachers' of Mathematics Knowledge About the Nature of Mathematical Modeling

Reuben Asempapa

Modeling with mathematics is gaining increased focus in standards and assessments for school mathematics—both nationally and internationally. Nevertheless, how do teachers conceptualize the nature of mathematical modeling? This provides a starting point for designing appropriate professional development for teachers in mathematical modeling. This presentation reports on the development of an instrument to assess teachers' knowledge about the nature of mathematical modeling. Using several sources, an initial Mathematical Modeling Knowledge Scale (MMKS) was developed including 22 items; formats included true-false and multiple choice. Using interviews with experts, item analysis, and factor analysis, the MMKS was honed to a 13-item version.

#110 **Centennial Ballroom 3** **Research: Mathematics**

Advancing the Field: Development and Validation of Algebra Teachers' Self-Efficacy Instrument

Dittika Gupta, Bill Jasper, Sarah Quebec Fuentes, Sandi Cooper, Winifred A. Mallam

The presenters will describe the development and validation process of an instrument aimed to measure teachers' self-efficacy of knowing algebra and teaching algebra. After a brief discussion of the conceptual framework, the presenters will discuss the development of the original 118 items and their content and construct validity. The presenters will also share results from a factor analysis resulting in an item reduction from a 118-item to 50-item instrument. The participants will engage in discussion and sharing of instrument items and its application.

#111 **Grand Ballroom A** **Research: Mathematics**

Beyond Engagement: Inductive Evaluation of a 21st Century Educational Board Game

Abigail Perkins, Carol Stuessy

A collaborative educational board game about earthquake engineering was inductively evaluated. Aligned with 21st century learning, the game provides players opportunities to practice critical thinking, argumentation, and metacognitive skills while constructing earthquake engineering knowledge. Evidence supporting learning outcomes resulted from constant comparison of interviews from six secondary students who played the game twice. Video analysis of student game-play was compared via a rubric to assess cognitive gains between games. The rubric was developed to measure changes in higher-order thinking and engineering knowledge between game-plays. Findings indicate students practiced more higher-order thinking during the second game and gained engineering knowledge.

Friday Afternoon Sessions 4:30 – 4:55

#112	**Grand Ballroom B**	**Research: Mathematics**

Taking Advantage of the Dragging and Measuring Features of Dynamic Geometry Software

Zhonghong Jiang

This presentation will report a research study on how the use of dynamic geometry (DG) software can facilitate students' conjecturing and proving capabilities in high school geometry classrooms. Case studies revealed that with the use of the DG software students were able to formulate and prove quality conjectures more quickly. They can use the dragging and dynamic measurement features of the DG software to find and correct misconceptions more straightforwardly, but teachers should purposefully help their students to develop a learning habit of taking full advantage of these useful features of the DG tools.

#113	**Grand Ballroom C**	**Research: STEM**

Q-Tips: Quality of Teachers in the Perception of Students

Alexandra Foran, Kristina K. Hill, Mahati Kopparla

A considerable amount of literature has been written regarding quality of teaching, teacher-student relationships, and students' perception of their teachers. To understand the relationship between the quality of teaching and students' perception about their teachers, we used data (n=10875) from the Education Longitudinal Study of 2002 (ELS: 2002). The present study investigated this relationship and yielded a positive correlation ($r = .832$, $p < .01$) between the quality of teaching with students' perception about their relationships with their teachers.

Friday Afternoon SSMA Committee Meetings 4:55 – 5:55

Awards and Endowment	**Centennial Ballroom 1**
Convention	**Centennial Ballroom 2**
Finance	**Centennial Ballroom 3**
Membership	**Grand Ballroom A**
Nomination and Election	**Grand Ballroom B**
Policy	**Grand Ballroom C**
Publications	**Balinese Room**

Saturday Morning – Continental Breakfast (Grand Ballrooms E-F) 8:00 – 9:00

Saturday Morning Sessions 9:10 – 10:00

#114 **Centennial Ballroom 1** **Hot Topic: Mathematics**

Examining Cognitive Demand and Content of Early Number and Fraction iPad Apps

Adrienne Redmond-Sanogo, Amy Adkins

iPads offer a new and engaging platform for young children to learn mathematics. This research study seeks to inspire mathematics educators to consider the attributes of apps that would support maximized learning for elementary students. Although digital platforms have been depicted as being transformative in the learning process, very few guidelines for teachers on how to choose apps have been explored. This study identified ten early elementary number apps and ten fraction apps and analyzed them for mathematics content and cognitive demand. We will report results and invite participants to bring their iPads to explore some apps we investigated.

#115 **Centennial Ballroom 2** **Research: Mathematics**

Communication, Metacognition, and Teaching Mathematics: A Plausibility Probe

Kate Raymond, Melissa Gunter

Much focus has been given to increasing students' opportunities to use verbal and written communication in mathematics classes in order to increase understanding and problem solving skills. This research asks what factors determine the ways and extent to which mathematics teachers use communicative activities in the mathematics classroom and suggests improving mathematics teacher metacognition as a possible means towards increasing opportunities for student communication in mathematics classrooms. Possibilities for future research will be discussed.

#116 **Centennial Ballroom 3** **Research: Science**

Elementary Science Teacher Preparation: The Importance of Breadth and Depth of Content

Madelon McCall, Suzanne Nesmith

Presenters will share the initial impressions and research gathered from the first semester offering of two laboratory science courses designed to prepare university students pursuing a degree in Elementary Education. The purpose of the courses is to promote the development of a deep understanding of the scientific concepts required for the effective instruction of elementary school students. The new courses also integrate scientific knowledge and understanding with the technology necessary for the effective teaching of elementary science, as well as equip elementary pre-service teachers with experimental design and data analysis skills.

#117 **Grand Ballroom A** **Regular: Science**

Connecting NGSS and the Common Core Through Integration in the Elementary Classroom

Carolyn Riley, Linda Figgins

This workshop session will provide examples of integrated units connecting mathematics, science, social studies, and language arts. These units were developed and taught in an elementary school that had many English language learners. The developers will share how the past and the future connect as the next generation science standards meet the common core, which encourages the use of integrated units. Teachers of science and mathematics methods courses can use these units to model authentic mathematics and science integration.

Saturday Morning Sessions 9:10 – 10:00

#118	**Grand Ballroom B**	**Regular: STEM**

Avatars and Online Professional Development in STEM and College Career Readiness Skills

Carol Stuessy, Joy Killough, Jennifer LeBlanc, Luke Lyons, Abigail Perkins

Avatars? In online PD for STEM leaders? Our contribution to an online STEM training initiative was a training module using classroom teacher avatars within a PBL scenario. Avatars responded to interviews, surveys, questionnaires, and classroom observations to provide data for exercises simulating data analysis and interpretation. Our PD participants, who played district-level PD providers, worked with the data to optimize the design of a summer workshop maximizing teachers' strengths and attending to specific areas for growth. In this session, we introduce avatars, describe PD lessons, and provide information about receptivity of our PD participants to this form of online PD.

#119	**Grand Ballroom C**	**Regular: STEM**

Modeling in CCSSM and NGSS: Finding Common Ground for Teaching and Research

Kimberly Groshong

This presentation will discuss the implications for teachers and researchers regarding how the term "modeling" is used in both the Common Core State Standards for Mathematics and the Next Generation Science Standards detailing similarities and differences. The establishment of common ground can provide opportunities for interdisciplinary teaching using curricula to influence these connections and challenging approaches to teaching and learning. Suggestions for secondary education mathematics and science activities specifically focusing on mathematical modeling will be included.

Saturday Morning Sessions 10:10 – 11:00

#120 **Centennial Ballroom 1** **Research: Mathematics**

ETEAMS: Elementary Teachers Engaged in Authentic Math and Science-Year 2

Tonya Jeffery, Cherie McCollough, Kim Moore

ETEAMS (Elementary Teachers Engaged in Authentic Math and Science) is an NSF funded initiative that brings together pre-service and in-service teachers, grades 4-8 students, teacher education professors, research scientists, and instructional coaches for the purpose of improving teacher practices, student achievement, self-efficacy, and interest in mathematics and science. This research project is an innovative STEM model involving a school-university partnership. Findings from a mixed-methods study design involving Cohorts I, II, and III as it relates to the school-university partnership, pre-service teachers' conceptions of nature of science (NOS), math and science content knowledge, and teaching self-efficacy will be discussed.

#121 **Centennial Ballroom 2** **Research: STEM**

Correlated Science and Mathematics

Sandra Browning

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This presentation describes the evaluation of a professional development (PD) model called Correlated Science and Mathematics (CSM) for its effectiveness in enabling teachers to integrate science and mathematics curriculum and to use the proper language of each discipline. Although national standards recommend integration, without effective PD models, broad-scale integration is not likely to occur. Use of the CSM model resulted in teachers planning and teaching integrated lessons and using each discipline's proper language. The implementation of the critical attributes of the CSM PD model was effective in enabling teacher teams to effectively teach integrated science and mathematics lessons.

#122 **Centennial Ballroom 3** **Research: STEM**

Enhancing Middle School Mathematics Teachers' Pedagogical Content Knowledge With a Summer Institute

Cynthia Orona, Conra Gist

Rural middle school mathematics teachers attended a three-day summer institute focused on enhancing pedagogical content knowledge (PCK). The teachers developed two lessons based upon a given content module, and co-taught video-recorded lessons in an undergraduate structures mathematics course designed for pre-service teachers. The teachers reflected upon their teaching experiences and the video recordings of their instructional practice to refine the lessons for future classroom use. Teacher video recordings and reflections were examined to determine shifts in teachers' PCK, and explore the possibility of similar professional development designs via an on-line platform for rural teachers.

#123 **Grand Ballroom A** **Regular: Mathematics**

Practices Make Perfect: Preparing Teachers to Teach Core STEM Practices

Louis Nadelson

We have designed a series of tools and activities that enhance teacher capacity to teach aligned to core STEM practices (e.g. NGSS and CCSS-M). Participants will be guided through a STEM activity that applies these practices to provide a common context for exploration of teaching aligned with these practices. Classroom assessment activities will be explored and a rubric will be developed and applied to determine the extent to which students engage in and apply these practices. Emphasis will be placed on the importance of innovation and creativity to effectively teach and assess student learning aligned with core STEM practices.

Saturday Morning Sessions 10:10 – 11:00

#124 | **Grand Ballroom B** | **Syllabus Share**

Let's Talk Methods for Intermediate Mathematics: A Syllabus Share

Kansas Conrady, Adrienne Redmond-Sanogo

As the role of the teacher continues to change, so do the needs of preservice elementary teachers. Bring your syllabus and share ideas with other intermediate math methods instructors. Discuss ways you find balance between content and pedagogy while also sharing favorite resources, activities, and assignments. Leave this session with contacts and fresh ideas to continue improving your course and future elementary teachers. It's even okay if you don't have a hard copy of your syllabus with you, we would still love to hear your ideas and will talk ways to share electronic files or other agreed upon information.

Elementary Mathematics Methods Syllabus Share

Jessica de la Cruz

During this session, participants will be invited to share their Elementary Mathematics Methods for Teaching syllabus and related course activities. Participants will be engaged in a discussion regarding their course's focus areas and related assessments. Resources, such as classroom videos and various technologies, will also be considered.

Foundations of Number and Algebraic Reasoning (K-6)

Tracy Hargrove

This session will focus on the syllabus and course activities for an undergraduate methods course on number and algebraic reasoning. This course includes the following primary activities: 1) Comprehensive Mathematics Inventory – Students complete a series of assessments before tutoring an elementary student in mathematics, 2) Math Trail – Students create a resource designed to explore mathematics in the community while addressing the Common Core Standards 3) Case Study Responses - Students analyze interactions between students and teacher, and 4) Textbook Review – Students complete a critique of an elementary mathematics textbook.

Foundations of Teaching Geometry, Data and Measurement (K-6)

Heidi Higgins

This session will focus on the syllabus and course activities for an undergraduate methods course on geometry, data and measurement. This course includes the following primary activities: 1) Data project - Students conduct a statistical investigation and learn how to implement similar activities with elementary students, 2) Case Study Analysis – Students analyze interactions between students and teacher, and 3) Video Analysis – Students videotape themselves teaching content from the course and reflect on classroom discourse, and 4) WebQuest – Students research a famous mathematician and create an online interactive artifact.

Saturday Morning Sessions 11:10 – 12:00

#125 **Centennial Ballroom 1** **Regular: Science**

Coaching as a Professional Development Model: At What Cost?

Beau Hartweg, Yohanis de la Fuente, Erin Pearce, Molly Weinburgh

Van Driel, Beijaard & Verloop (2001) posited that long-term professional development (PD) utilizing a peer-coaching model was needed if science teachers were to be able to enact reform-based teaching practices. Four graduate students acted as 'near peer' coaches to high school biology teachers during a yearlong PD project. The near peer coaches worked weekly with teachers in a plan-teach-debrief format to help foster reform-based teaching. This presentation describes what the coaches learned and provides insight into using a coaching model with in-service teachers.

#126 **Centennial Ballroom 2** **Regular: STEM**

Blurring the Lines Between Disciplines: Is It Math or Is It Science?

Heidi Higgins, Tracy Hargrove

This presentation focuses on how we structure our elementary methods courses for integration of content and application in the field. Students in our courses are part of a cohort or block where they take all of their methods courses together and complete over 150 hours in an elementary classroom. This block format affords our students an unusual opportunity to seamlessly integrate content across several disciplines. This presentation will highlight one project that integrates math and science concepts. Examples of student projects across a variety of grade levels and topics will be shared.

#127 **Centennial Ballroom 3** **Regular: STEM**

Changing Cultural Perceptions and Misconceptions Through Family Math and Science Learning Events

Cherie McCollough, Olga Ramirez

Presenters have been conducting Family Math and Science Learning events for 8 years as part of University preservice teacher training in Math/Science content courses. Will present research regarding changed attitudes and perceptions of Hispanic families by preservice teachers through the use of family learning events. Theoretical framework and research regarding culturally relevant teaching, instructions and lesson/project examples will be provided to incorporate family learning as part of math/science content curriculum in preservice training/teacher education. Multiple resources will be distributed and explained.

#128 **Grand Ballroom A** **Regular: STEM**

Integrating Content and Pedagogy Within and Beyond STEM for Secondary Pre-Service Teachers

Kit Price Blount, Melanie Fields

LeoTeach is the secondary STEM teacher preparation program at Texas A&M University-Commerce. LeoTeachers are undergraduate students who are majoring in a STEM discipline, and who enroll in three newly designed courses in the College of Education that specifically target science and math teaching. Courses focus on integrating content and pedagogy within and beyond STEM, and on best practices for student-centered learning, including inquiry and PBL. This year the LeoTeach courses were co-taught by a math education instructor and a geoscientist, which facilitated both student learning and faculty professional growth. Specific strategies will be shared, and audience contributions will be solicited.

Saturday Afternoon Session and Boxed Lunch 12:10 – 1:00

#129 | **Grand Ballrooms E-F** | **Innovations Showcase: Science, Mathematics, and STEM**

"Clouds Have Names?" Science Literacy and Elementary GLOBE

Georgia Cobbs

This session will share how GLOBE (Global Learning Observations to Benefit the Environment) has developed stories around several science topics, including clouds, soils, creeks and the earth as a system. Fun science activities and resources will be shared.

History of Mathematics in the Classroom: A Focus on Cultures

Brian Evans

This presentation gives a brief overview of the history of mathematics through the contributions from various cultures. It provides ideas for using mathematics history to motivate students. The presentation will be interactive and have teachers solve historical problems and we will discuss how mathematics history can be used in the classroom. Topics will briefly include mathematics in ancient Egypt, ancient Mesopotamia, ancient Greece, China, India, the Islamic World, the Pre-Columbian Americas, Europe, and the United States. The development of mathematics from ancient times, the Middle Ages, and throughout the 17th to 21st Centuries will be briefly examined.

Integration Across Disciplines: Math, Science and Physical Education in Elementary Classrooms

Laura Cason, Dittika Gupta, Tommye Hutson

The presenters will share and involve the participants in lessons involving movement, mathematics, and science. After a brief introduction about the components of integrating movement in content areas, the participants will be engaged in "moving" math and science lessons. The participants will not only share their experiences after the integrated lessons and also collaborate to share and develop ideas for other lessons.

STEM Activities for the Elementary Classroom

Cynthia Orona

Science, Technology, Engineering, and Mathematics (STEM) activities can be used in the elementary classroom as a way to integrate mathematics and science in a real-world context in order to engage students in the learning process. This session will showcase activities for teachers to use in their classrooms. The activities chosen will allow for further integration of literature, mathematics, and science by using narrative to hook the students.

Practical Practices: Integrating Mathematical Standards of Practice Into Content Lessons

Kate Raymond, Devon Gunter

Explore properties of snowflakes and draw conclusions about properties of polygons. The activities used in this in this session engage students in the use of patterns and structure to construct and critique arguments about rotations, reflections, and symmetry by examining, describing, and categorizing snowflakes. See how you can integrate NCTM's Standards for Mathematical Practices and Mathematical Teaching Practices into rich, content driven lessons and discover how these practices work in tandem to support student learning. Special attention will be given to the use of discourse and questioning to promote student construction and critiques of arguments.

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What Are You Doing? Mixing up Science with Engineering

Lionnel Ronduen

Have you begun to infuse your science activities with engineering? Attend this session to get quick and easy ways to do just that! Leave this session with methods on how to infuse engineering design into your lesson. This hands-on, minds-on session will have you trying it out for yourself!

Exploring Spatial Sense Using OSMO

Tracy Thompson, Adrienne Redmond-Sanogo

The session will present recent research on the development of spatial ability through the use of multimodal mathematics manipulatives; in particular, research on the OSMO gaming system and its effects on students' spatial ability. Presenters will discuss the usage of OSMO in the mathematics classroom and how it can be used as a tool to aid in the development of spatial ability. Participants need to bring their iPad to explore the app and manipulatives.

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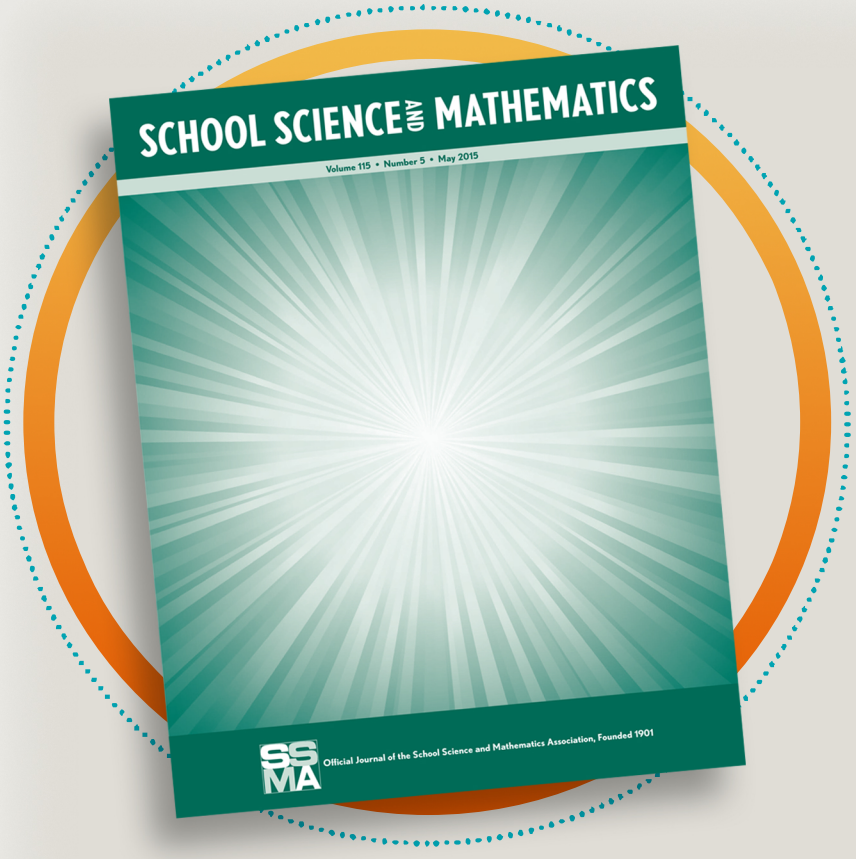

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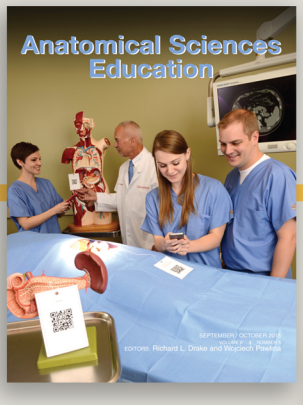

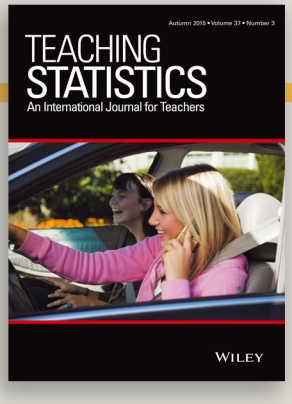

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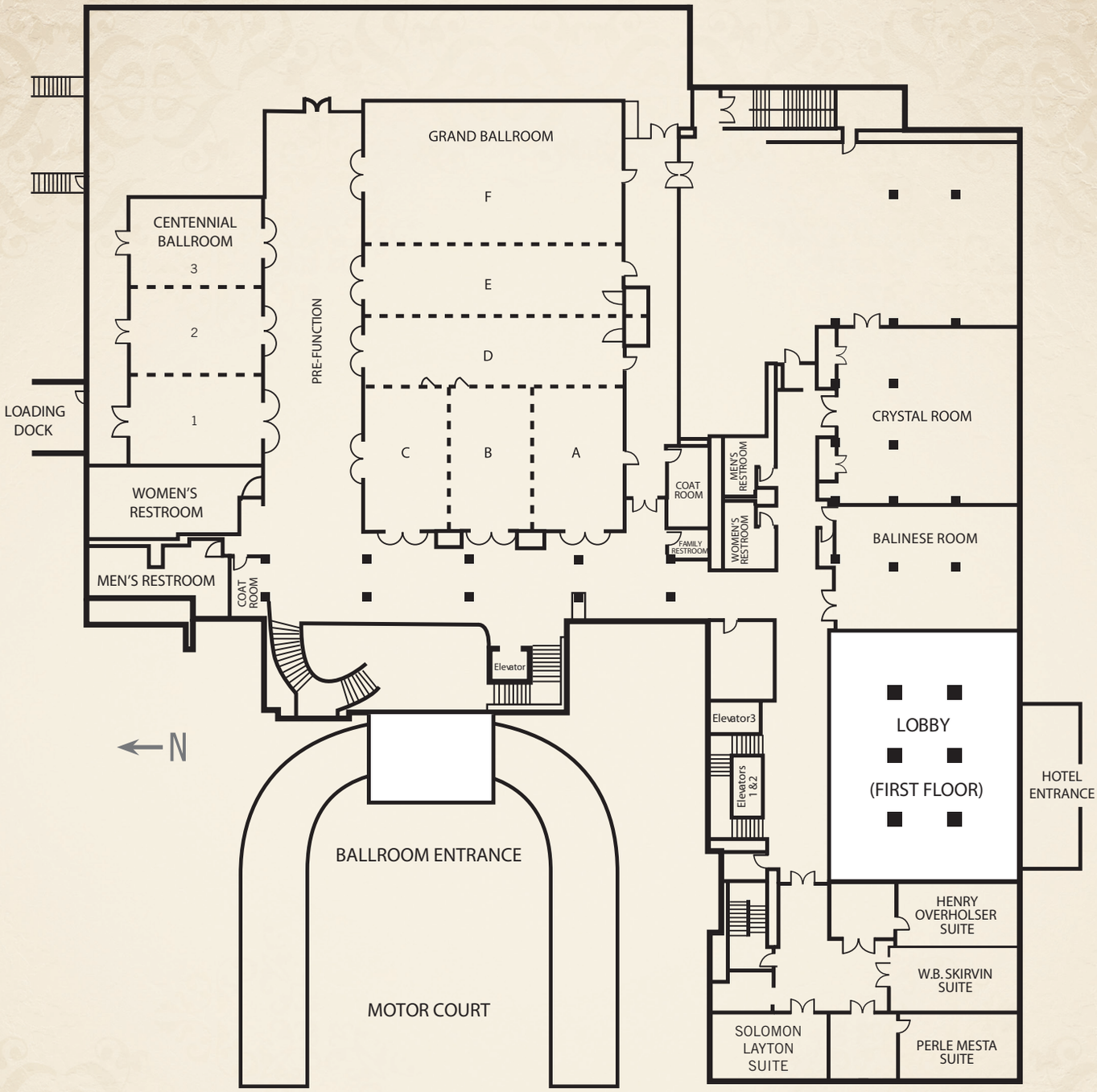

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