

2025 RCML Conference
College Station, TX

Conference at a Glance

Thursday, March 6, 2025

Pre-Conference Meetings

- 11:30 AM–2:30 PM RCML Board of Directors Meeting
South 40
- 2:30 PM–3:30 PM RCML Publications Divisions Meeting
South 40

Conference Begins

- 1:00–5:00 PM Registration Table
Oakwood Ballroom Foyer
- 3:30–5:00 PM Poster Session and Reception (with heavy hors d'oeuvres)
Oakwood Ballroom
- 5:15–6:30 PM **FOUNDERS LECTURE: DR. MARY SWARTHOUT**
INTRODUCED BY: DR. JAMAAL YOUNG
Oakwood Ballroom

Friday, March 7, 2025

- 8:00 AM–5:00 PM Registration Table
Oakwood Ballroom Foyer
- 8:00–8:50 AM Continental Breakfast and Networking
Oakwood Ballroom
- 9:00–11:50 AM Breakout Sessions 1–3
South 40, North 40, Mockingbird ABCD, and Brazos Amphitheater
- 12:00–1:50 PM Lunch and RCML Business Meeting
Oakwood Ballroom
- 2:00–4:50 PM Breakout Sessions 4–6
South 40, North 40, Mockingbird ABCD, and Brazos Amphitheater
- 5:00–5:15 PM Networking Break
Mockingbird Hallway
- 5:15–6:30 PM **WILSON MEMORIAL LECTURE: DR. GUNI SHARON**
INTRODUCED BY: DR. JAMAAL YOUNG
Oakwood Ballroom

Saturday, March 8, 2025

- 8:00 AM–12:00 PM Registration Table
Oakwood Ballroom Foyer
- 8:00–8:50 AM Continental Breakfast & Networking
Oakwood Ballroom
- 9:00–11:50 AM Breakout Sessions 7–9
South 40, North 40, Mockingbird ABCD, and Brazos Amphitheater
- 12:00 PM–1:30 PM Lunch & Closing
CLOSING: DR. JAMAAL YOUNG
Oakwood Ballroom

Event Agenda

52nd Annual Conference of the Research Council on Mathematics Learning (RCML) Spring 2025

Thursday, March 06, 2025

RCML Board of Directors Meeting

11:30 AM – 2:30 PM | Location: South 40

RCML Registration Table

1:00 PM – 5:00 PM

RCML Publications Divisions Meeting

2:30 PM – 3:30 PM | Location: South 40

Student Engagement with the Utilization of Music

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

Objective/Purpose - The objective of this presentation is to explore effective strategies for integrating music into the math classroom to enhance student demeanor and enthusiasm by examining the psychological impact of music on learning, discussing various musical techniques, and sharing practical implementation examples.

Background to Support the Argument/Analysis -The session on utilizing music in a high school mathematics course to cultivate a positive classroom environment and improve student disposition encourages additional research and study by exploring how the emotional and psychological aspects of learning can be enhanced through the integration of music. Specifically, the session prompts further investigation into:

Content of Presentation-This presentation is relevant as it addresses current educational challenges, promotes effective teaching practices, and emphasizes the holistic development of students in the mathematics classroom. Many students tend to have a negative attitude toward math, and this presentation aims to help address that with the utilization of various types of music.

Limited References

Adjapong, E. S., & Edmin, C. (2015). Rethinking pedagogy in urban spaces: Implementing hip-hop pedagogy in the urban science classroom. *Journal of Urban Learning Teaching and Research*, 11, 66–77.

Speaker



Mario Hamilton

A study on procedures without connection and learned helplessness in the math classroom

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

The objective of my research is to discover if there is a correlation between the overuse of procedures without connection and students' learned helplessness in the context of a math classroom. Learned helplessness is a topic that is well known and researched in the world of education and yet it still seems to commonly occur in students in mathematics. My research is searching for a correlation in order to discover a possible source of how students are learning to be "helpless" when engaging in mathematics. Some of the main topics discussed in my research include the differences between procedures with and without connection in a math setting, what is learned helplessness, and is there a correlation between procedures without connection and learned helplessness.

Speaker



Robert Chalfant

Graduate Research Assistant | Bowling Green State University

Technology-Enhanced Data Literacy Lessons and Students' Attitudes Toward Mathematics

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

With the constant growth of STEM-related career opportunities teachers may seek out ways to engage students in STEM during the school day in order to build positive attitudes and perceptions, making the choice to pursue a STEM path more accessible to a broad range of students. Specifically in the context of mathematics and data-literacy, implementing technology-enhanced lessons may create learning experiences that are responsive to life in the 21st century, providing students with the skills that will allow them to make observations in their communities, gather data, and use their findings to enact positive change. Based on the findings of this research,

others may be encouraged to study how technology-enhancement in other areas of mathematics, not just data literacy, affects students' attitudes. Other researchers may find this topic relevant in the world of ever-expanding technological opportunity, especially with regard to the constant creation of new educational technologies designed to enhance learning in content-specific ways—think Desmos, Excel/Google Sheets, and PhET Simulations, rather than game-based platforms like Kahoot. While sharing this poster, I would like to have discussions with mathematics and STEM educators who are interested in or have done research on similar issues. I want my research to be a part of the growing conversation on how to implement technology in meaningful ways in the classroom while growing student interest in mathematics and STEM.

Speaker



Megan Recker

Graduate Student | Bowling Green State University

Co-speaker



Gabriel Matney

Professor of Mathematics Education | Bowling Green State University

Key Strategies for Securing NSF Funding for Meta-analysis or Systematic Review in STEM

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

Key Strategies for Securing NSF Funding for Meta-Analysis or Systematic Review in STEM Education

This presentation will provide practical insights into securing National Science Foundation (NSF) funding for meta-analyses or systematic reviews in STEM education. Meta-analyses and systematic reviews are critical for synthesizing existing research, identifying gaps, and guiding future work. However, obtaining funding for such projects requires a clear and compelling proposal that aligns with NSF priorities.

Key topics will include:

1. Identifying NSF Program Alignment: Guidance on identifying specific NSF programs and initiatives that support systematic reviews and meta-analyses in STEM education.
2. Crafting a Compelling Proposal: Strategies for developing a research question that addresses a pressing need in STEM education, demonstrating broader impacts, and articulating the transformative potential of your findings.
3. Budget and Resource Planning: Tips for planning your project's budget, including funding for data synthesis, research tools, and interdisciplinary collaboration.
4. Strengthening the Research Team: How to assemble a diverse team with a track record of successful research, including expertise in STEM education, methodology, and equity-focused analyses.

Attendees will leave with actionable steps to craft proposals that align with NSF goals and increase the likelihood of securing funding for their systematic reviews or meta-analyses.

Speaker



Jamaal Young

Associate Professor | Texas A&M University

Co-speakers



Rachel Renbager

Research Associate | FHI360



Rachel Wong

Assistant Professor | The University of Tennessee, Knoxville



Ying Wang

Research Associate | FHI360



David Rehfeld

Assistant Professor | Kansas State University



Rachel Rush-Marlowe

Founder & Executive Director | ResearchEd

Improving bilingual math instruction— A study of Chinese students and bilingual teachers' experiences

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

In China's education realm, many Chinese students enroll in international schools to prepare for higher education abroad. Some of these schools often offer a 2+2 or 2+1 program, where students begin their high school education in China for two years and later transfer to partner institutions in English-speaking countries like Canada. This transitional arrangement relieves students' learning difficulties in an all-English educational environment.

Within this context, bilingual mathematics teachers play an important role before they come to an English-speaking country. They are the bridge between the Chinese education system and the Canadian curriculum offered by partner schools like Vernon High School in Canada. Bilingual teaching is expected to enhance students' understanding of the mathematical concepts within a bilingual classroom setting and equip them for the academic rigors of an English-speaking educational environment.

The lack of help from bilingual teachers during their learning in Canada can lead to extended graduation timelines. Thus, Chinese students need a more professional understanding of these phenomena and how bilingual mathematics instruction can be enhanced. It is better to prepare students for the transition to an English-medium curriculum.

Speaker



Leyang Xu

Graduate student | Texas A&M University

Investigating Longitudinal Changes in Fractions Knowledge: A Multilevel Modeling Approach

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

Many students, particularly those with math difficulties (MD), struggle with fractions, a foundational concept for learning algebra (Jordan et al., 2017). Fractions are crucial not only for success in middle and high school mathematics but also for future careers in STEM fields (Booth & Newton, 2012; Booth et al., 2014; Siegler et al., 2012; Chen, 2009). Understanding how well students, especially those with MD, retain their fractions knowledge after interventions is critical to supporting their long-term academic and career trajectories.

This study employs longitudinal models to investigate changes in students' fractions knowledge over time. Data were collected from 245 students across nine school districts in Texas and Missouri as part of a randomized controlled trial. Using multilevel modeling, the repeated measures of fractions knowledge (pre-test, post-test, and a one-year follow-up) are nested within individual students. In this study, measurement occasions represent Level 1, while individual students represent Level 2.

The analysis uses the rank order of time points as an independent variable to capture within-student changes in fractions knowledge. By modeling individual growth trajectories, this study provides insights into how students retain fractions knowledge over time. The findings contribute to the design of more effective mathematics interventions that support knowledge retention, particularly for students with MD.

Speaker



Joanne Joo

Ph.D. Student | Southern Methodist University

Co-speaker



Allison McClure

PhD Student | Southern Methodist University

Preservice Teacher's Perceived Confidence in a Mathematics Lesson Study Lab

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

The Mathematics Lesson Study Lab aims to enhance the field experience of 1st-year preservice teachers by actively involving them in several lesson study cycles. This lab experience replaces lost field experiences while offering preservice teachers an early opportunity to engage with standards, lesson planning, curriculum analysis, and teaching.

Lesson study has been practiced in Japan for nearly 140 years but only gained traction in the United States in 1999. Research has been conducted on preservice teachers showing a significant transformative effect (Author, 2022), but there is a limited exploration of how to develop a college lab dedicated to preservice teachers engaging in the lesson study process.

Teacher confidence is linked to classroom effectiveness, especially in subjects like mathematics, where many preservice teachers often experience anxiety or self-doubt (Gresham, 2021). In lesson study students are critiquing the lesson and not the teacher which can help reduce anxiety or self-doubt when reflecting on the lesson and not the person.

As lesson study gains popularity for bridging the gap between theory and practice, exploring its impact on teacher confidence could encourage educators to adopt similar models. It's essential to discuss how lesson study can be used to boost the confidence of teacher candidates early in their secondary education training.

Speaker



Oliver Soper

Graduate Research Assistant | Bowling Green State University

Co-speaker



Gabriel Matney

Professor of Mathematics Education | Bowling Green State University

The Impact of Mastery Learning on Student Learner Mindset

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

The study shared here was designed to understand the impacts on students' mindsets when they experience mathematics classes where expectations are aligned with mastery learning and traditional learning. Through case comparison, data collection will derive from two schools with differing learning approaches. Each school either has mastery learning or traditional learning. Two classrooms will be highlighted. The teachers and a focus group of students from each school will be interviewed. A survey will be administered to measure learner mindset about who they are as a mathematics student. There is a lack of comparative research involving the impacts of traditional learning and mastery learning on students' mindsets toward learning. This session encourages additional study by inviting

people to investigate the differences between the two. Since this study will only occur at two specific schools in a midwestern state, researchers can take this idea to a different state and study what occurs there. This poster presentation will start with a brief description of teaching for mastery verses teaching traditional learning. I will share the context, participants, data collection, analysis, as well as the findings and implications. My sessions promote discussions by present real-life examples of mastery learning in action. This can lead to questions regarding what worked, what did not work, and how the different outcomes affected learner mindset.

Speaker



Ashleigh Bettum

Research Graduate Assistant | Bowling Green State University

Co-speakers



Gabriel Matney

Professor of Mathematics Education | Bowling Green State University



Stefanie Livers

Assistant Professor | Bowling Green State University

Creating a STEM Education Ecosystem for Underrepresented Communities

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

The NC Piedmont-Triad STEM Education Ecosystem is building a sustainable network of collaborators, including universities, community colleges, school districts, museums, and companies, with the goal of enhancing math and STEM learning opportunities for K-12 students, especially underrepresented groups. Our research seeks to understand and address factors impacting math learning to reduce disparities in STEM education.

Informal learning environments, such as after-school programs and community initiatives, are crucial for engaging students in math. These settings allow students to explore concepts through hands-on, real-world applications, making math more accessible. To harness this potential, we are conducting a needs assessment of informal STEM learning providers in the Piedmont-Triad area, identifying gaps and collaboration opportunities.

We are also creating a repository of K-12 STEM programs to provide a valuable resource for educators and stakeholders, cataloging successful initiatives and addressing programming gaps. Through an analysis of established ecosystems, we aim to understand how community partnerships improve STEM education and create models that other communities can adopt.

By addressing common challenges like limited resources and community engagement, our research will help build strong partnerships, foster high-quality programs, and create a more equitable STEM landscape, inspiring student success in math and STEM careers.

Speaker



Katrina Nelson

Teaching Associate Professor | North Carolina A&T State University

Co-speaker



Tanya Malloy

Teaching Associate Professor | North Carolina A&T State University

Navigating the Path to Mathematics Success: Exploring Academic Performance and School Discipline Among Black Students

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

This study examines how prior achievement in mathematics and reading, along with school discipline, influence 7th-grade math performance. It examines the roles that discipline and reading achievement play in shaping student outcomes. The findings will provide valuable insights for educators and administrators seeking to enhance math learning, particularly for students facing disciplinary challenges or struggling with reading proficiency.

Previous research highlights the importance of prior academic performance and school discipline in predicting mathematics success (Grimm, 2008; Ibrahim & Johnson, 2020). However, there is less clarity on the interplay between prior reading achievement, school discipline, and prior mathematics outcomes. This study contributes to the literature by exploring how these factors interact. It encourages further research into the role interdisciplinary skills and behavioral contexts play in mathematics learning. Understanding these relationships can inform targeted interventions and future research on broader factors impacting student achievement.

Grimm, K. J. (2008). Longitudinal associations between reading and mathematics achievement. *Developmental Neuropsychology*, 33(3), 410–426.

Ibrahim, H., & Johnson Jr, O. (2020). School discipline, race–gender and STEM readiness: A hierarchical analysis of the impact of school discipline on math achievement in high school. *The Urban Review*, 52(1), 75-99.

Speaker



Micayla Gooden

Graduate Student | Texas A&M University

Co-speaker



Virginia Redwine Johnson

Graduate Student | Texas A&M University

From Battlefield to Blackboard: How Military Experience Shapes Mathematical Excellence in Engineering

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

Does military service equip veterans with unique advantages in tackling complex mathematics? At Texas A&M University, we're uncovering surprising connections between combat experience and calculus competence. By comparing veteran and traditional students in foundational engineering courses, our research reveals how military-honed skills translate to mathematical problem-solving. Through rigorous statistical analysis of GPA, persistence, and self-efficacy, we're challenging conventional wisdom about non-traditional students while expanding RCML's understanding of diverse learning pathways. Our findings promise to revolutionize support services for the growing veteran population in higher education, potentially diversifying STEM fields and transforming how universities approach inclusive mathematics instruction. Join us at the intersection of military training and mathematical mastery—where veterans' unique experiences may hold the key to reimagining STEM education for all students.

Speaker



Thomas Hallmark

Graduate Student (PhD) | Texas A&M University

Multimodality in the Math Classroom: An Examination of Elementary Preservice Teachers

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

National mathematics standards place an emphasis on the use of multiple modes, practices, and strategies to provide students equitable opportunities to engage with mathematical concepts and demonstrate their mathematical understanding (Powell et al., 2021). Yet, there is limited literature on the effective use of multiple modes of engagement and learning in mathematics classrooms. Therefore, the foundation of this study was the use of multiple modes to engage learners, stimulate imagination, and foster mathematical communication. This study aimed to understand how elementary preservice teachers perceive and develop multimodal instruction.

Participants were enrolled in a mathematics for elementary teachers content course. The course met weekly for three hours and the instructor focused on mathematical content, pedagogy, curriculum, collaboration, and equitable teaching practices throughout the semester. Assignments and activities throughout the course were designed to expose elementary preservice teachers to multiple modes, strategies, and practices across a variety of elementary mathematics concepts. At the end of the course, participants were tasked with developing and implementing a teaching demonstration. Participants' lesson plans and demonstrations were analyzed for instances of multiple modalities, strategies, and practices throughout instruction. The researchers propose to share the findings and implications through a poster presentation.

Speaker



Erin Rich

Indiana University

Co-speaker



Kaleigh Pate

University of West Alabama

Investigating Spatial Reasoning in Elementary Mathematics Textbooks

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

This research evaluates how elementary mathematics textbooks incorporate spatial reasoning, using the ELPSA framework, which is designed to enhance children's spatial reasoning skills through Experience, Language, Pictorial, Symbol, and Application (Lowrie & Logan, 2015). Spatial reasoning, the ability to manipulate and understand space, plays a key role in mathematics and broader STEM fields (Bruce et al., 2017). However, research shows that elementary curricula often neglect spatial reasoning in favor of arithmetic and numeracy (Mulligan, 2015). This presentation is timely as it addresses the growing need to integrate spatial reasoning into elementary education, aligning with recommendations from NCTM (2010), which suggests that at least half of mathematics instruction should focus on developing spatial reasoning concepts. Our initial analysis of K-2 textbooks through the ELPSA framework reveals how current materials support or hinder spatial reasoning development, offering insights for educators and policymakers to improve the textbook design. The session will also discuss the decline of hands-on tasks in higher elementary grades, limiting students' engagement with spatial reasoning. Attendees will explore how these findings might influence curriculum design and teaching strategies to maintain active, tactile learning experiences essential for spatial development.

Lowrie, T., & Logan, T. (2015). Using the ELPSA framework. *Mathematics Education Research Journal*, 27(2), 217–233.

Speaker



Maryam Zolfaghari

Assistant professor | Kent State University

Co-speakers



Hadi Rahmati

TT Assistant professor of Visual Communication Design at Kent State University



Peter Oyewole

Teaching Assistant | Kent State University



Seyedeckhadijeh Azimi Asmaroud

Assistant professor | Virginia State University

A Usability Analysis and Consequences of Testing Exploration of Mathematics Tests

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

Existing research about test usability is often shared in healthcare but less often in education (see Thielemans et al., 2018). While that work outlines how to study the usability of a healthcare test, there are limited discussions about conducting usability studies within education. The present study provides a model for others to conduct usability studies within education, drawing on a problem-solving test for middle school students.

The Standards (AERA et al., 2014) describe a need for evidence of the consequences of testing. These consequences point to evidence about the assessment, in addition to the interpretation and uses of test scores. This poster describes evidence related to consequences of testing: Both positive and negative consequences are shared.

The *Standards* describe five sources of validity evidence. One source of validity evidence is consequences of testing. The consequences of testing – both positive and negative – must be evaluated strategically and purposefully because such evidence can affect how tests are used and how they are evaluated (Kane, 2016; Lane, 2014; Sireci & Benitez, 2023). Educators and/or test administrators should be provided information about how they can evaluate the consequences of a test that they administer to their students.

How might someone gather usability data related to an assessment? How can teachers engage in usability analyses with their in-class tests?

Speaker



Sophie King

Graduate Student | Bowling Green State University

Co-speakers



Jonathan Bostic

Professor | Bowling Green State University



Toni May

Professor | Binghamton University



Gregory Stone

CEO | Clarity Assessment Systems

Exploring Elementary Pre-Service Teachers' Experiences with Educational Video Games in Mathematics Problem-Solving: Aligning Student Experiences with Existing Frameworks

3:30 PM – 5:00 PM | Location: OakWood Ballroom

POSTER

This qualitative research study explores elementary pre-service teachers' experiences with educational video games (EVGs) in mathematics problem-solving. Through a literature review, this study identifies key features of existing frameworks for teaching mathematics with EVGs. The objective is to compare these features with emergent themes from student reflections, specifically examining how these experiences influence cognitive engagement, motivation, and problem-solving abilities. This analysis assesses the alignment between existing frameworks and students' actual experiences, providing insights into the effectiveness of current frameworks in facilitating mathematics learning with EVGs.

The use of technology in education underscores the need for learning tools that foster critical thinking skills (Prensky, 2004). EVGs present medium for teaching mathematics. Devlin (2011) highlights that video games offer unique opportunities to teach essential mathematical skills. Furthermore, Gee (2003) argues that good games embody learning principles that can be effectively leveraged in educational contexts. Together, these perspectives highlight the need for further research into the integration of EVGs as a tool for mathematics instruction, encouraging an examination of their impact on cognitive development and problem-solving abilities.

Devlin, K. (2011). *Mathematics education for a new era: Video games as a medium for learning*. A K Peters/CRC Press. <https://doi.org/10.1201/b10816>

Speaker



Eric Rivera Rodriguez

PhD Student | Texas A&M University

Founders Lecture "The Reading Connection: Now, Then, and What's Next?"

5:15 PM – 6:30 PM | Location: OakWood Ballroom

The Reading Connection: Now, Then, and What's Next?

This year's conference theme invites us to consider how we can advance mathematics teaching and learning through innovation and integration with other content disciplines. Let's start our RCML conference experience by considering literacy and reading skills and their impact on mathematics teaching and learning. What is the current picture for reading and mathematics connections? Where has this connection been seen in our RCML past? What actions can we take as researchers and as readers in support of the RCML mission going forward?

Speaker



Mary Swarthout

Associate Professor | Sam Houston State University

Friday, March 07, 2025

RCML Breakfast

8:00 AM – 8:50 AM | Location: OakWood Ballroom

RCML Registration Table

8:00 AM – 5:00 PM

Culturally Responsive Pedagogy within Alternative Certification Math Teacher Preparation

9:00 AM – 9:25 AM | Location: North 40

25 MINUTE PRESENTATION

Objective/Purpose:

The New York City Teaching Fellows (NYCTF) prepares teachers through an alternative certification program to teach in New York City public schools. Teaching Fellows have demonstrated positive attitudes toward the learning potential and abilities of students from typically underrepresented groups.

Background to Support the Arguments/Analysis:

The focus of this presentation is on preparing alternative certification mathematics teachers with culturally responsive pedagogy. In this presentation, the use of culturally responsive pedagogy to prepare teachers is examined in the context of preparing teachers to teach in diverse school districts in urban environments.

Content of Presentation:

Culturally responsive pedagogy builds on cultural knowledge, and it falls within the context of Universal Design for Learning (UDL) (National Center on Universal Design for Learning, 2024). This presentation will be interactive and interesting for the audience because we will have open discussions about the implications of this work and how to apply it to math teacher preparation and in our own classrooms.

Issues for Discussion:

An integrated model of culturally responsive pedagogy, in conjunction with instruction on differentiated instruction within a UDL approach, would move forward the cultural responsiveness into teaching mathematics.

References:

National Center on Universal Design for Learning. (2024). *What is UDL?* Retrieved from <http://www.udlcenter.org/aboutudl/whatisudl>

Speaker



Brian R Evans

professor, chair, associate dean | Pace Univ.

Validation of a Shortened Measure of Students' Beliefs About Problem Solving

9:00 AM – 9:25 AM | Location: South 40

25 MINUTE PRESENTATION

Objective

Students' beliefs can influence their success in mathematics (Rhodes et al., 2023). Researchers measuring beliefs need valid scales that are also short to prevent cognitive fatigue associated with testing (Jenkins & Taber, 1977). Thus, this study shortened scales from the Indiana Mathematics Beliefs Scales (IMBS).

Background

The findings of the present study indicate that we can shorten three IMBS scales from 18 items to 12 items. Validation of these shortened scales decreases barriers to use associated with time or testing fatigue and increases their utility.

Content

Given the demands on instructional time in schools, many researchers face barriers associated with administering lengthy measures when conducting empirical research. Thus, these shorter scales will be relevant to many attendees.

Discussion

This session promotes discussion around the measurement and validation of measures of math beliefs. We will also discuss

relationships subsequent research found between these measures and student problem solving.

References

Jenkins, G. D., & Taber, T. D. (1977). A Monte Carlo study of factors affecting three indices of composite scale reliability. *Journal of Applied Psychology*, 62(4), 392–398. <https://doi.org/10.1037/0021-9010.62.4.392>

Rhodes, S., Bryck, R., Gutierrez de Blume, A. (2023). Exploring factors influencing success in mathematical problem solving. Proceedings of the 44th annual conference of PME-NA.

Speaker



Sam Rhodes

Assistant Professor | Georgia Southern

Co-speakers



Antonio Gutierrez de Blume

Professor | Georgia Southern University



Rick Bryck

Senior Director | Landmark College



Patrah Frimpong

Research Assistant | Georgia Southern University

How and Why Undergraduates Read Proofs: An Exploration of Strategies and Purposes

9:00 AM – 9:25 AM | Location: Brazos Amphitheater

25 MINUTE PRESENTATION

de Villiers, M. D. (1990). The role and function of proof in mathematics. *Pythagoras*, 24, 17-24.

Weber, K. (2015). Effective proof reading strategies for comprehending mathematical proofs. *International Journal of Research in Undergraduate Mathematics Education*, 1, 289-314.

In this presentation, we examine the benefits that undergraduate students gain from reading mathematical proofs, alongside the strategies they typically use. Drawing on Weber's (2015) work, we investigate how undergraduates approach proofs and the strategies they believe their instructors expect them to use. We also compare undergraduates' perceptions of these expectations with the preferences of their proof instructors, as well as the implications of incorporating the recommended proof-reading strategies at the college level to better support student learning.

Undergraduate mathematics majors serve as brokers between the research mathematics community, secondary mathematics education, and university mathematics. This role demands a deep understanding of proof, enabling undergraduate mathematics students to bridge the gap between the advanced concepts of university-level mathematics and the practical needs of secondary school instruction.

By examining the gap between how undergraduates perceive their instructors' expectations and what instructors actually prefer, this session opens up a conversation about alignment between teaching methods and students' learning approaches.

Speakers



MaryPatricia Sill

Undergraduate Student | Indiana State University



Winnie Ko

Professor of Mathematics Education | Indiana State University



Eliza Baker

Undergraduate Student | Indiana State University

Teaching Mathematics Using an Online Flipped Model

9:00 AM – 9:25 AM | Location: Mockingbird A

25 MINUTE PRESENTATION

Objective This presentation focuses on research integrating mathematics learning within online educational programs.

Background Studies have shown that instruction delivered using the flipped model results in better learning outcomes and increased learners' engagement when compared with traditional face-to-face lectures (Elmaadaway, 2018). Few studies have addressed using an online flipped model in mathematics classes. We believe our session will pique the interest of faculty currently teaching mathematics online or who are scheduled to teach online in the future.

Content This presentation focuses on lessons learned that can aide faculty who may be new to online teaching. One lessons learned is start slow—flip only a few lessons at the beginning. Learning objectives that are procedural in nature may be a good place to start.

Discussion Instead of simply sharing our findings, we will involve participants by asking them to predict what we found. Before stating each research finding, participants will be asked for their prediction.

References

Elmaadaway, M. A. N. (2018). The effects of a flipped classroom approach on class engagement and skill performance in a Blackboard course. *British Journal of Educational Technology*, 49(3), 479–491.

Lo, C. K. (2023). How can flipped learning continue in a fully online environment? Lessons learned during the

Speaker



Sue Brown

Chair: Curriculum and Instruction | University of Houston-Clear Lake

Co-speaker



Nelson Carter

Senior Lecturer: Department of Mathematics | University of Houston-Clear Lake

Identifying Gaps in Culturally Responsive Practices in an Early Math Learning Experience

9:00 AM – 9:55 AM | Location: Mockingbird B

50 MINUTE PRESENTATION

To respond to the need for stronger preparation for kindergarten, especially for English Learners (EL), this project targets the opportunity for support during the summer months and just before entering kindergarten. We have developed a summer curriculum designed to engage children for 4-weeks, focused only on early number sense. In the midst of this development, the instructional teams begin to recognize the need for more culturally relevant tasks and strategies for working with ELs. We have attempted to include more supportive materials, but have also worked to integrate more effective teaching practices. However, a more strategic approach for including culturally relevant experiences is needed, with an organized analysis to determine effectiveness. As summarized by Aguirre & Zavala (2013), providing a culturally relevant learning experience can “leverage mathematical learning by expanding children’s mathematical thinking, building bridges between previous knowledge and new knowledge, supporting bilingualism and academic language development” (p. 168). Using the Lesson Analysis Tool developed by Aguirre & Zavala (2013), the team analyzed every written whole group lesson and video of the lesson in order to explore the evidence of culturally responsive practices. The presenters will share an overview of the program, this work, and results of the study and will engage the participants through opportunities for discussion about culturally responsive teaching.

Speaker



Sandi Cooper

Professor and Associate Dean | Baylor University

Co-speakers



Tracey Jones

Clinical Assistant Professor | Baylor University



Blaire Thornton

Lecturer | Baylor University



Margeaux Smith

PhD Candidate | Baylor University



Sara Teichmann

Master’s Student | Baylor University



Jordan Nguyen

Master’s Student | Baylor University



Jenna Benedict

Master’s Student | Baylor University



Andrea Martinez

PhD student/field supervisor | Baylor University Curriculum & Instruction PhD Program

Mathematics relationship to science achievement before and during COVID-19 disruptions: An examination of middle school cohorts

9:00 AM – 9:25 AM | Location: Mockingbird C

25 MINUTE PRESENTATION

The COVID-19 pandemic in 2020 disrupted education globally, causing school closures, remote learning challenges, and reduced access to hands-on science instruction (Dorn et al., 2020). These disruptions disproportionately impacted student achievement, particularly in mathematics and science, leading to significant learning losses (Donnelly & Patrinos, 2022; Pietro, 2023). Historically marginalized groups were most affected, emphasizing the need for targeted interventions to address these inequities. This study examines the relationship between science and mathematics achievement over time, focusing on differences before and after the pandemic. Specifically, we (a) analyzed how science achievement growth varies with mathematics achievement, (b) compared schools pre- and post-pandemic, and (c) isolated the effects of mathematics achievement at the student and school levels. Using NWEA MAP Growth tests for mathematics and science, we analyzed data from 9,675 7th-grade students in 57 schools. Pre-pandemic data were collected from Fall 2017 to Spring 2019, and mid-pandemic data from Fall 2021 to Spring 2023. Findings show that higher mathematics achievement correlates with greater science achievement at both the student and school levels. Additionally, shifts in the influence of individual versus institutional factors highlight the need for tailored support, including resources and targeted interventions for lower-achieving schools, to mitigate learning losses and promote equity. Implications for mathematics instruction and its relationship to science achievement and growth will be addressed.

Speakers



Su Jiang

Texas A&M University



Syahrul Amin

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Giselle Deleon

Program Coordinator II | Texas A&M University



Isabella Schemidt

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Karen Rambo-Hernandez

Associate Professor | Texas A&M University



Noah Koehler

Texas A&M University

When Math Apps Miss the Mark: The Impact on a Student's Math Identity and Motivation

9:00 AM – 9:25 AM | Location: Mockingbird D

25 MINUTE PRESENTATION

Over the last few decades, mathematics applications (e.g., IXL, Prodigy, Zearn, etc.), or math apps, have become increasingly prevalent in K-12 schools worldwide and have been acknowledged as an influential part of learning mathematics (Griffith et al., 2020). Since elementary students are a common target group for math apps (Griffith et al., 2020), there is a high need to study this population of students. Existing literature indicates that identity and motivation are important aspects of students' learning experiences as they impact their success and well-being in the classroom (Wigfield & Wagner, 2005). This presentation brings together math identity and motivation data, which includes interviews, surveys, observations, and field notes, as well as mathematics app usage and achievement data to actively engage with the case of Sarah, a third grader who is vocal about the positive and negative relationships between her math identity and motivation. The session will explore the following questions: *What is the relationship between math apps and one student's mathematical identities and motivation? How much learning takes place on math apps?*

References:

- Griffith, S. F., Hagan, M. B., Heymann, P., Heflin, B. H., & Bagner, D. M. (2020). Apps as learning tools: a systematic review. *Pediatrics, 145*(1).
- Wigfield, A., & Wagner, A. L. (2005). Competence, motivation, and identity development during adolescence. *Handbook of competence and motivation, 222–239*.

Speaker



Micah Swartz

Mathematics Education PhD Candidate | Texas State University

Elevating Student and Teacher Voices Through Co-design

9:30 AM – 9:55 AM | Location: South 40

25 MINUTE PRESENTATION

Objective

This presentation overviews efforts over four years to elevate the voices of students and teachers by positioning students and teachers as co-creators. The framework provides meaningful examples of how to impact math learning in equitable ways through co-design.

Background

"Why am I always being researched?" asks Jonte (Chicago Beyond, 2019, p. 10). This quote highlights unintended consequences of research that draws sharp distinctions between the power and roles of researchers and participants. Conversely, Hart (1992) aspires to share decision making with children. Building from this, we seek to create spaces for shared decision-making.

Content

The co-design framework is a step forward in addressing the concerns of Jonte noted above through authentic inclusion of all key stakeholders. Attendees will leave with tangible ideas and frameworks to apply to their future research.

Discussion

Participants will discuss how inequities can arise from research "on" students and teachers and how research "with" students and teachers might help change the narrative and arrive at more holistic understandings of research findings through co-design and co-creation.

References

- Chicago Beyond. (2018). Why am I always being researched?: A guidebook for community organizations, researchers, and funders to help us get from insufficient understanding to more authentic truth, (1).
- Hart, R. A. (1992). Children's Participation: From Tokenism to Citizenship. *Papers Inness, 92*(6).

Speaker



Aris Winger

Associate Professor | Georgia Gwinnett College

Co-speakers



Sam Rhodes

Assistant Professor | Georgia Southern



Joann Wang

Project Manager | Imagine Learning



Sheela Sethuraman

Director | Imagine Learning



Rick Bryck

Senior Director | Landmark College



Patrah Frimpong

Research Assistant | Georgia Southern University

History of Mathematics in the Classroom: A Focus on Cultures

9:30 AM – 9:55 AM | Location: North 40

50 MINUTE PRESENTATION

Objective/Purpose:

This presentation gives a brief overview of the history of mathematics through the contributions from various cultures over the centuries. It provides ideas for using mathematics history to motivate students (Evans, 2014). A focus will be on how using cultural contributions in the development of mathematics will demonstrate to students how mathematics is an inclusive subject area that helps improve their perceptions of themselves as math learners with a sense of self-efficacy.

Background to Support the Arguments/Analysis:

The background on this presentation is to change the lens of how we view mathematics history both from the various cultural contributions throughout the world and how to use this knowledge to motivate students, particularly students from diverse cultural backgrounds.

Content of Presentation:

This presentation will be interesting for the participants because the focus will be on interesting aspects of mathematics history including legends and stories of mathematics. A brief history of mathematics will be presented with interesting examples and stories integrated throughout.

Issues for Discussion:

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.

References:

Evans, B. R. (2014). *The development of mathematics throughout the centuries: A brief history of mathematics in a cultural context*. Wiley.

Speaker



Brian Evans

professor, chair and associate dean | Pace University

Children's Multiplicative Reasoning when Engaging with Partial Products

9:30 AM – 9:55 AM | Location: Brazos Amphitheater

25 MINUTE PRESENTATION

The purpose of this exploratory study is to examine how children of varying levels of multiplicative reasoning solve multiplication problems involving two and four partial products. There is little prior research, but scholars have found students may initially rely on repeated addition or some form of doubling before able to describe partial products (Larsson et al., 2017). However, students' reasoning about partial products remains significantly underexplored, and an understanding of how their multiplicative reasoning associates with such understanding is also less known. This proposal presents findings from eye-tracking interviews with 16 fifth-grade students at varying levels of multiplicative reasoning. Interviews incorporated both standard video and eye-tracking video to gain deeper insight into students' conceptual and verbal reasoning about partial products. During the presentation, we will share scanned written work and video excerpts from interviews to discuss observed differences in how children solved multi-digit multiplication and their ability to articulate their reasoning of partial products.

Speaker



Sanampreet Gill

Graduate Research Assistant | Kent State University

Co-speakers



Karl Kosko

Professor | Kent State University



Temitope Egbedeyi

Research Assistant | Kent State University

Algebra & Sociology: A comparison of physiological response in undergraduate general education courses

9:30 AM – 9:55 AM | Location: Mockingbird A

25 MINUTE PRESENTATION

We compare two studies that use fitness trackers to explore academic distress: mathematics with roots of polynomials (Lanius et al., 2024) and sociology with fallacies of racism (Sims et al., 2024). Stress can be beneficial to learning. However, too much (i.e. distress) can be harmful. Math anxiety is common in mathematics classrooms and is inversely correlated with academic achievement. In sociology classrooms, it is common for people to experience discomfort discussing race. Using our results concerning math anxiety and discomfort talking about race, we compare how distress manifests, how it is addressed by instructors, and how it informs student-centered interventions for undergraduate mathematics educators utilizing real-world data to analyze pressing issues facing society.

References

Lanius, M., Zheng, J., & Abebe, A. 2024. "Exploring Undergraduate Students' Psychological Stress in the Mathematics Classroom with Fitness Trackers." *Investigations in Mathematics Learning*, 16(1):18-35.

Sims, J., Lanius, M., Connors, R., & Lanius, C. 2024. "The Physiology of Sociology: Students' biometric response to lessons on race and racism". Preprint.

Speaker



Melinda Lanius

Assistant Professor | Auburn University

Co-speaker



Jennifer Patrice Sims

Associate Professor of Sociology | University of Alabama in Huntsville

How much academic variability exists in 4th grade mathematics classrooms?

9:30 AM – 9:55 AM | Location: Mockingbird C

25 MINUTE PRESENTATION

The U.S. educational system is anchored by grade-level learning objectives and age-based grouping, but the degree of variability in student academic needs within typical classrooms has not been reliably quantified by any large scale, empirical study. Thus, this study describes the variability in mathematics in fourth grade classrooms and estimates the number of instructional grade levels present in those classrooms. The data are from computer-adaptive measures of student fourth-grade mathematics and reading achievement from two large school districts in the U.S. from 2014-2015 to 2018-2019. Students (n= 92,754) were from 4,051 classrooms. The plan of analysis was preregistered. Results indicated, at the beginning of fourth grade, approximately 44% of students were below grade level, 35% were on grade level, and 21% were above grade level in mathematics. Further, lower achieving classrooms had more variability in achievement than higher achieving classrooms. The results indicate a wide range of academic needs present in mathematics classroom. Potential ways to address the needs of all students will be highlighted in this session.

Speakers



Karen Rambo-Hernandez

Associate Professor | Texas A&M University



Blaine Pedersen

NWEA/HMHCO



Scott Peters

NWEA/HMHCO



Matthew Makel

Professor | University of Calgary



Jonathan Plucker

Julian C. Stanley Endowed Professor of Talent Development | Johns Hopkins University

Teacher Self-efficacy in AP Precalculus

9:30 AM – 9:55 AM | Location: Mockingbird D

25 MINUTE PRESENTATION

The research question is "Do teachers' self-efficacy in content knowledge and pedagogical content knowledge for teaching precalculus

differ before and after an AP Precalculus training?" The presentation will include results from a pre- and post-survey taken of current precalculus teachers before and after a training at an AP Summer Institute for AP Precalculus. Forthcoming results for the presentation will be based on quantitative analysis.

Speaker



Jill Taylor

Assistant Professor of Math | Tulsa Community College

Co-speaker



Karen Zwanch

Associate Professor of Mathematics Education | Oklahoma State University

Andragogy and Mathematics Teacher Education: A Union

10:00 AM – 10:25 AM | Location: South 40

25 MINUTE PRESENTATION

Andragogy (Henschke, 2021; Knowles et al., 2020) focuses on adult learning differently from pedagogy (Knowles, 1970). In the US research on andragogy began with Lindeman (1926) and became a distinct academic field to separate from teaching children. While learning for children and adults may share epistemological underpinnings, their applied areas remain distinctive. I argue that while mathematics teacher educators may unknowingly apply principles of andragogy, being more explicit in how they relate to one another creates the potential to increase effectiveness during instructional activities within mathematics teacher education.

Pre-service and in-service teachers are adult learners; thus, mathematics teacher educators can apply principles of andragogy when instructing them. I raise the question of why we do not discuss andragogy in mathematics teacher education to bring awareness to the field of mathematics teacher education.

Henschke, J. A. (2021). *Facilitating adult and organizational learning through andragogy: A history, philosophy, and major themes*. IGI Global.

Knowles, M. S. (1970). *The modern practice of adult education: Andragogy versus pedagogy*. Cambridge Books.

Knowles, M. S., Holton, E. F., Swanson, R. A., & Robinson, P. A. (2020). *The adult learner: The definitive classic in adult education and human resource development* (9th ed.). Taylor & Francis.

Lindeman, E. C. (1926). *The meaning of adult education in the United States*. New Republic, Inc.

Speaker



Sarah Pratt

Lecturer | Baylor University

Upholding Academic Integrity in Using ChatGPT: Eliciting Ethical Thinking and Critical Thinking

10:00 AM – 10:25 AM | Location: North 40

25 MINUTE PRESENTATION

50 MINUTE PRESENTATION

Objective

As institutions develop policies on academic integrity with AI expectations, it might be helpful to understand how students perceive responsible ways of using AI to uphold academic integrity. I will discuss students' ethical thinking when given hypothetical situations of ethical and unethical use of ChatGPT in solving problems and how critical thinking emerges when students suggest ways to turn unethical practices of using ChatGPT into ethical ones.

Background

The NCTM (2023) argues that we need to recognize that AI can be helpful in mathematics learning, not limited to generating correct answers but more broadly by posing questions that provide opportunities for conceptual understanding and developing mathematical reasoning skills.

Content

This talk is timely in examining the role of AI in mathematics learning. It highlights the potential of ChatGPT in fostering ethical and critical thinking, underscoring students' concerns about academic integrity.

Issues for Discussion

Discussions around this topic may offer valuable insights into reframing the design and implementation of mathematics instructions involving AI and the design of proper support for teachers in integrating AI into their teaching.

References

National Council of Teachers of Mathematics (2023). Artificial Intelligence and Mathematics Teaching. NCTM Position. <https://www.nctm.org/standards-and-positions/Position-Statements/Artificial-Intelligence-and-Mathematics-Teaching/>

Speaker



Erell Germia

Assistant Professor | Kean University

Using Video Club to Engage PSTs Noticing during Instruction

10:00 AM – 10:55 AM | Location: Brazos Amphitheater

50 MINUTE PRESENTATION

To develop noticing, PSTs participate in video clubs as part of a mathematics methods course. Teacher noticing can be considered a viable approach to the process of assessing student thinking (Jacobs et al., 2010). The use of videos in teacher preparation can help PSTs effectively attend to students' mathematical thinking through self-reflection, viewing particular classroom moments, and dialoguing with others viewing the same experience (van Es et al., 2017). In this session, the presenters will share the progression of the implementation of video clubs into a mathematics methods course, describe the current structure of video clubs, and engage the audience in a sample video club. The presenters will share the results from the data on the PSTs' experiences, leading discussions of elementary PSTs' ability to notice through engaging in video clubs. The audience will be able to view footage from a video club and discuss how they might implement video clubs.

Jacobs, V. R., Lamb, L. L. C., & Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, 41(2), 169–202.

<http://dx.doi.org/10.5951/jresmetheduc.41.2.0169>

Van Es, E. A., Cashen, M., Barnhart, T., & Auger, A. (2017). Learning to Notice Mathematics Instruction: Using Video to Develop Preservice Teachers' Vision of Ambitious Pedagogy. *Cognition and Instruction*, 35(3), 165–187.

<https://doi.org/10.1080/07370008.2017.1317125>

Speaker



Blaire Thornton

Lecturer | Baylor University

Co-speakers



Sandi Cooper

Professor and Associate Dean | Baylor University



Margeaux Smith

PhD Candidate | Baylor University



Andrea Martinez

PhD student/field supervisor | Baylor University Curriculum & Instruction PhD Program



Shelby Taylor

Baylor University

OU's Transformational Tutoring Initiative: Investigating a Representational Approach to Teaching Linear Equations Through Visual Patterns.

10:00 AM – 10:25 AM | Location: Mockingbird A

In this session, participants will learn how to use visual models as a way to model linear equations. This lesson was developed to support learning in our Transformative Tutoring Model. We have seen college students improve their own understanding of linear models through this exercise and noticed 9th graders making stronger connections to rates of change and y-intercepts. Our team will provide participants with tools they can take back to the classroom and share with others.

Speakers



Cristina Moershel

Director of Tutoring | The University of Oklahoma



Kayla Pierson

Program Manager | The University of Oklahoma



Lisa Cortez

Program Manager | University of Oklahoma

Developing Critical Consciousness in Preservice Teachers: A Framework for Integrating Social Justice in Mathematics Education

10:00 AM – 10:25 AM | Location: Mockingbird B

25 MINUTE PRESENTATION

This research aims to develop and introduce a framework that engages preservice teachers (PSTs) in examining sociopolitical issues through mathematics, with the goal of fostering critical consciousness and promoting equitable teaching. There is a pressing need for teacher education programs to integrate social justice into mathematics education. Traditional curricula often focus solely on content knowledge, missing opportunities to explore how mathematics can reveal systemic injustices. Our framework addresses this gap by helping PSTs understand mathematics as a tool for critical thinking and social change. Through data-driven exploration of issues, PSTs gain insights into how mathematics can illuminate and challenge social inequities. This presentation covers the development of our framework, its implementation in K-12 PSTs' mathematics methods courses, and initial results. Early findings show that PSTs who engage with this approach report increased awareness of systemic inequalities and feel more prepared to integrate similar activities into their future teaching. Key issues include the role of teacher preparation programs in supporting social justice-focused mathematics education, challenges in integrating these topics into the curriculum, and ways to cultivate data literacy that encourages critical analysis.

Speaker



Jiyeong Yi
Associate Professor | Iowa State University

Co-speaker



Hyunyi Jung
Associate Professor | Texas A&M University

Towards a Place-Based Mathematics Learning and Curriculum

10:00 AM – 10:25 AM | Location: Mockingbird C

25 MINUTE PRESENTATION

The applications of mathematics are argued to be more abstract than concrete. One key reason is that mathematics curricula and textbooks fail to include local content that can assist students in linking mathematics to everyday experiences within the immediate environment. This failure has become a major concern among scholars; diverse scholars have advocated for place-based mathematics education (e.g., Showalter, 2013).

Place-based mathematics integrates local contexts and community experience into the teaching of mathematics, which enhances and improves students' math achievement and the development of cultural competence. Hence, this study proposed a comparative study to investigate the presence of place-based mathematics in two different places - one from the Global South (Nigeria) and one from the Global North (United States) - in their respective mathematics textbooks. Four mathematics textbooks in total will be selected and analyzed using the Place-Based Model to present the study findings. During the presentation, we will share findings on the similarities and differences in how these textbooks incorporated local context and community experience to present mathematics lessons

Speaker



Temitope Egbedeyi
Research Assistant | Kent State University

Co-speaker



Peter Oyewole
Teaching Assistant | Kent State University

Co-creating bilingual STEM media to supplement children’s books at a school library

10:00 AM – 10:25 AM | Location: Mockingbird D

25 MINUTE PRESENTATION

Children’s media is a powerful space for mathematics learning inside and outside of the mathematics classroom (Russo et al., 2021). It can provide caregivers, teachers, and learners a “window on the world” (Graves, 1999, p. 707). Digital stories can also be motivational to students’ learning of mathematics (Russo et al., 2021). The authors and a school librarian partnered together to produce a series of STEM related children’s programming. The 3 to 4-minute videos are meant to be supplementary resources to particular children’s books the librarian would be promoting as winners of state and district book awards. In this session, we will show the development processes for one of our videos, Wondering with Roro. We will discuss clips and the decision making processes involved, including the representation of mathematical ideas. Our goal is to have a conversation about media in mathematics education and how to promote more mathematical conversations in and out of school.

Graves, S. B. (1999). Television and prejudice reduction: When does television as a vicarious experience make a difference? *Journal of Social Issues*, 55(4), 707–725.

Russo, J., Russo, T., & Roche, A. (2021). Using rich narratives to engage students in worthwhile mathematics: Children’s literature, movies, and short films. *Educational Science*, 11, 1–19.

Speaker



Carlos Nicolas Gómez Marchant
Associate Professor of STEM Education | The University of Texas at Austin

Co-speakers



Ana Benitez
The University of Texas at Austin



Jessica Cortez
Graduate Student | The University of Texas at Austin



Max Love
Graduate Student | The University of Texas at Austin



Alexandra Aguilar
The University of Texas at Austin



Amy Rae Johnson
PhD Student | The University of Texas at Austin

Preservice Teachers' Personified Relationships with Math via Power Dynamics

10:30 AM – 10:55 AM | Location: South 40

25 MINUTE PRESENTATION

This study employs a hybrid thematic analysis methodology (Fereday, 2006) to investigate the personification narratives of 18 preservice teachers, examining how power dynamics and sociocultural influences shape their relationships with mathematics (Nasir, 2002). Analysis of these narratives contributes to developing more empathetic, student-centered approaches to math instruction, particularly in teacher education programs.

The findings suggest the need for further research into how teachers' perceptions of mathematics evolve and affect their teaching practices, especially in diverse classrooms. This research encourages integrating reflective practices into teacher preparation programs to address underlying perceptions and foster more equitable learning environments.

The presentation analyzes preservice teachers' personified narratives—such as math as a friend, foe, or authority—revealing power dynamics and sociocultural factors shaping their math relationships. This research provides practical strategies for promoting inclusive and empowering instruction through narrative reflection.

The session will encourage discussion on how these reflective practices can help reshape teachers' math perceptions and support diverse learners, offering insights for integrating these strategies into teacher education programs.

Zazkis, D. (2015). Monsters, lovers and former friends: Exploring relationships with mathematics via personification. *For the Learning of Mathematics*, 35(1), 33-38.

Speaker



Tracey Howell

Assistant Professor, Mathematics | Appalachian State University

Co-speaker



Daniela Tirnovan

Lecturer | CUNY Brooklyn College

The Precalculus Self-Efficacy Survey (PCSES): Development and Validation

10:30 AM – 10:55 AM | Location: North 40

25 MINUTE PRESENTATION

Objective Self-efficacy consistently has a positive influence on achievement in mathematics classes (Peters, 2013); however, the common instrument used to measure mathematics self-efficacy is more than 30 years old. This research established a new valid and reliable instrument.

Background This session encourages additional research by providing a valid and reliable instrument to measure precalculus self-efficacy. The PCSES could be used as a tool for future research studies.

Content With the recent establishment of the College Board's Precalculus AP exam, precalculus is a timely area of research in mathematics education.

Discussion The session will promote some discussion by showing some questions from the Mathematics Self-Efficacy Scale (MSES) (Betz & Hackett, 1983); therefore, attendees will understand that the MSES is dated and understand the need for a new instrument.

References

Betz, N. E., & Hackett, G. (1983). The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *Journal of Vocational Behavior*, 23(3), 329–345. [https://doi.org/10.1016/0001-8791\(83\)90046-5](https://doi.org/10.1016/0001-8791(83)90046-5)

Peters, M. (2013). Examining the relationships among classroom climate, self-efficacy, and achievement in undergraduate mathematics: A multi-level analysis. *International Journal of Science and Mathematics Education*, 11(2), 459–480. <https://doi.org/10.1007/s10763-012-9347-y>

Speaker



Nelson Carter

Senior Lecturer: Department of Mathematics | University of Houston-Clear Lake

Co-speaker



Sue Brown

Chair: Curriculum and Instruction | University of Houston-Clear Lake

New Conditions for Agency: Disability Rights, Statistics, and an Advocacy Trip to Washington DC

10:30 AM – 10:55 AM | Location: Mockingbird B

25 MINUTE PRESENTATION

Powerful mathematics learning provides students with opportunities for agency through inquiry-based tasks and collaboration (National Council of Teachers of Mathematics, 2014). Social justice mathematics suggests cultivating youth agency is a priority in relation to mathematics and in relation to youth as actors in a sociopolitical world (Gustein, 2007). This presentation explores the opportunities and nature of agency, broadly conceived, in a week-long trip to Washington DC— the culmination of a collaborative project between an ASL class and a statistics class that explored disability rights in relation to wages and employment. This project shifted the normative

conditions in which teachers and researchers engage with students, providing new conditions for agency. We consider what agency looked and felt like as evidenced in student interaction using Martin's (2016) "grammar of agency." This session will explore different approaches to understanding agency with audio of youth interactions.

National Council of Teachers of Mathematics. (2014). Principles to actions: Ensuring mathematical success for all. National Council of Teachers of Mathematics.

Gutstein, E. (2007). "And that's just how it starts": Teaching mathematics and developing student agency. Teachers College Record, 109(2), 420-448.

Martin, J. (2016). The grammar of agency: Studying possibilities for student agency in science classroom discourse. Learning, Culture and Social Interaction, 10, 40-49.

Speaker



Max Love

Graduate Student | The University of Texas at Austin

Co-speaker



Emma Gargroetzi

University Of Texas At Austin

Growing Our Math Mindsets: Understanding Incoming Preservice Teachers' Mindsets

10:30 AM – 10:55 AM | Location: Mockingbird C

25 MINUTE PRESENTATION

Objective/Purpose: This study examined growth mindsets about math among preservice teachers.

Background: Growth mindsets are beliefs that ability can be improved through effort (Dweck & Master, 2009). Mindsets benefit teachers as well as students in the classroom. However, research has not examined teachers' mindsets about math and teaching math specifically. Teachers who have fixed mindsets about their students' math ability and their own teaching may undermine student success (Muenks et al., 2020).

Content: We will present findings about how $N = 1,013$ preservice teachers' growth mindsets (measured in multiple ways, including intelligence, their own math ability, students' math ability, and teaching) impact their reactions to students' struggles in math.

Issues: Session will promote discussion about the importance of growth mindsets for preservice teachers and their future students.

References

Dweck, C. S., & Master, A. (2009). Self-theories and motivation: Students' beliefs about intelligence. In K. R. Wentzel & A. Wigfield (Eds.), Handbook of motivation at school (pp. 137-154). Routledge.

Muenks, K., Canning, E. A., LaCosse, J., Green, D. J., Zirkel, S., Garcia, J. A., & Murphy, M. C. (2020). Does my professor think my ability can change? Students' perceptions of their STEM professors' mindset beliefs predict their psychological vulnerability, engagement, and performance in class. Journal of Experimental Psychology: General, 149(11), 2119–2144.

Speaker



Carrie Cutler

Clinical Associate Professor | University of Houston

Co-speakers



Justin Burris

Clinical Associate Professor | University of Houston



Kahyun Lee

Doctoral Student | University of Houston



Allison Master

Assistant Professor | University of Houston

Consciousness as examined in research on mathematics, science, and education.

10:30 AM – 10:55 AM | Location: Mockingbird D

25 MINUTE PRESENTATION

My presentation expands on my own understandings of consciousness as discussed via Friere (1973) and those focused on cognition, such as radical constructivism or extended consciousness (Frinston, 2013; Hohwy, 2013). I will attempt to leave notions in which consciousness is considered localized to an individual's brain, and provide notions of consciousness to outline ways in which our current frameworks of cognition are necessarily incomplete. I will provide scientific research extending from the work of the Princeton Engineering Anomalies Research laboratory (Jahn & Dunne, 2011) among other scientific and mathematical publications pointing us directly toward the reality of non-local consciousness. Although the implications of these scientific findings are ontologically and epistemologically extensive for the field of educational and cognitive research, I will attempt to provide some guiding next steps for myself and others.

Speaker



Travis Olson

Professor | University of Nevada, Las Vegas

Facilitation Moves for Supporting a Teacher's Understanding of Collective Argumentation

11:00 AM – 11:25 AM | Location: South 40

25 MINUTE PRESENTATION

Objective/Purpose: Our research explores what facilitation moves were used to help a secondary mathematics teacher's understanding of and support for argumentation over the first three years of her teaching while she participated in individualized, job-embedded professional development (PD).

Background to Support the Argument/Analysis: Teachers have a pivotal role in orchestrating mathematical argumentation (Krummheuer, 2007; Yackel, 2002). However, little is known about how novice teachers learn to support argumentation. Through an in-depth analysis of how a teacher educator scaffolds a novice teacher in analyzing her support for argumentation, we contribute to research on the facilitation of PD for learning to support argumentation.

Content of Presentation: This presentation will focus on the facilitation moves used to support a novice teacher's trajectory in fostering argumentation. We will consider how the teacher responded to those facilitation moves as they relate to her trajectory in learning to support argumentation.

Issue for Discussion: What lessons can we learn from this PD regarding how to support teachers with argumentation?

Krummheuer, G. (2007). Argumentation and participation in the primary mathematics classroom: Two episodes and related theoretical abductions. *Journal of Mathematical Behavior*, 26(1), 60–82.

Yackel, E. (2002). What we can learn from analyzing the teacher's role in collective argumentation. *Journal of Mathematical Behavior*, 21(4), 423–440.

Speaker



Yuling Zhuang

Assistant Professor | Texas A&M University

Co-speakers



AnnaMarie Conner

Professor | University of Georgia



Jonathan Foster

Assistant Professor | University at Albany



Hyejin Park

Assistant Professor | Drake University



Laura Singletary

Professor | Lee University

The Impact of an Integrated steM Camp on Middle School Students' Mathematics Identity

11:00 AM – 11:25 AM | Location: North 40

25 MINUTE PRESENTATION

Several scholars have called for an integrated approach to STEM education and for that integrated approach to emphasize the M in STEM (e.g. Stohlman, 2018) and for mathematics education professionals to get more involved with informal STEM learning (Blanchard et al., 2020). However, there is limited research that explores the impacts of an integrated approach to steM education within STEM camps on middle school students' STEM related outcomes. The purpose of the current study is to investigate the impact of an integrated steM camp on 5th-8th grade students' STEM related outcomes including mathematics identity, STEM identity, STEM interest, and STEM career interest. This is timely and relevant to the focus of the conference because the major focus of the camp was on integrating learning across the disciplines including environmental issues, mathematics, coding, and engineering. Our session will include a discussion around how mathematics education professionals can get more involved in informal STEM learning and we will provide future directions for research.

Limited References

Blanchard, M., Gutierrez, K., Habig, B., Gupta, P., & Adams, J. (2020). Informal STEM program learning. In *Handbook of research on STEM education* (pp. 138-151). Routledge.

Stohlmann, M. (2018). A vision for future work to focus on the "M" in integrated STEM. *School Science and Mathematics*, 118(7), 310-319.

Speaker



Queshonda Kudaisi

Assistant Professor of Mathematics Education | University of North Texas

Co-speakers



Michael Leonas

Graduate Student | University of North Texas



Jennifer Hylemon

Graduate Student | University of North Texas

Foundations of Proof: Insights from Instructors

11:00 AM – 11:25 AM | Location: Brazos Amphitheater

25 MINUTE PRESENTATION

In recent years, there has been a growing recognition of the need to improve proof instruction in undergraduate mathematics education. Proof is an essential skill in mathematics that involves not only establishing the truth of an argument, but also explaining reasoning, organizing mathematical knowledge, discovering new results, and conveying complicated ideas. Many students struggle to understand the many roles of proof - finding it difficult to engage with the conceptual elements of proof. As a result, proof education is important in developing students' understanding in this area.

This session encourages additional research in several key areas for better proof instruction. One area is different instructional approaches. The session invites participants to play around with alternative methods of teaching and judging proof. It raises questions as to whether functions such as explanation and discovery, in addition to verification and communication, receive enough focus in the classroom.

de Villiers, M. D. (1990). The role and function of proof in mathematics. *Pythagoras*, 24, 17-24.

Stylianides, A. J. (2007). Proof and proving in school mathematics. *Journal for Research in Mathematics Education*, 38(3), 289-321.

Speaker



Eliza Baker

Undergraduate Student | Indiana State University

Co-speakers



Winnie Ko

Professor of Mathematics Education | Indiana State University



MaryPatricia Sill

Undergraduate Student | Indiana State University

Evaluating the Cognitive Demand and Content of Mathematics Apps for Elementary Students

11:00 AM – 11:55 AM | Location: Mockingbird A

50 MINUTE PRESENTATION

Objective/Purpose

This study analyzes early number apps, focusing on cognitive demand and math content for elementary students. Building on research by Redmond-Sanogo et al. (2015), we refined a rubric to evaluate cognitive demand and content and included cultural relevance adapted from Culturally Responsive Mathematics Teaching (Aguirre et al., 2013).

Background

Empirical evidence indicates interaction with digital devices influences cognitive processes. Specifically, the manipulation afforded by touchscreens elicits higher-level cognitive strategies. The use of math apps and its relationship to pedagogical potential in facilitating engagement and cognitive advancement in mathematics education needs further investigation.

Content of Presentation

Presenters will provide an overview of the study evaluating mathematics apps based on cognitive demand, content, and cultural relevance.

Issues for Discussion

What should effective cognitive demand look like in a math classroom? What criteria are essential for evaluating mathematics apps?

Limited References

Aguirre, J. M., & Zavala, M. del Rosario. (2013). Making culturally responsive mathematics teaching explicit: A lesson analysis tool. *Pedagogies: An International Journal*, 8, 163–190.

Vasinda, S., Kander, F., & Redmond-Sanogo, A. (2015). University Reading and Mathematics Clinics in the Digital Age.

Speaker



Andrea Martinez

PhD student/field supervisor | Baylor University Curriculum & Instruction PhD Program

Co-speakers



Adrienne Redmond-Sanogo

Associate Dean For Academic Affairs and Associate Professor of Mathematics Education | Oklahoma State University



Sandi Cooper

Associate Dean of Undergraduate Education | Baylor University



Michelle Donner

Graduate Student | Baylor University

Mission to Mars: Curriculum Equity Analysis

11:00 AM – 11:25 AM | Location: Mockingbird B

25 MINUTE PRESENTATION

STEM education is positioned to prepare students to be problem solvers and critical thinkers (Mohr-Schroeder et al., 2020). How the content in STEM curriculum is connected and presented is important (Gao et al., 2020). The learning process and supporting practices should be evident from congruent objectives and assessments showcasing the complexity of integrated STEM (Gao et al., 2020, p.12). The purpose of our study was to examine NASA's Mars curriculum with the Equity-Oriented STEM Literacy Framework (Jackson, et al., 2021) to assess how it addresses the ability to produce societal change agents.

As we work to ensure high-quality STEM opportunities for all students, curriculum analysis is necessary. It is important to ensure that criteria to support empowerment, empathy, dispositions, identity development, utility and applicability, and critical thinking and problem solving are present in order to disrupt systems of oppression and privilege (Jackson, et al., 2021), so that students will be prepared and confident to be future change agents. We will: (1) Discuss the need for equity oriented curriculum in STEM (3 minutes); (2) Describe our analysis and results (10 minutes); (3) Engage discussion:(a) What other equity frameworks are beneficial in STEM curriculum analysis? (b) How do our findings compare to participants' experiences with other STEM curriculum/ instructional resources? (10 minutes); (4) Final remarks, reflections, and questions (2 minutes).

Speaker



Stefanie Livers

Assistant Professor | Bowling Green State University

Co-speakers



Chloe Bolyard

Associate Professor | Missouri State University



Erin Rich

Indiana University



Jennice McCafferty Wright

Associate Professor | Missouri State University

Facilitators and Barriers to Mathematics Writing: Learning from and with Elementary Teachers

11:00 AM – 11:25 PM | Location: Mockingbird C

25 MINUTE PRESENTATION

Mathematical writing (MW) plays a critical role in mathematics learning because it promotes reflection and clarification of ideas via explanations, descriptions, definitions, and critiques. Yet, writing is often overlooked in mathematics, and teachers rarely teach students how to write in mathematics. In order to support the increased attention and incorporation of MW into instruction, this study sought to learn about MW beliefs and practices from a group of elementary teachers who have prioritized MW. Specifically, we examined 1) teachers' conceptions of effective MW instruction, 2) factors that facilitate or constrain MW, 3) systematic differentiation for multilingual learners and students receiving special education services, and 4) assessment practices. Findings indicate that teachers' conceptualized effective MW instruction as supportive and interactive with clear product expectations. It also includes assessment (e.g., teacher, peer, self) using a rubric, daily practice, explicit modeling, exemplar analysis, and discussion. Multiple facilitators emerged, such as daily writing, teacher modeling, oral discourse opportunities, mnemonics, relevant contexts, and embedded performance tasks. Barriers included pacing, content, and the number of standards to address. Study implications include recommendations on systematically designing professional learning and teacher preparation coursework to enhance MW instruction.

Speaker



Erin Smith

Assistant Professor | University of Nevada Las Vegas

Co-speakers



Aliza Robinson

Instructional Coach (Math) | Clark County School District



R. Alex Smith

Assistant Professor, Special Education | University of Nevada Las Vegas



Madeline Day Price

Graduate Assistant | University of Nevada Las Vegas



Alain Bengochea

Associate Professor of Multilingual Education | University of Nevada Las Vegas

STEM Smart: Five Ways to Support Students with the Mindset They Need for Their Future

11:00 AM – 11:25 AM | Location: Mockingbird D

25 MINUTE PRESENTATION

Why does my one student succeed in mathematics while another does not? To be truly successful in a future STEM-focused world, students need to know more than content. Students also need non-academics skills. Students need to be STEM Smart. A STEM Smart student has the mindset of an intellectual risk taker, the tenacity to tackle tough problems while learning from mistakes, and the critical thinking skills to separate scientific information from opinions and beliefs. We will unpack the research on intra- and inter-skills needed that go beyond the teaching of mathematics. Intrinsic, self-regulating skills include persistence through productive struggle, openness to academic risk taking, embracing mistakes as problem-solving opportunities, thinking critically and creatively, and managing one's own emotions and impulses. Extrinsic "people skills" include verbal and nonverbal communications, empathy, patience, active listening, reliability, teamwork, and collaboration. The session will conclude by discussing how teachers can empower students to develop both intrinsic and extrinsic skills, fostering success alongside mathematical learning.

Speaker



Alan Zollman

Professor | Indiana University Southeast

Middle School Preservice Teachers' Mathematical Knowledge for Teaching Fraction Multiplication

11:25 AM – 11:55 AM | Location: South 40

25 MINUTE PRESENTATION

Preservice teachers (PSTs) often have inadequate Mathematical Knowledge for Teaching Fraction Multiplication (MKT-FM) (Lou et al., 2011). When multiplying fractions, PSTs often use unnecessary or inaccurate steps, including cross multiplication (Newton, 2008), calculating common denominators (Young & Zientek, 2011), or converting to equivalent fractions (Krejci et al., 2024). We examined the fraction multiplication strategies of twenty middle school PSTs enrolled in a mathematics content course to address this challenge. In paper-pencil and video-recorded assessments, PSTs used area models to solve and represent fraction multiplication that required or did not require additional subdivision of the referent fraction. In this presentation, we will share the sequence of the fraction multiplication tasks (part of the assessment) and the PSTs' area model representations to highlight practical implications. Analysis of PSTs' pre-tests, Flip assignments, and post-tests revealed several emerging concepts and models, including (a) using two separate wholes (referent units) to represent two fractions, (b) performing unnecessary subdivisions and shading on area models, (c) procedurally representing fractions in drawings without referring to the concept of area, and (d) representing the first fraction without applying the concept of a referent unit. The conference audience will discuss potential tasks that could advance these emerging concepts to develop PSTs' MKT-FM.

<https://youtu.be/yDE9Br48J54?si=kBil35tzRoMXboDO>

Speaker



Bima Sapkota

Assistant Professor | The University of Texas Rio Grande Valley

Co-speakers



Brooke Krejci

Assistant Professor | University of Wisconsin-River Falls



Bona Kang

Assistant Professor | Ohio Wesleyan University



Tegan Nusser

Assistant Professor | Bradley University

Prospective Teachers and AI-Generated Imagery: Toward Pedagogically Transformative AI-Usage

11:30 AM – 11:55 AM | Location: North 40

25 MINUTE PRESENTATION

Professional organizations are encouraging conversation among mathematics educators about AI in our field. A recent NCTM position statement (2024) posited that educators should be "involved in developing and testing AI tools in math education" (p. 1).

This proposal stems from a research project investigating the ways that prospective teachers (PTs) might use AI to support mathematical learning. Participants were 50 PTs enrolled in a content course on number and operation. PTs were introduced to Adobe Firefly, which is a text-to-image AI. PTs designed and reflected upon their own Firefly-generated images on course assignments. We present (a) the Firefly-dependent tasks we assigned to prospective teachers, (b) examples of Firefly-generated images that PTs created in response to these tasks, and (c) analyses for one task.

This session encourages additional research/study by illuminating some mathematically pedagogical possibilities afforded by artificial intelligence.

Our session will provide ample opportunities for discussion. In particular, it will raise issues about the nature of teaching and learning mathematics

in the age of artificial intelligence.

National Council of Teachers of Mathematics. (2024). Artificial intelligence and mathematics teaching.

Speaker



Hamilton Hardison

Assistant Professor | Texas State University

Accuracy, Efficiency, and Flexibility Across Multiplicative Double Counting Stages

11:30 AM – 11:55 AM | Location: Brazos Amphitheater

25 MINUTE PRESENTATION

This research examines how multiplicative double counting (mDC) stage is related to the three constructs of fact fluency: accuracy, efficiency, and flexibility. Gaining a deeper understanding of this relationship will help teachers structure math fact instruction so that students are more efficient and flexible.

Prior research has consisted of timed assessments that only measure accuracy by how quickly a student can answer math fact questions (Brendefur et al., 2015). However, the National Council for Teachers of Mathematics (2014) defines fluency as accuracy, efficiency, and flexibility when solving mathematical problems. This research adds a theoretical framework to prior research by examining fluency through the lens of stage theory.

This presentation will include findings from a larger study that demonstrated a positive relationship between students' multiplication fluency level and mDC stage. As students' mDC stage increased, so did their efficiency and flexibility. However, accuracy was not as impacted. This indicates that a student can demonstrate accuracy without being truly fluent.

Session participants will view study data and discuss and examine students' written work. Participants will then be asked to discuss instructional techniques that could be used to increase student efficiency and flexibility with multiplication facts. The findings of the study will also be related to existing literature on efficiency and flexibility for further discussion.

Speaker



Bridget Broome

Instructor | Oklahoma State University

Exploring the Foundations of the Science of Mathematics

11:30 AM – 11:55 AM | Location: Mockingbird B

25 MINUTE PRESENTATION

An analysis of some researchers' efforts to promote "the science of math" demonstrates several flaws in the logic used to position mathematics educators and researchers as unresponsive to students and research. We will illustrate this flawed reasoning and demonstrate how it is used to influence media, policy, and, ultimately, mathematics learning. Finally, we will offer talking points that can be used to engage in critical conversations about the science of math.

This session is designed to spur additional research. By illustrating the gaps in the arguments of the proponents of the science of math, we identify critical needs for future research. Future research may focus on the teaching methods in mathematics classrooms, the effectiveness with which those methods are implemented, or the relationship between the science of reading and mathematics learning. We must be prepared to respond to questions about the science of math and how it differs from other pedagogies. By unpacking the implicit assumptions made by proponents, we can engage in critical conversations about the potential benefits and drawbacks of the movement while positioning it within a more comprehensive understanding of what it means to teach and learn mathematics. Participants in this session will discuss the purpose of mathematics education, evaluate how the "myths" presented in the science of mathematics align with those purposes and generate ideas for responding to inquiries regarding the science of math.

Speaker



Kate Raymond

Associate Professor | University of Oklahoma

Co-speaker



Melissa Gunter

Assistant Professor | Central Connecticut State University

Together We Rise Divided We Fall: Understanding Black Girls Math Competency within and Beyond STEM

11:30 AM – 11:55 AM | Location: Mockingbird C

25 MINUTE PRESENTATION

The panel titled "Together We Rise, Divided We Fall: A Panel to Discuss Integrated STEM for Black Girls" seeks to address current issues in STEM education head-on by exploring integrated STEM education models and approaches that specifically target the needs of Black girls. This session brings together scholars, educators, community advocates, and industry leaders to share insights, experiences, and practical strategies to dismantle barriers and create a more equitable STEM ecosystem. The panel will also examine

how STEM education, when done through a lens of equity and inclusion, can serve as a tool for empowerment and leadership among Black girls.

This proposal outlines the need for such a discussion, the key themes the panel will explore, and the expected outcomes for participants. By addressing these issues, we hope to foster collaboration and action toward creating supportive, inclusive environments where Black girls can thrive in STEM.

Speaker



Jemimah Young

Associate Professor | Texas A&M University

Developing Measures of Self-Efficacy for Teaching Mathematics and Concrete-To-Abstract Pedagogy

11:30 AM – 11:55 AM | Location: Mockingbird D

25 MINUTE PRESENTATION

Teachers' self-efficacy is associated with effective math pedagogy. Yet, many measures lack specificity to the context of math, or have insufficient validity evidence. This presentation will share initial validity evidence for two measures: the Self-Efficacy for Teaching Mathematics Instrument – Revised (SETMI-R) and the Self-Efficacy for Concreteness Fading (SECF).

While teachers' self-efficacy is associated with better outcomes, many measures are either too general or are ill-fitted with Bandura's theory (Bandura, 2023; McGee & Wang, 2014). Thus, the present study focuses on two varying grain sizes of specificity. The SETMI-R is specific to math teaching, but the SECF is focused on a particular math pedagogy.

We will present initial validity evidence for both the SETMI-R and SECF following including: content validity (expert ratings); response processes (cognitive interviews); internal structure and generalizability (Rasch modeling); and relations to other variables (correlational analysis).

The session facilitates discussion about validity evidence presented for these specific measures. Additionally, we present novel approaches to studying validity evidence for measures intended for longitudinal analysis.

Bandura, A. (2023). *Social cognitive theory: An agentic perspective on human nature*. Wiley.

McGee, J. R., & Wang, C. (2014). Validity-supporting evidence of the self-efficacy for teaching mathematics instrument. *Journal of Psychoeducational Assessment*, 32(5), 390-403.

Speaker



Karl Kosko

Professor | Kent State University

Co-speakers



Maryam Zolfaghari

Assistant professor | Kent State University



Rezwan Shihab

Graduate Student | Kent State University



Ashley Aguilera

Graduate Student | Kent State University



Enrico Gandolfi

Associate Professor | Kent State University



Richard Ferdig

Professor | Kent State University

RCML Lunch and Board Meeting

12:00 PM – 1:50 PM | Location: OakWood Ballroom

Expanding Secondary Mathematics Teachers' Knowledge of Content and Pedagogy Through Technology Integration

2:00 PM – 2:25 PM | Location: South 40

25 MINUTE PRESENTATION

This study examined preservice secondary mathematics teachers' (PSTs) perceptions of the effectiveness of an online learning platform (*EdReady*). The platform was integrated into several units in math-specific credential courses. The PSTs believed the units helped them to expand their understandings of grades 6-12 math and they enjoyed exploring math using this platform. The PSTs communicated that the experience enhanced their understanding of the capability of online learning platforms as a tool for grades 6-12 math courses and allowed them to envision how they might use such an online learning platform in their future practice.

Critical to maximizing success of these types of technology learning tools is teachers' use of best practices that support effective integration into existing curricula and mediate students' cognitive and emotional learning. Thus, it is important that PSTs have experiences that utilize such tools and scaffold reflection on how to use these tools in instruction. More research is needed that examines specific implementations and tools that will

support PSTs in expanding both their math content and pedagogical content knowledge in ways that allows them to effectively implement existing tools. In this session implications for professional development will also be discussed. We aim to encourage discussion regarding what other kinds of experiences and/or settings may be helpful to expanding PSTs understandings.

Speaker



Babette Benken

Richard D. Green Professor & Director | California State University, Long Beach

Is it “doing mathematics?” Assessing problem solving versus exercises.

2:00 PM – 2:25 PM | Location: North 40

25 MINUTE PRESENTATION

In this session we share a task analysis of assessment items from various tests of middle school mathematics students. Items from various assessments will be shared for the engagement of session attendees in task analysis. This will promote thoughtful conversations around research on assessment of problem solving. Participants will have an opportunity to share thinking about problem solving items and the use of those items to better understand measurement of problem solving. The presenters will share their findings across hundreds of items from various assessments.

We hope that the presentation will provide a forum for participants to think and converse about problem solving and its measurement.

References:

Smith, Margaret Schwan, and Mary Kay Stein. “Selecting and Creating Mathematical Tasks: From Research to Practice.” *Mathematics Teaching in the Middle School* 3 (February 1998): 344–50.

Speaker



Alex Bajwa

BGSU Graduate Student & Research Assistant | Bowling Green State University

Co-speaker



Gabriel Matney

Professor of Mathematics Education | Bowling Green State University

Let it resound: An update on the research project

2:00 PM – 2:55 PM | Location: Brazos Amphitheater

50 MINUTE PRESENTATION

Objective/Purpose: This research will help to make the case for mathematics learning being a linguistic matter (as well as a sociopolitical/sociocultural one; Gutierrez, 2008). My purpose is to highlight the notion that the ways many Black youth engage in mathematics discourse is likely to be inundated with Black Language (BL), and even if one could eradicate this linguistic repertoire, it represents a harmful strategy towards mathematics achievement. This research helps to recenter how teachers may view BL in more affirming ways and demonstrate that within their pedagogy.

Background to Support the Argument/Analysis: The current mathematics education in which Black children must participate promotes the unlearning of their linguistic repertoires. Mathematics classrooms create this division between what is appropriate mathematical language and discourse and that which is known as Black Language (BL), often situating BL, and BL speakers, outside of appropriate or allowable mathematics discourse, instead of *highlighting the affordances of home language*. This is the case in previous work like Orr (1997) who frame this language as a hindrance to Black youth’s mathematics success.

Limited References

Gutiérrez, R. (2013). The sociopolitical turn in mathematics education. *Journal for Research in Mathematics Education*, 44(1), 37-68.

Orr, E. W. (1997). *Twice as less: Black English and the performance of Black students in mathematics and science* WW Norton & Company.

Speaker



Nickolaus Ortiz, Ph.D.

Assistant Professor of Mathematics Education | Georgia State University

Investigating Differences in Assessment Delivery Formats: An Illustration with DEAP-CAT

2:00 PM – 2:25 PM | Location: Mockingbird A

50 MINUTE PRESENTATION

The objective for this presentation is to understand the extent to which mathematical problem-solving constructed response item and overall test psychometrics compare when the same items are administered to middle school students in paper-pencil and computer

formats.

Prior research on differences in paper-pencil and computer-based tests has focused on multiple-choice questions and results vary depending on testing contexts including grade level (Hardcastle et al., 2017). Research has not investigated how constructed-response item tests fare in both testing formats.

This presentation begins with a sample item. Some attendees will solve it on paper and others will scan a QR code to complete it online. Following this experience, a review of past work comparing test outcomes in both formats will occur. A description of our study and findings will be shared. Discussion around the choice to administer tests online or using paper-pencil is a goal. Group questions include: What reasons might you select one test format over the other? What challenges might prevent use of one format compared to another?

Speaker



Jonathan Bostic

Professor | Bowling Green State University

Co-speakers



Toni May

Professor | Binghamton University



Gregory Stone

CEO | MetriKs Amerique

Language in 3's: Spanish, English, and Mathematics

2:00 PM – 2:25 PM | Location: Mockingbird B

25 MINUTE PRESENTATION

English is the dominant language for instruction and assessment of students' learning in the US (National Research Council, 2000). Studies, however, pose concerns when performing English-only assessments to learners demarcated as English language learners (ELLs), as it may reflect a discrepancy between mathematical understanding and English proficiency (Martiniello, 2010; National Research Council, 2000). We conducted interviews with two female Hispanic middle school multilingual learners that included an eight-problem mathematical worksheet in English and Spanish. We will discuss what they shared regarding classroom experiences and language use in their mathematical understanding. We will also share how language is a tool to support mathematical learning. This work can contribute to current research and practices to support Hispanic multilinguals' mathematical understanding.

Martiniello, M. (2010). Linguistic complexity in mathematics assessments and the performance of English language learners. In Research Monograph of TODOS: Mathematics For All. Assessing English-Language Learners in Mathematics. National Education Association.

National Research Council (2000). Testing English-Language Learners in U.S. Schools: Report and Workshop Summary. Committee on Educational Excellence and Testing Equity. National Academy Press.

Speaker



Ana Benitez

The University of Texas at Austin

A Teacher's Use of Notice and Wonder to Integrate STEM

2:00 PM – 2:25 PM | Location: Mockingbird C

25 MINUTE PRESENTATION

Notice and Wonder is a black hole of research on instructional practice (Author, in review). With this designation comes the acknowledgement that there is intuitively value to the routine but that this value must be carefully examined through research (Matney et al., 2020). This presentation will expand on these findings by indicating ways that Notice and Wonder was utilized in a sixth-grade STEM class to support the teacher's incorporation of more mathematics into lessons. We will also report on changes in the teachers' perspective on incorporating math into her teaching.

This study is related to mathematical learning because it examines the ways that a potentially high leverage routine for the mathematics classroom might improve the mathematics teaching in the context of STEM.

This research is timely and relevant in that it relates to the conference call to examine the integration of mathematics with other disciplines. To generate interest for the audience, the presentation will include examples of the Notice and Wonder prompts utilized in the study so that the audience can view and discuss what they notice and wonder, and how it might stimulate mathematical thinking in the context of STEM.

This presentation will raise pertinent issues such as, how does a teacher's planning and implementation of the Notice and Wonder routine affect their instruction? And, in what ways can the Notice and Wonder routine be leveraged to increase the integration of mathematics in STEM?

Speaker



Karen Zwanch

Associate Professor of Mathematics Education | Oklahoma State University

Learning Community High Impact Practice - Investigation of the PAL Program & Lower Division Math

2:00 PM – 2:25 PM | Location: Mockingbird D

25 MINUTE PRESENTATION

In a tiered mentoring model, first-year students are mentored by upper-level students, who are simultaneously mentored by professionals in the students' field of study. It can be a powerful tool to create a thriving learning community, an essential component of Native Hawaiian and Pacific Islander students' expression of meaning. Tiered mentoring also harnesses the experience of teacher candidates as mentors to enhance student learning, engagement, and academic success.

The NSF BE-MathPREP at the University of Hawaii at West Oahu, implemented a tiered mentoring model called the Peer Academic Leader (PAL) Program. This study sought to investigate the PAL program's impact on both UHWO undergraduate students enrolled in math courses and on students serving as PALs. The study explored students' perception of math and their math self-efficacy, two factors this study recognizes as major contributors to a student's motivation and academic success in math.

Understanding the effects of our PAL program may incite interest among other institutions to implement a similar program. This study will contribute to the growing body of research in math education and pedagogy, provide recruitment and retention models, and help to establish a clear pathway and access for local students to better prepare themselves as future math teachers. Future studies could look at the impact of PALs who are non-math ed majors on students in lower-division math courses.

Speakers



Dylan Mason Blue

Student | University of Hawai'i – West O'ahu



Veny Liu

Associate Professor in Mathematics | University of Hawaii at West Oahu



Eric Kobayashi

Lecturer | University of Hawaii-West Oahu

Co-speaker



Sarah Elaina Arios

Student | University of Hawai'i – West O'ahu

Positions of Authority in a Number Talk: Relationships Between Teacher Questions and Student Agency

2:30 PM – 2:55 PM | Location: South 40

25 MINUTE PRESENTATION

This presentation describes *how teachers' questions explain varying forms of student engagement in a Number Talk*. Given the pedagogical structures within Number Talks, we employ Engeström's (2015) activity theory to analyze the interactions between teacher questions and student engagement. Drawing on questioning and engagement patterns (e.g., Huinker & Bill, 2017), we explore how questioning reveals authority dynamics. We frame student engagement with agency; defined as an individual's choice of how to engage in a classroom community in relation to authority (Cobb et al., 2009).

Findings indicate participants operate along a continuum of authority, explaining varying student agency within a Number Talk. Forms of authority related to types of teacher questions and stances represented through discourse patterns. Discussions will focus on these findings and questions such as, *How do these positions of authority change in different populations? What other theoretical frames explain complex teacher and student interactions in a Number Talk?*

Cobb, P., Gresalfi, M., & Hodge, L. L. (2009). An interpretive scheme for analyzing the identities that students develop in mathematics classrooms. *Journal for research in mathematics education*, 40(1), 40-68.

Engeström, Y. (2015). *Learning by expanding*. Cambridge University Press.

Huinker, D. & Bill, V. (2017). *Taking action: Implementing effective mathematics teaching practices in K-grade 5*. National Council of Teachers of Mathematics.

Speaker



Beth MacDonald

Associate Professor | Illinois State University

Co-speaker



Hilary Tanck

Assistant Professor of Educator Preparation | High Point University

Embracing Culture in STEM: Examining a Culturally Relevant Informal Learning Experience.

2:30 PM – 2:55 PM | Location: North 40

25 MINUTE PRESENTATION

The purpose of this study was to examine students' interest in and anxiety towards mathematics and STEM throughout their participation in an informal learning opportunity grounded in Culturally Relevant Pedagogy (CRP). The study examines qualitative data collected at multiple points throughout the summer program.

Mathematics anxiety (MA) is negatively correlated with mathematics achievement and persistence (Ruff & Boes, 2014; Ashcraft, 2002), while interest is positively correlated (Denner et al., 2019). Additionally, research suggests that MA can affect students' persistence in other STEM areas (Everingham et al., 2017). This study seeks to build upon prior literature that indicates CRP benefits students' affective measures (Yu, 2018).

This presentation will provide an overview of the results of a qualitative dissertation that examined students' affect towards mathematics and STEM throughout their participation in a CRP-based informal learning program. Data was collected at several stages during the week-long summer program. The multiple data collection points will help provide an understanding of students' interest and anxiety throughout the week.

Session participants will hear more about the development of the summer program, as well as how students described their affect

towards mathematics and STEM throughout the learning experience. This will allow for a discussion about the activities, how students received them, and their overall experience in the program.

Speaker



Jacob Martin

Doctoral Candidate | Oklahoma State University

Dual-University Analysis Integrating Social Justice in Math Methods: Context of Displaced Persons

2:30 PM – 2:55 PM | Location: Mockingbird A

25 MINUTE PRESENTATION

In this session we share our teacher educator lesson study results which focused on engaging pre-service teachers (PSTs), who were enrolled in a mathematics methods course, in a social justice lesson centered on the context of displaced persons. Through this work we seek to honor the suggestion from the joint position statement (2016) of the National Council of Supervisors of Mathematics and TODOS: Mathematics for ALL when it states that educators should “include tasks that demand quantitative analysis of fairness and civic engagement issues” (p. 5). Presenters will share the lesson design and its implementation at two different universities located in the mid-west and the southwest United States. Using the lens of PSTs engagement, the presenters will discuss the experiences of secondary and elementary math methods students. The research study draws inspiration for this work from Author et al. (2024) and Felton-Koestler (2017).

We hope that the presentation will provide a forum for participants to share about social justice integrated lessons in their courses and discuss ways to create opportunities for PSTs engagement.

Speaker



Gabriel Matney

Professor of Mathematics Education | Bowling Green State University

Co-speakers



Dittika Gupta

Associate Professor of Curriculum and Learning | Midwestern State University



Holly Plank

Assistant Professor of Science Education | Bowling Green State University



Leston Mwale

Graduate Student | Bowling Green State University



Alex Bajwa

BGSU Graduate Student & Research Assistant | Bowling Green State University

Preparing Teachers for Today's Mathematics Students

2:30 PM – 2:55 PM | Location: Mockingbird B

25 MINUTE PRESENTATION

Come find out how we trained preservice teachers to support mathematical learning trauma-informed practices and strategies for newcomers. We describe the implementation of a module on these topics with student teachers (prek-12 mathematics) and their application of at least one classroom strategy and one teaching strategy in their observed lesson. We share data results from analysis of their pre/post knowledge, attitudes, reflections, and lessons. This is a spring research project but we hope to demonstrate that setting up the classroom and teaching with strategies was beneficial in supporting children experiencing trauma or learning Math from another language.

Speaker



Amy Corp

Associate Professor | East Texas A&M University

Co-speaker



Julie Mills

Assistant Professor | Texas A&M University - Commerce

Challenging Expectations: Rethinking the Link Between Advanced Math Courses and Proficiency

2:30 PM – 2:55 PM | Location: Mockingbird C

25 MINUTE PRESENTATION

[Summary](#)

Speaker



Rachel Ervin

Enrollment Specialist | Lake Land College

Graduate Teaching Assistant Beliefs on Product-Driven Professional Development (Preliminary Investigation)

2:30 PM – 2:55 PM | Location: Mockingbird D

25 MINUTE PRESENTATION

This research focuses on enhancing mathematics education by improving graduate teaching assistant (GTA) training in universities. Recognizing GTAs' crucial role in undergraduate math education and their common lack of pedagogical experience, the study proposes a product-based approach to professional development (Martinez, 2022). This method encourages GTAs to create instructional artifacts/lessons, aiming to boost their self-efficacy and beliefs about teaching mathematics. The study presents preliminary results and invites discussion on this approach's effectiveness. It guides future research in math teacher development, exploring scalability across different contexts and STEM fields. The work is relevant given the increasing reliance on GTAs and the recent impacts of COVID-19 on teacher preparation. The session promotes discussion by presenting an alternative to conventional methods, addressing key issues like the gap between GTAs' mathematical expertise and teaching experience. It encourages dialogue on how universities can better equip GTAs for their roles in undergraduate education, inviting comparisons with current practices and exploring innovative approaches to teacher preparation.

Choate, K., Goldhaber, D., & Theobald, R. (2021). The effects of COVID-19 on teacher preparation. *Phi Delta Kappan*, 102(7), 52-57.

Martinez, C. (2022). Developing 21st-century teaching skills: A case study of teaching and learning through project-based curriculum. *Cogent Education*, 9(1).

Speaker



John Sevier

Asst Professor | Appalachian State

What Elements of Collaboration Can Transform a Research Collaboration into a Sustainable Partnership

3:00 PM – 3:25 PM | Location: South 40

25 MINUTE PRESENTATION

The purpose of the session is to engage participants with the elements of collaboration that help to build a sustainable partnership.

Research collaborations have been a vital part of the fabric of academia for centuries. Academic partnerships can be defined as two or more parties coming together to enhance student learning (Cox-Peterson, 2010). Typically, the parties in such a cooperative endeavor are (1) a higher education partner and (2) a community partner (Eddy, 2010). So, can an academic partnership emerge between two parties within higher education exclusively?

We posit the answer is yes. This context has not been well documented in the research. The literature details how collaborations can be thought of as a form of social exchange relationships (Haug & Brown, 2019). This lens can be extended using a social network perspective, which examines how social relationships between individuals form network structures and influence joint activities (Burt, 2000). Thus, we considered the details of the structures, such as meetings, accountability, and collaborative spaces, that laid the foundation for our partnership.

This session will explore how structural elements, accountability, trust and vulnerability helped our research collaboration develop into a sustainable and productive partnership.

We will engage participants in discussion about the different elements that influenced our partnership and brainstorm about adapting them to their own contexts.

Speaker



Julie Herron

Director of Curriculum and Course Design | U.S. Airforce Academy

Co-speakers



Amy Ray

Assistant Professor | Sam Houston State University



Emma Bullock

Associate Professor | Sam Houston State University



Beth Cory

Associate Professor of Mathematics Education | Sam Houston State University



Mary Swarthout

Associate Professor | Sam Houston State University

Cultivating Positive Math Identities: A Journey Through Mirrors, Windows, and Planning Responsive Math Learning Experiences for all Learners

3:00 PM – 3:25 PM | Location: North 40

25 MINUTE PRESENTATION

The focus of this session is fostering learning experiences that support and extend the development of students' positive math identities. The essential question at the core of the discussion is why do some students perceive themselves as capable math learners and doers, while other students do not. The session is designed to explore and implement strategies that aim to foster a sense of confidence and enthusiasm for mathematics.

To guide the exploration, the session draws inspiration from Rudine Sims Bishop's influential concept of "mirrors, windows, and sliding glass doors." This literary framework is applied to the realm of mathematics, emphasizing the importance of providing students with reflections of their own experiences (mirrors), glimpses into other perspectives and experiences (windows), and opportunities for

connection and exploration (sliding glass doors).

As our classrooms become more ethnically, linguistically and culturally diverse, there is a growing recognition of the importance of creating learning experiences that reflect students' cultural backgrounds and lived experiences. During this session we will examine math literature that authentically represents the assets and brilliance of diverse populations of learners. The goal is to use these resources as guides when planning responsive math experiences that go beyond traditional approaches, supporting and extending the learning of all students.

Speaker



Shequana Wright-Chung

Assistant Professor | Brooklyn College

The University of Oklahoma's Transformative Tutoring Initiative: A Successful Model for High-Dosage Mathematics Tutoring

3:00 PM – 3:55 PM | Location: Brazos Amphitheater

50 MINUTE PRESENTATION

This session discusses the transformation of our tutoring initiative over the past 4 years and what our model looks like as a highly effective high dosage tutoring model. Our model is not a canned curriculum, it allows the tutors to develop a personalized plan to support student learning. Our model utilizes graduate and undergraduate students from all majors and backgrounds, developing them into well prepared tutors. We will briefly discuss our data that supports the model.

Speakers



Cristina Moershel

Director of Tutoring | The University of Oklahoma



Kayla Pierson

Program Manager | The University of Oklahoma



Lisa Cortez

Program Manager | University of Oklahoma

Leveraging Teacher Positionality Statements in Professional Development of Equity-Framed Mathematics Teaching and Learning

3:00 PM – 3:25 PM | Location: Mockingbird A

25 MINUTE PRESENTATION

This presentation explores the use of teacher positionality statements as a reflective tool in the professional development of middle school math teachers, specifically in the context of equity-framed teaching and learning. The iterative writing of these statements helps teachers become more aware of how their social, cultural, and personal identities influence their teaching practices, particularly in addressing equity in math education. Understanding these factors empowers teachers to create inclusive and responsive math classrooms that enhance learning for diverse students.

We will share how we have adapted positionality research and resources, which primarily are found for post-secondary audiences, for middle school math teachers. Our development of an iterative writing process, which includes revisiting and revising their statements multiple times, created space for teachers to examine how their identities inform their approach to equity in the classroom. Further, it has allowed us to examine barriers and accelerators in our work with teachers, particularly in their taking-up of equitable teaching practices centered in our longitudinal professional development. Our research on teacher identity highlights its impact on instructional choices and student engagement. This session draws on these findings and encourages additional research into how teacher reflection through positionality statements can promote professional growth and equitable teaching practices.

Speaker



Candace Joswick

Associate Professor | The University of Texas at Arlington

Co-speakers



Holly Hungerford-Kresser

The University of Texas at Arlington



Miriam Sanders

Assistant Professor | University of Wyoming



Micayla Gooden

Graduate Student | Texas A&M University



Julia Calabrese

Postdoctoral Research Associate | The University of Texas at Arlington

Empowering Students with Choice through Equitable and Interactive Mathematical Modeling

3:00 PM – 3:55 PM | Location: Mockingbird B

50 MINUTE PRESENTATION

Goals of our research project is to create and study the equitable and interactive mathematical modeling program that involves

collaboration with middle school students, a professional learning community series with their mathematical teachers, and the creation of a free online platform that hosts the newly designed mathematical modeling modules. Mathematical modeling invites students to actively design, test, and modify mathematical lenses to solve real-life problems. With a sociocritical mathematical modeling perspective—a process of using mathematics to understand the life experiences of students and unjust situations—we aim to offer students agency and power in mathematical learning in classrooms and beyond schools. Our research fills a theoretical gap related to scalable design models for interactive mathematical modeling curricula that are culturally sustaining for students. We share how our model of learning processes and design principles are tested and refined through multiple iterations to ensure usability and efficacy.

Speaker



Hyunyi Jung

Associate Professor | Texas A&M University

Co-speakers



Corey Brady

Associate Professor | Southern Methodist University



Chonika Coleman-King

Associate Professor | University of Florida



Mary Bratsch-Hines

Senior Manager, Research and Evaluation | University of Florida Lastinger Center for Learning



Enrique Hernandez-Zavaleta

Assistant Professor | Cape Breton University



Kayla Sutcliffe

Graduate research assistant | University of Florida



Hongze (Devon) Zhu

Graduate research assistant | University of Florida



Sangyeon Park

Research specialist | Texas A&M University



Sheida Moghtader

Graduate Research Assistant | University of Florida

Hong Zhang

Graduate research assistant | University of Florida



Christine Salama

Research coordinator | University of Florida Lastinger Center for Learning

Definitions Matter: Elementary Preservice Teachers' Conceptions of Antiracist Mathematics Teaching

3:00 PM – 3:55 PM | Location: Mockingbird C

25 MINUTE PRESENTATION

Objective

Our research efforts focus on elementary preservice teachers' perceptions of what antiracist math teaching entails. We believe that a focus on antiracist math teaching addresses racial inequities in elementary math teaching and learning.

Background to Support the Analysis

Our findings suggest that PSTs in our study have ideas about race in mathematics education that could be built upon to develop an understanding regarding antiracist math teaching. However, our findings also suggest that teacher preparation has to be intentional about antiracist teaching and antiracist math teaching, specifically.

Content of Presentation

Systemic racism is a prevalent issue in the US and it permeates many aspects of society including elementary mathematics classrooms.

Issues for Discussion

In light of anti-DEI efforts across the US it is becoming increasingly more difficult to center justice-oriented approaches to mathematics education. It is our hope that findings from this study will spark conversation around the importance of this work and how to continue doing it in this political climate.

Speaker



Karisma Morton

Assistant Professor | The University of North Texas

Preservice teachers learning about quadrilaterals using an online learning progression curriculum

3:00 PM – 3:25 PM | Location: Mockingbird D

25 MINUTE PRESENTATION

50 MINUTE PRESENTATION

Previous research has found that K-8 teachers lack conceptual understanding of K-8 mathematics sufficient to teach it effectively. We used an online, learning progression (LP) based, dynamic geometry (DG) curriculum (iDG), previously developed and tested for K-10 students, to enhance preservice teachers' (PTs) knowledge of quadrilaterals. iDG is a DG curriculum whose online modules are sequenced using a research-based LP. We studied 541 PTs in multiple sections of a geometry course using the same online multiple-choice test to assess them before and after using the curriculum. In our presentation, we will discuss the iDG curriculum and how it was used in mathematics courses for PTs, our theoretical underpinnings, methodology, and quantitative analysis that found significant gains in PTs' content knowledge of quadrilaterals. Our research results encourage other researchers to develop similar LP curricula for PTs for other mathematics topics to see how they impact PTs' learning of the mathematics they are expected to teach. Our study also suggests that more research is needed on creating and using LP assessments for other topics and how LP assessments can be used to inform instruction in PTs' mathematics content courses. Our research adds to the discussion of how teacher educators design mathematics content courses for PTs and that these need to be designed based on research of how students learn mathematics.

Speaker



Michael Winer

Associate Professor of Mathematics Education | Eastern Washington University

Co-speakers



Michael Battista

EHE Distinguished Emeritus Academy Professor of Mathematics Education | The Ohio State University



Viktoria Taroudaki

Associate Professor of Computational Mathematics | Eastern Washington University

Productive Struggle, Persistence, and Perseverance Phase 3: Putting Theory into Practice

3:30 PM – 3:55 PM | Location: South 40

25 MINUTE PRESENTATION

The idea of productive struggle is that the student persist throughout the process with creativity and determination until a solution presents itself. In the first phase of this study, investigators introduced a REACT framework to explore the effect that productive struggle has on student learning in an entry level college mathematics course. In the second phase of this study, investigators, with guidance from the Mathematics Inquiry Project leadership team at Oklahoma State University revised activities to highlight the MIP pillars and mathematical understandings within the REACT framework. This work was then published as an article on the MIP website. In the third and final phase, the CoRD (Collaborative and Research Development) team puts this theory into practice, hosting a regional CoRD workshop for mathematics faculty from the region showing how to reinvent their own mathematics learning activities and having participants revise and rework these activities, using the lenses of the REACT framework and productive struggle to reflect the pillars of the Mathematical Inquiry Project.

The authors reintroduce to mathematics faculty their REACT framework which consists of five steps: Read, Explore, Attempt, Critique, and Teach.

Revisions of the activities emphasize the pillars of the Mathematics Inquiry Project--*Active Learning, Meaningful Applications, and Academic Success Skills*.

Speaker



Lucas Foster

Associate Professor Of Mathematics | Northeastern State University

Co-speaker



Karl Kruczek

Associate Professor of Mathematics | Northeastern State University

A logistic regression analysis of access to advanced mathematics in alternative high schools

3:30 PM – 3:55 PM | Location: Mockingbird C

25 MINUTE PRESENTATION

Purpose

Because alternative schools' aim to support students (Moore et al. 2020), equity-oriented mathematics research should investigate the mathematics opportunities they offer. Access to advanced mathematics coursework in high school, including calculus, has been found by researchers to promote post-secondary student outcomes as it is associated with higher college enrollment and college persistence, especially for marginalized students (Bressoud, 2021; Byun et al., 2015; Musoba & Krichevskiy, 2014; Yang et al., 2022). This study performs logistic regression to analyze access to advanced mathematics and calculus in United States high school alternative schools using the 2017-2018 U.S. Department of Education Office Civil Rights Data Collection (CRDC).

Background

Currently there is very limited research on mathematics in alternative schools. This study serves as an addition to that body of research, allowing future researchers to further delve into the topic and its implications for equity.

Content

This presentation will describe the availability of advanced mathematics coursework in alternative school settings in the United States, an under researched topic area.

Issues for Discussion

Research has found that marginalized students are less likely to have access to advanced mathematics and more likely to be placed in alternative schools (Liu et al., 2022; Welsh, 2020), making this issue one of equitable access that deserves discussion.

Speaker



Kristian Edosomwan

Graduate research assistant | Texas A&M University

Exploring the Roles of Proof in Mathematics: The Transformation of Undergraduate Students' Views

3:30 PM – 3:55 PM | Location: Mockingbird D

25 MINUTE PRESENTATION

Proof is a fundamental aspect of college mathematics education, serving roles in verification, explanation, systematization, discovery, and communication (de Villiers, 1990). Thus, fostering a deeper understanding of proof among undergraduate students is essential for their future learning of advanced mathematics. However, research shows that many students struggle with proof, often overemphasizing its role in establishing the truth of mathematical statements (e.g., Baxter & Pair, 2017; de Villiers, 1990). This narrow view can hinder their recognition of proof's broader significance (Baxter & Pair, 2017). To address this challenge, we build on the work of Baxter and Pair (2017) and Bleiler et al. (2015) by providing opportunities for undergraduate students to explore various roles of proof throughout the semester. In this presentation, we examine how our three-part class activities have influenced undergraduate students' perceptions of proof in mathematics.

Bleiler-Baxter, S. K., & Pair, J. D. (2017). Engaging students in roles of proof. *The Journal of Mathematical Behavior*, 47, 16-34.

Bleiler, S. K., Ko, Y. Y., Yee, S. P., & Boyle, J. D. (2015). Community development and evolution of a rubric for proof writing. In C. Suurtamm & A. R. McDuffie (Eds.), *Annual perspectives in math ed 2015: Assessment to enhance learning and teaching* (pp. 97-108). Reston, VA: NCTM.

de Villiers, M. (1990). The role and function of proof in mathematics. *Pythagoras*, 24, 17-24.

Speaker



Winnie Ko

Professor of Mathematics Education | Indiana State University

Co-speaker



Abigail Craft

Graduate Student | Indiana State University

PSTs' Perspectives: What Does the Elementary Mathematics Classroom "Look Like" When We Return from Collective or Individual Crises?

3:30 PM – 3:55 PM | Location: Mockingbird A

25 MINUTE PRESENTATION

During Spring 2021, pre-service teachers (PSTs) in my mathematics methods course experienced widespread flooding that caused not only cancellation of class but also many different individual accounts of difficulty ranging from discomfort to devastation. In our first class meeting after we returned from this experience, we reflected collaboratively about what the mathematics classroom often looks like when we return from collective or individual crises. Then, we brainstormed what the mathematics classroom could look like (Dunn, 2022). In this presentation, I will share the results of a pedagogical action research study (Norton, 2018) in which I thematically analyzed students' collective reflections from this class session as documented on their group posters. PSTs had thoughtful observations about how the classroom can provide space for students experiencing trauma while also promoting the joy of mathematics discussed earlier in the semester (Parks, 2020). The results of this study have implications for mathematics teacher educators as we seek to equip PSTs with both mathematical knowledge for teaching and an understanding of the role of justice in the teaching and learning of mathematics (Gutstein, 2012).

Speaker



Amy Ray

Assistant Professor of Mathematics Education | Sam Houston State University

Social Justice in Mathematics: Using Critical Theory to Explore Relationships Between the Mathematical word, and Science Technology or Engineering.

4:00 PM – 4:55 PM | Location: South 40

50 MINUTE PRESENTATION

Objective/Purpose – Two misconceptions about the nature of mathematics promote disinterest, disengagement, and amotivation within mathematics education. The first misconception is associated with students seeing mathematics as not being relevant to their lived experience, and the second misconception is that mathematics is value neutral. To remediate these misconceptions, I present a STEM for social justice framework. This framework builds upon Gutstein's (2016) framework that discusses mathematics education in terms of

critical theory. For this presentation I look at student projects from three years of senior capstone courses in mathematics education at a private midwestern university. These projects reveal how the

mathematical word provides agency for students to critique science, technology, or engineering, and through this critique these projects reveal how the mathematical word alters the dialectic discussions surrounding how these students read and write their world. The purpose of this presentation is to provide mathematics educators examples how they might include cultural and community assets of their students in mathematics curricula in a way that promotes equity, social justice, and critical consciousness.

Speaker



Kenneth Butler

Assistant Professor | University of Dayton

What Research Activities Count Toward Tenure: A Survey of Math Ed Faculty

4:00 PM – 4:55 PM | Location: North 40

50 MINUTE PRESENTATION

One of the challenging aspects of the job of a mathematics education faculty member is meeting the necessary research expectations to achieve tenure. We conducted a survey 404 US mathematics education faculty regarding the research expectations for obtaining tenure. Survey questions asked about expected numbers of publications per year, how much different types of publications (e.g., journal articles, book chapters) and scholarly activities (e.g., giving presentations, obtaining funding) were valued. The responses were analyzed for connections to 3 demographic variables (level of institution, department type, research commitment). We found statistically significant differences related to each of these variables. Research expectations varied substantially across institution type. For example, the average expected number of yearly publications was 2.23, 1.63, and .99 papers at R1, R2, and Other institutions respectively. By contrast, research expectations seldom varied by department.

Speaker



Blake Peterson

Professor | Brigham Young University

Seeing is Believing: Tackling Doubts About the “4” in the Formula for Surface Area of Spheres

4:00 PM – 4:55 PM | Location: Brazos Amphitheater

50 MINUTE PRESENTATION

In our work with pre-service teachers (PSTs), we have found that exploring topics starting from a tangible, hands-on approach is a powerful way to give meaning to often abstract concepts (Bruner, 1986; Cory & Ray, 2023). Specifically in our geometry content course for middle school PSTs, when we explore the surface area and volume of prisms, pyramids, cylinders, and cones, students connect the hands-on experiences of covering and filling 3D-shape manipulatives with the abstract algebraic formulas for surface area and volume. We found these activities beneficial, but we were dissatisfied with our approach to deriving the surface area of a sphere, which relied solely on students' previous calculus coursework with derivatives. While mathematically valid and efficient timewise, we were motivated to develop a different approach that aligned more closely with the tangible methods we used for the other 3D shape measures (Flores, 2011; Wasserman et al., 2020). We then considered how to bridge this new hands-on method to our original abstract approach involving calculus. In this proposed session, participants will collaboratively investigate multiple hands-on methods for constructing a sphere's surface area formula. We, the facilitators, will share our continuing journey of refinement and encourage participant discussion as we continue to consider how to scaffold and rigorously extend these experiences for various levels of PSTs.

Speaker



Beth Cory

Associate Professor of Mathematics Education | Sam Houston State University

Co-speakers



Amy Ray

Assistant Professor of Mathematics Education | Sam Houston State University



Dustin Jones

Associate Dean, College of Science and Engineering Technology; Professor of Mathematics Education | Sam Houston State Un...

Structure, flexibility, and uncertainty throughout the design and implementation of online mathematics courses for teachers of elementary mathematics within a state-wide alternative pathways program.

4:00 PM – 4:55 PM | Location: Mockingbird A

50 MINUTE PRESENTATION

With opportunity provided through the implementation of a state-wide online alternative route for teaching program through our University, we have embarked on revision of mathematics courses for teachers of elementary mathematical concepts. Building from Table 1 and Table 2 in the Common Core State Standards for Mathematics, we have also integrated online manipulatives from Brainiac.com in an effort to provide support for state-wide students who may be a multiple hour drive from a regional municipality.

Along with our guiding framework of the CCSSM, our work specifically addresses the Standards for Preparing Teachers of Mathematics Indicator C.1.1 Know Relevant Mathematical Content. We believe our work specifically addresses the first item in the call for speakers.

We will engage participants in a discussion of the current online structure of our courses, and our current reflections on our analyses. We will provide time for participants to provide input and reflections from their own work to allow space for us to broaden our own perspectives.

We will directly build in approximately 20 minutes to allow participants time so that we may identify and recognize alternative perspectives to ours in order to build more robust next steps for ourselves and our participants.

Association of Mathematics Teacher Educators. (2017). Standards for the Preparation of Teachers of Mathematics.

National Governors Association. (2010). Common Core State Standards for Mathematics.

Speaker



Sinead Pelleschi

Graduate Assistant | University of Nevada, Las Vegas

Co-speakers



Carryn Warren

Professor | University of Nevada, Las Vegas



Travis Olson

Professor | University of Nevada, Las Vegas

The impact of STEM interns on engaging high school students in a STEM summer camp

4:00 PM – 4:55 PM | Location: Mockingbird C

50 MINUTE PRESENTATION

Purpose

How does a two-week professional development (PD) program impact STEM interns' ability to develop meaningful lessons that engage high school students in STEM?

Background to Support Argument/Analysis

This work is part of an NSF-funded grant, focusing on STEM interns who are recent graduates with degrees in Chemistry or Engineering and are considering teaching as a career. The program includes two weeks of PD in teaching, followed by two weeks of teaching at a summer STEM camp with high school students. The camp offers interns valuable teaching experience without requiring a long-term commitment (Watson, 2023). The PD is grounded in a strong theoretical base, 1) covering equity-based practices, 2) interdisciplinary content connections, and 3) trauma-informed instruction (Aguirre et al., 2013). Interns revise an existing STEM lesson from the Gains in the Education of Mathematics and Science (GEMS) program or design a new lesson for the camp.

Content of Presentation

The presentation will include an overview of the interns, the PD they received, lesson selection or creation, and lesson implementation. It will focus on two or three interns as case studies. High school student data will be evaluated qualitatively, based on their final camp activities, and quantitatively, on their dispositions toward STEM.

Issues of Discussion

Discussion points include 1) recruitment of STEM interns, 2) integrated STEM lessons, and 3) student dispositions toward STEM.

Speaker



Colleen Eddy

Associate Professor of Mathematics Education | University of North Texas

Co-speakers



Nirmala Naresh

Associate Professor of Mathematics | University of North Texas



Zhenhua Huang

Professor of Civil Engineering | University of North Texas

From Counting to Confidence: Improving Basic Fact Fluency in At-Risk Students

4:00 PM – 4:55 PM | Location: Mockingbird D

50 MINUTE PRESENTATION

Elementary students are expected to fluently add, subtract, multiply and divide. According to the Common Core State Standards for Mathematics (CCSSM, 2020), students in Grade 2 should know basic addition facts through 20 while Grade 3 students should know from memory all products of two one-digit numbers. Yet, many students through grade 12 rely on counting as a means for solving single digit problems such as $9 + 8$ or 7×6 .

The latest NAEP assessments show significant declines in students' basic mathematics skills, including simple computations, compared to results from 2020 (National Center for Education Statistics, 2022). Traditional methods such as rote memorization and drill type practices continue to be pervasive. The prevalence of during and after-school programs underscores the importance of investigating and supporting effective methods for mathematics instruction.

At-risk K-12 students from a large urban school district, attend an after-school program in order to receive tutoring, enrichment, or college & career support. While there, students engage in explicit strategy instruction and math games meant to foster fluency and positive dispositions toward learning mathematics. The school's principal and I will share our methods, progress and process for measuring student growth in basic fact fluency. We also support teachers who are learning about fluency and best practices for using formative assessment data to tailor instruction for all students.

Speaker



Victoria Miller Bennett

Educational Programs Specialist | Collaborative for Teaching and Learning

Co-speaker



Tonkeyta Rodgers

Principal | Jefferson County Public Schools

RCML Networking Coffee Break

5:00 PM – 5:15 PM | Location: TBD

Wilson Memorial Lecture: Optimizing Intelligence: Bridging AI and Real-World Decision-Making with Mathematical Tools

5:15 PM – 6:30 PM | Location: OakWood Ballroom

Dr. Sharon is an assistant professor at the Department of Computer Science and Engineering at Texas A&M. His expertise include Reinforcement Learning, Multi-agent Markov Modeling, Algorithmic Game Theory, and Combinatorial Search. He holds a proven record in integrating various AI solutions into safety-critical Transportation Applications. The impact of Dr. Sharon's work is evident through numerous accolades, including the Dean of Engineering Excellence Award (2024), the Bergmann Memorial Research Award (2024), the NSF CAREER Award (2023), and three Best Paper Awards at top AI venues: the Journal of Artificial Intelligence, the AAAI Conference on Artificial Intelligence, and the International Symposium on Combinatorial Search. His research has been widely recognized through invited talks at leading international conferences and extensive coverage in both local and international media.

Speaker



Guni Sharon

Assistant Professor | Texas A&M University

Saturday, March 08, 2025

RCML Registration Table

8:00 AM – 1:00 PM

RCML Breakfast

8:00 AM – 8:55 AM

Exploring mathematics and relationships: The role of care in calculations

9:00 AM – 9:55 AM | Location: South 40

50 MINUTE PRESENTATION

There is a desire within many in the mathematics education community to convince folks we are all 'math people' (Nabb & Lunsman, 2021). While the intention in doing so is often good, imposed inclusion in the mathematical community can risk conflating inclusion and enforcement, assuming mathematics is something everyone must want. In this project, I interviewed two adults (a hairstylist and an illustrator) who do not identify as mathematically skilled to investigate how school mathematical hauntings (Gordon, 1997) manifest, and how to explore those hauntings without assuming learners want to become math people. In this session, I will share participant statements regarding how they consider the emotional weight of setting their prices (e.g. How do you put a numerical price on your worth or on social justice?). Their thinking was beyond the reach and scope of many mathematics classrooms, however they still felt in some ways intellectually insufficient without a mastery of school mathematics. In this session, I will discuss how we in mathematics education can be inclusive without enforcing inclusion. We will discuss and explore how to interact with learners' hauntings without reaffirming the dominance of school mathematics.

Gordon, A. F. (2008). *Ghostly Matters: Haunting and the Sociological Imagination*. U of Minnesota P.
Nabb, K., & Lunsman, P. (2021). Every Child is a Mathematician. *Math Horizons*, 28(2), 34-34.

Speaker



Alexandra Aguilar

The University of Texas at Austin

Through the Glass Box: Navigating Reality in Mathematics Tasks for Geometry Classes

9:00 AM – 9:55 AM | Location: North 40

50 MINUTE PRESENTATION

Objective: In this presentation, we will describe a set of tasks we developed for high school and college geometry classes. The goal was to make connections between textbook material and experiences out of the classroom.

Background: The presentation continues our 2024 RCML session that looked at tasks for Algebra II. We look at a different secondary mathematics course, Geometry. We also explore tasks for university-level Geometry. While the previous year's work gave almost too many opportunities, we found fewer connections between context and content.

Content: One secondary example is using perpendicular bisectors to model the placement of a cell phone tower equidistant to three cities. A university example would be an axiomatic system of geometry using the card get *SET*, as described by Carney (2021).

Issues: Integrating tasks with contexts outside the regular classroom invites a valuable question: how realistic is the context? Is the context realistic and meaningful enough to spark student interest? Do out-of-classroom contexts provide enough interest to move away from traditional teaching? One concern may be high school geometry is focused on preparing students to prove results from Euclidean geometry (Wu, 1996).

References

Carney, J. (2021). *SET and affine geometry* [Unpublished REU paper]. University of Chicago.

Wu, H.-H. (1996). The role of Euclidean geometry in high school. *Journal of Mathematical Behavior*, 15, 221–237. [http://dx.doi.org/10.1016/S0732-3123\(96\)90002-4](http://dx.doi.org/10.1016/S0732-3123(96)90002-4)

Speaker



Ryan Fox

Associate Professor of Mathematics Education | Belmont University

Co-speaker



Huntir Bass

Mathematics Teacher | The Woodlands High School

Empowering Students Through a Quantified Community Approach: Leveraging Student-Led Data on Classroom Community for STEAM Learning

9:00 AM – 9:55 AM | Location: Mockingbird A

50 MINUTE PRESENTATION

This research explores how engaging upper elementary school students in collaborative behavioral inquiry can shape mathematics learning from sociocultural and sociopolitical perspectives. Building on the quantified self framework (Lee et al., 2021)—in which individuals collect and analyze data about their own activities—we implemented a "quantified community" approach. In this approach, students tracked their behaviors related to class "readiness" to engage in daily goal-setting meetings, using a set of criteria they collaboratively defined to cultivate safe and productive dialogic cultures. Based on an analysis of video and classroom artifacts, we found that, over time, students refined the data collection process and redefined the teacher's role, focusing on cultivating a positive classroom culture. This shift reduced the time needed to achieve "readiness" and fostered positive peer interactions. As a result, the classroom became a stronger, student-driven community where learners took greater ownership. By recognizing the practical relevance of mathematics in their daily interactions, students also deepened their engagement with mathematical learning. Examples of this practice will be showcased, illustrating how students integrated mathematical analysis with community-focused and civic-minded objectives. This timely study opens new avenues for exploring current educational goals of fostering student agency, community involvement, and real-world integration in mathematics.

Speaker



Scarlett Calvin

PhD Student in STEM education | The University of Texas at Austin

Co-speaker



Hakeoung Hannah Lee

PhD Candidate in STEM education | The University of Texas at Austin

Characterization of math research partnerships in the literature

9:00 AM – 9:55 AM | Location: Mockingbird B

50 MINUTE PRESENTATION

1. A systematic analysis of mathematics education research partnerships and their processes helps us understand how to develop, support, and sustain effective research partnerships. We will share themes derived from analyzing over 500 full-text articles identified from over 7K abstract reviews in this systematic literature review.
2. While broader literature discusses research partnerships (see Coburn & Penuel, 2016), mathematics education research partnerships are less understood. It is essential to explore how these partners engage within the context of research projects. Such research will expand our capacity to build better, more effective, and more sustainable partnerships.
3. We build on our previous work on mathematics education research partnerships and describe our initial extraction process of the full-text reviews. We present initial findings on our research question: How are research partnerships characterized in mathematics education literature?
4. Participants will consider key characteristics contributing to effective mathematics research partnerships and the barriers to their impact. They will then reflect on the preliminary data presented relative to their own engagement in these partnerships. Finally, they will engage in discussion about the significance of studying these partnerships.

References

Coburn, C. E., & Penuel, W. R. (2016). Research–practice partnerships in education: Outcomes, dynamics, and open questions. *Educational researcher*, 45(1), 48-54.

Speaker



Tina Mitchell, Ed.D.

Director, Graduate Programs in Education | Delaware State University

Co-speakers



Trena L. Wilkerson

Professor | Baylor University



Colleen Eddy

Associate Professor of Mathematics Education | University of North Texas

Karen C. Enderle

Graduate Teaching Assistant | Clemson University



Megan Che

Associate Professor of Mathematics Education | Clemson University



Lianne Jones

Assistant Professor, Elementary Education | Appalachian State University

“Why can’t I buy more fencing?”: An Exploration of High School Students’ Perspectives of an Authentic Task

9:00 AM – 9:25 AM | Location: Mockingbird C

25 MINUTE PRESENTATION

The purpose of school mathematics is far more than college and career readiness; it has the potential to broaden students' professional opportunities, help them critique the world, and fully experience the real world and mathematics (NCTM, 2018). Authentic tasks serve as a vehicle to connect mathematics to the real world, are embedded in a context in such a way that there is no pre-decided strategy, and provide students the opportunity to apply concepts to situations outside of school (Tan & Nie, 2015). In this session, the presenter will share how students engaged with an authentic task and their perspectives on mathematics related to the real world. The audience will view student work and discuss students' takes on mathematics, also reflecting on what their own instructional practices communicate about the purposes of mathematics.

National Council of Teachers of Mathematics (Ed.). (2018). Catalyzing change in high school mathematics: Initiating critical conversations. The National Council of Teachers of Mathematics.

Tan, J. P.-L., & Nie, Y. (2015). The Role of Authentic Tasks in Promoting Twenty-First Century Learning Dispositions. In Y. H. Cho, I. S. Caleon, & M. Kapur (Eds.), *Authentic Problem Solving and Learning in the 21st Century* (pp. 19–39). Springer Singapore. https://doi.org/10.1007/978-981-287-521-1_2

Speaker



Margeaux Smith

Equity-Minded Redesign of the Calculus Pipeline at the forefront of AB 1705 legislation in California

9:00 AM – 9:55 AM | Location: Mockingbird D

50 MINUTE PRESENTATION

Equity minded redesign of calculus pipeline research focuses on building an inclusive future for student success advancing equity, diversity, inclusion, and accessibility through innovative mathematics pathways and support systems at Citrus College in line with California Assembly Bill (AB) 705/1705 – Equitable Placement and Completion legislation implementation. The research goal is to ensure all students, including those from disproportionately impacted groups, have access to transfer-level mathematics courses, such as *Calculus 1 with Support* and *Path to Calculus with Support*. The co-requisite model developed prioritize student-centered classroom re-design with innovative pedagogy, modular furniture and 360-degree whiteboards to encourage collaboration. Just-in-time remediation and growth mindset activities help students from diverse backgrounds engage with challenging material, build confidence, and develop a sense of belonging in rigorous mathematics pathways. By replacing traditional placement tests and embedding support services within the classroom, students are empowered to succeed in transfer-level mathematics on their first attempt resulting in one-year throughput rate in mathematics courses to 70%, while reducing equity gaps. Additionally, community building ensures consistency, innovation, and professional growth, enhancing overall institutional effectiveness resulting in cross-campus collaboration—between faculty, counselors, and Institutional Research, Planning and Effectiveness teams—leading to transformative change.

Speakers



Bala Raja

Dean of Mathematics | Citrus College



Robert Chen



Sophia Lee

Professor Of Mathematics | Citrus College



Yueyi Huang

Senior Research Analyst | Citrus College

Culturally Relevant Math Modeling and Community Contexts in Teacher Education

10:00 AM – 10:55 AM | Location: Mockingbird A

50 MINUTE PRESENTATION

Objective/Purpose:

The goal is to equip the audience with tools in teaching math modeling with cultural and community contexts. They will gain knowledge in culturally relevant math modeling and the intersection of mathematics, math modeling, and culture.

Background to Support the Argument/Analysis

Math modeling is an important high-leverage topic for participation in STEM education and civic engagement (Aguire et al., 2019; Borromeo Ferri, 2018). Making math accessible and equitable for all students involves creating and sustaining a classroom culture that is responsive to students' backgrounds, experiences, and culture (Kalinec-Craig et al., 2019; NCTM 2018).

Content of Presentation

This presentation will help PSTs construct meaning and develop understanding of making mathematics accessible and equitable for all students. There will be opportunities for participants to engage in a math modeling tasks that emphasize cultural and community contexts.

Issues for Discussion

This session is designed to promote a lively discussion in an inclusive environment. This collaborative approach ensures that pertinent issues are explored from multiple perspectives and facilitates a deeper understanding of the intersection of *mathematics, math modeling, and culture and community contexts*.

Limited References

National Council of Teachers of Mathematics (NCTM). (2018). *Catalyzing change in high school mathematics: Initiating critical conversations*. NCTM

Speaker



Reuben Asepapa

Penn State University-Harrisburg

Recontextualizing Play in the Mathematics Classroom: A Framework of Playful Mathematics

10:00 AM – 10:55 AM | Location: Mockingbird B

50 MINUTE PRESENTATION

Play is fundamental to human development and has many benefits for children, including enjoyment, building physical, emotional, and social skills, learning about cooperation and collaboration, and practicing taking risks (Gray, 2009). It is common, however, for mathematics schooling experiences to be limited in play opportunities (Miller & Almon, 2009). Exploring how mathematics teachers can engage students in play that supports learning can help create environments that are equitable and inclusive for all students (Parks, 2015). We created a framework, titled The Framework of Playful Mathematics to support mathematics researchers and educators in finding new ways to define, observe, and implement play in the mathematics classroom. In this session, we will share the constructed framework and examples of how to recontextualize play and playfulness in mathematics education spaces. Participants will engage in playful mathematics tasks while discussing the importance of the framework and how it can be used in various settings (i.e., elementary and middle grade classrooms). Our goal is to provide a tool to help identify moments of play and playfulness that may be occurring in mathematics teaching and learning.

Gray, P. (2009). Play as a foundation for hunter-gatherer social existence. *American Journal of Play*, 1(4), 476-522.

Parks, A. N. (2015). *Exploring Mathematics Through Play in the Early Childhood Classroom*. New York, NY: Teachers College Press.

Speaker



Amy Rae Johnson

PhD Student | The University of Texas at Austin

Co-speakers



Carlos Nicolas Gómez Marchant

Associate Professor of STEM Education | The University of Texas at Austin



Alexandra Aguilar

The University of Texas at Austin



Max Love

Graduate Student | The University of Texas at Austin



Ana Benitez

The University of Texas at Austin



Jessica Cortez

Graduate Student | The University of Texas at Austin

Influences of Communities of Practice on a Mathematics Related Teacher Identity

10:00 AM – 10:55 AM | Location: Mockingbird C

50 MINUTE PRESENTATION

This presentation explores how a teacher's identity shapes their mathematics instruction and the learning opportunities they provide to students. A teacher's identity is influenced by the different communities of practice (CoPs) they engage with at their schools. These different interactions within the different CoPs can be visualized as interlocking gears that work together to build a teacher's identity. These different experiences contribute to the ongoing development of their identity.

Understanding these dynamics can help schools foster supportive communities that encourage positive identity growth, ultimately leading to stronger math instruction and more equitable student learning opportunities. Additionally, these insights can help teacher preparation and induction programs prepare their teacher(s) (candidates) to navigate the different CoPs they will be engaging with as they become teachers.

Teacher identity is a growing area of interest, as it is shaped by many factors the impact both the individual teacher and their broader professional practice. Exploring these factors further and can deepen our understanding of how identity influences teaching and learning.

Speaker



Kelly Navas

Postdoc | University of South Florida

The Art of Mathematics: A College-Level Course for Non-STEM Majors

10:00 AM – 10:55 AM | Location: Mockingbird D

50 MINUTE PRESENTATION

The purpose of this study is to understand how a college-level mathematics course, the Art of Mathematics (AoM), designed for non-STEM majors changes students' attitudes towards mathematics. The AoM is designed with an overarching goal of offering a non-traditional mathematics course to help inspire and motivate students towards mathematics. The AoM, while dealing with more theoretical topics such as number theory and topology, emphasizes the problem-solving strategies used to solve mathematical problems that are universal and can be applied to solving day-to-day problems to engage students, give them a new appreciation of mathematics, and boost their self-confidence. A pre- and post-survey design was used to explore the impact of AoM on students. The survey included both Likert-scale items measuring motivation and anxiety (through aggregated scale scores) and open-ended responses to qualitatively explain the impact. Paired-sample *t*-test results indicated that students significantly improved their motivation, enjoyment, utility value, and self-confidence in mathematics; reduced their evaluative anxiety; did not, however, change their learning anxiety. Open-ended responses highlighted realization of real-world applications and utility; safe, inclusive, and comfortable environment to learn mathematics; and connection between mathematics and creativity that the AoM course allowed. Some students expressed anxiety about the multiple ways of solving mathematics problems in the homework assignments and lack of background knowledge to engage in some mathematics topics. The presentation will give an overview of this innovative course, share the findings, and encourage discussions around how to motivate all students to learn mathematics and reduce their anxiety in doing so.

Speakers



Betul Orcan

Associate Teaching Professor | Rice University



Adem Ekmekci

School Mathematics Project | Rice University

Postsecondary Mathematics Teaching Methods and Practices: Experiences and Professional Development

10:00 AM – 10:25 AM | Location: South 40

25 MINUTE PRESENTATION

This session shares the results of a qualitative study that followed a national study designed to gather information about teaching methods and practices utilized by faculty of introductory college-level mathematics courses.

According to Complete College America (2019), only 5% of students in 2-year colleges and 8% of students in 4-year colleges will successfully complete their first mathematics course within one year. While there could be many reasons why students fail to complete their required mathematics course(s), research specifically addressing college mathematics faculty and their choices of teaching methods and practices has been scant.

The researcher followed up with participants from the national study. Four themes helped to explain why participants chose specific teaching methods and practices within their introductory college mathematics courses. The faculty who participated in professional development seemed more open to new teaching methods and practices because they felt supported in their teaching endeavors. What are ways to promote attendance and incorporate experiences for professional development sessions?

Chemosit, C. C., & Rugutt, J. K. (2020). The Impact of Professor Engagement, Student Peer Interactions, and Traditional Status on Student Assessment of Quality of Teaching and Learning. *Educational Research Quarterly*, 44(1), 64–83.

Opper, I. M. (2019). *Understanding Teachers' Impact on Student Achievement*.

Speaker



Molly Bowen

Adjunct Lecturer of Mathematics | Baylor University

Three Approaches to Student Motivation in Linear Equations: The Mathematics Teachers' Guide

11:00 AM – 11:55 AM | Location: North 40

50 MINUTE PRESENTATION

This research investigates how motivational approaches impact student engagement in algebra, particularly in simple linear equations ($y = ax$). Using affective, cognitive, and socio-cultural frameworks, it examines key factors shaping student motivation and offers strategies to foster supportive classroom environments. Targeting 5th-8th graders, the study addresses critical aspects of mathematics learning and provides practical methods for motivating students. Combining research-based strategies with classroom applications, the study demonstrates how emotional, cognitive, and social dynamics influence engagement. Transitioning from arithmetic to abstract concepts like linear equations often leads to disengagement, hence the need to explore ways to enhance motivation (Boaler, 2016).

The research focuses on affective motivation (emotions like curiosity or anxiety) (Hannula, 2012), cognitive motivation (self-efficacy, task design), and socio-cultural motivation (classroom environment, peer interactions). The session will highlight strategies to reduce math anxiety, improve self-efficacy, and promote a growth mindset in algebra learners (Schukajlow et al., 2023).

References

Boaler, J. (2016). *Mathematical mindsets*. Jossey-Bass.

Hannula, M. S. (2012). Motivation in mathematics. *Educational Studies in Mathematics*, 80(1-2), 157-173.

Schukajlow, S., Rakoczy, K., & Pekrun, R. (2023). Emotions and motivation in mathematics education. *ZDM Mathematics Education*, 55, 249-267.

Speaker



Humphrey Ochulor

Graduate Student | Purdue University

MAPP2Calc: Micro-Active Pedagogies for PreCalculus to Calculus

11:00 AM – 11:55 AM | Location: South 40

50 MINUTE PRESENTATION

This session discusses both a theoretical and a practical consideration of the potential for constructivist pedagogies implemented on a micro-scale to facilitate (pre)calculus students' reasoning and sense making.

In this work, I adopt a micro-constructivist approach (Knorr, 1981; Leydesdorff, 1993) to “account for the specificities of localized action and interaction” and to examine “specific episodes” (Leydesdorff, 2003, p. 4)--in this case, specific micro-infusions of pedagogical adjustments with (pre)calc extant materials. This micro-responsive constructivist framework positions us to reject determinism for the nonlinear dynamics inherent in potential (Leydesdorff, 2012).

This session will discuss the theoretical framing of this effort, which is to begin where (pre)calculus instruction is living and make responsive, constructivist, micro adjustments and adaptations in the direction of reasoning and sense-making, with a particular emphasis on representation and sequencing of tasks. We will examine three side-by-side comparisons of extant (pre)calculus materials and Micro-active Pedagogical (MAP) materials as a way of initially operationalizing the field of possibilities for MAP instruction to support student learning. Our discussion will consider the potential for MAP to address the pervasiveness of traditional pedagogies in (pre)calculus.

Leydesdorff, L. (2003). Interaction versus action in Luhmann's sociology of communication. *Rethinking Communicative Interaction*, 163.

Speaker



Megan Che

Associate Professor | Clemson University

Adapting Thinking Classrooms in Higher Education: Provoking Thought and Inspiring Student Synergy Through Active and Generative Learning

11:00 AM – 11:55 AM | Location: Brazos Amphitheater

50 MINUTE PRESENTATION

The Building Thinking Classrooms (BTC) framework has become a prominent topic of discussion in mathematics education as educators face the challenge of engaging students who are disinterested or reluctant to learn. The negative stigma surrounding math, coupled with the anxiety and trauma many students carry from past experiences, has made this an increasingly difficult barrier to overcome.

Active and generative learning encourages students to engage with content, construct knowledge, and participate in hands-on experiential activities. Despite growing evidence supporting these methods, they are not widely adopted in higher education mathematics classrooms (Børte et al., *Barriers to Student Active Learning in Higher Education* 2023). While some faculty integrate these strategies into traditional lectures, they often do so cautiously, blending them with didactic methods rather than fully embracing them (Laursen, *Levers for Change: An Assessment of Progress on Changing STEM Instruction* 2019).

This presentation explores student experiences in higher education mathematics courses that implement the BTC framework (Liljedahl, *Building Thinking Classrooms in Mathematics* 2021), active learning, and generative learning approaches in contrast to traditional didactic instruction. Specifically, we will investigate some students' challenges when adapting to these dynamic synergy spaces and some successes/opportunities created.

Speaker



Brentley Bendewald

Math Instructor | Tarleton State University

Co-speaker



Aria Dougherty

Assistant Professor of Mathematics | Tarleton State University

Mathematical Task: Student Representations and Instructional Connections

11:00 AM – 11:55 AM | Location: Mockingbird A

50 MINUTE PRESENTATION

Objective/Purpose: While research has explored factors contributing to effective implementation of mathematical tasks (e.g., Stein & Smith, 2011), little attention has been given to the representations students produce and connections they make. We argue the need for deeper exploration of students representations and connections.

Background: Mathematical tasks in reform-oriented classrooms promote reasoning and problem-solving and provide insights into students' reasoning and misconceptions (NCTM, 2014). However, if students do not connect their representational activities to underlying mathematical concepts, the task's impact is reduced. Given the potential of these tasks to elicit unique and unanticipated student representations and connections, we argue the need for further consideration.

Content: This session presents research informed strategies to help students make meaningful connections on mathematical tasks, fostering deeper understanding. It also identifies areas for future research to refine task based instruction.

Issues for Discussion: The session will explore how mathematical tasks, student representations, and instructional connections interact, focusing on the S-pattern task.

References (limited): National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring Mathematical Success for All*. Reston, VA: NCTM.

Speaker



Kwaku Adu

East Carolina University

Mathematical Conferencing: An Intervention of Astronomical Proportions

11:00 AM – 11:55 AM | Location: Mockingbird C

50 MINUTE PRESENTATION

Purpose

This study reports on the results of a mathematical conferencing intervention within introductory astronomy courses that incorporate empirical and quantitative skills, critical thinking skills, teamwork, and communication skills.

Background

A series of mathematics skills-focused homework assignments were created in the context of astronomical concepts (including topics of scientific notation, percentages, interpretation of graphs, and solving equations). Students then worked in groups to present their solutions in a conference-like setting.

Content of Presentation

The student demographic examined are often less prepared for college level work (Atherton, 2014), especially in mathematics, and require additional support (Eveland, 2020). An interdisciplinary collaboration between professors in both the astronomy and mathematics departments examined the effectiveness of a mathematical conferencing intervention.

Issues for Discussion

Results of the conferencing intervention showed a high level of student engagement and active learning along with higher levels of mathematical skill by the end of the semester.

Atherton, M. C. (2014). Academic Preparedness of First-Generation College Students: Different Perspectives. *Journal of College Student Development*, 55(8), 824–829.

Eveland, T. J. (2020). Supporting first-generation college students: Analyzing academic and social support's effects on academic performance. *Journal of Further and Higher Education*, 44(8), 1039–1051.

Speaker



Emma Bullock

Associate Professor | Sam Houston State University

RCML Lunch and Closing

12:00 PM – 1:00 PM