

EMMA ECCLES JONES
COLLEGE OF EDUCATION
AND HUMAN SERVICES

MATHEMATICS EDUCATION — AND — LEADERSHIP NEWSLETTER

UtahState
University®

Spring 2019
Vol. 8, Issue 2

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NSF Grant Funds Coding in Kindergarten Research Project

Drs. Jody Clarke-Midura, Jessica Shumway, and Victor Lee were awarded over one million dollars from the National Science Foundation's STEM+C Program to develop curriculum and assessments for integrated mathematics and computer science learning in kindergarten classrooms. Math education PhD students, Joey Kozlowski and Lise Welch, are Graduate Research Assistants on the funded project. Hannah Evans, an undergraduate researcher from SPER, and Heather Gardner, a graduate researcher in ITLS, are also members of the project team. The Coding in Kindergarten research team is interested in the ways early childhood coding toys provide engaging contexts for kindergarten students to learn how to code while developing mathematical and computational thinking. Joey, Lise, and Hannah presented preliminary findings on the ways students use different perspectives to assist them in debugging programs and using their spatial reasoning to navigate the robot on a grid at the 2019 USU Student Research Symposium.



Math Education Graduate Research Assistant, Joey Kozlowski, teaching kindergarten students programming skills with the Code-a-pillar robot.



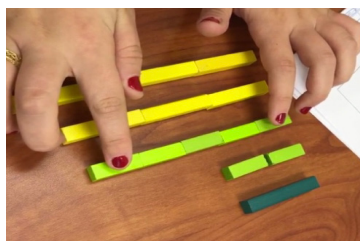
Joey Kozlowski, Hannah Evans, and Lise Welch present at the 2019 USU Student research Symposium.

National Conference Working Group Led by USU Math Educators

Beth MacDonald and Diana Moss (of USU) joined Steve Boyce, Jessica Hunt, and Cameron Byerley as leaders of a working group at the 40th Annual North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA) fall 2018 conference in Greenville, South Carolina. The working group was titled: *Complex Connections: Reimagining Units Coordination*. The purpose of the group was to extend the discussions surrounding research on learning theories associated with units construction

and coordination (Norton & Boyce, 2015) in mathematics education. On average, about 12 additional conference participants consistently joined this working group over the three-day experience.

Three research projects developed as a part of this working group. This collaboration resulted in the development of 5 manuscripts and 11 conference proposals at 4 national and international conferences. Discussions from the 2018 working group included at least two new members to begin research initiatives in the units construction/coordination field. The working group developed a webpage (<https://unitscoordination.wordpress.com/>) to improve organization of the research on this topic and to share research publications. In fall 2019, the working group will meet in St. Louis, Missouri to continue their initiatives. These plans include proposing a special issue of a journal and developing a collaborative grant proposal.



Note: Units are being coordinated to construct unit fractions and the referent whole to solve a problem with an improper fraction.

Math Educators Present at Multiple Conferences

The 2018-2019 academic year was an exciting time for mathematics educators from the School of Teacher Education and Leadership to share their research work at multiple professional conferences. At the Association of Mathematics Teacher Educators (AMTE) conference in Orlando, Florida, Jessica Shumway and Heather Gardner presented their research on teachers' successes and challenges with ambitious mathematics teaching, and Diana Moss presented her research on professional teacher noticing. At the Society for Information Technology and Teacher Education (SITE) conference in Las Vegas, a team of faculty and doctoral students presented four research papers on digital math games, and team members Kristy Litster and Patricia Moyer-Packenham won an Outstanding



UCTM Conference 2018

Beth MacDonald, Kristy Litster, Jessica Shumway;
(back) Jet Warr, Hannah Lewis, Jessica King, Rachel Reeder,
Monika Burnside, Felicia Messervy,
Sara Urbanek-Carney, and Annika Jensen

Paper Award. At the American Education Research Association (AERA) conference in Toronto, faculty and doctoral researchers presented several papers and poster sessions on topics including an instructional treatment's influence on students' number system knowledge learning and how the design features in digital math games promote children's awareness of the game affordances. At the Utah Council of Teachers of Mathematics (UCTM) conference in Draper, Utah, faculty, graduate and undergraduate students presented on early number development, symbol sense, teachers' talk moves, and ways to support students in special education. At the National Council of Teachers of Mathematics (NCTM) conference in San Diego (not



AMTE Conference 2019

Derrick Harkness, Heather Gardner, Jessica Shumway,
Kimberleigh Hadfield, and Diana Moss

pictured), faculty and students reported research on differentiation, discourse models, encouraging girls in mathematics, MC Escher in math class, and use of arrays for number system knowledge learning.



SITE Conference 2019

Joey Kozlowski, Allison Roxburgh, Patricia Moyer-Packenham, Kristy Litster, and Jill Ashby



AERA Conference 2019

Joey Kozlowski, Allison Roxburgh, Patricia Moyer-Packenham, Kristy Litster, and Jill Ashby

Undergraduate Students Shine in Math Ed Research

Jessica King and Monika Burnside are Undergraduate Research Assistants (URAs) in Dr. Jessica Shumway's Early Mathematics Research Group (EMRG). The group is studying the influence of an instructional treatment on second-grade students' number sense. The URAs learned to create curriculum materials, assess students, take field notes, videotape teaching episodes, organize and clean data, and analyze data in preparation for sharing research results from the project. To date, Jessica and Monika have participated in five conference presentations. They presented the project's quantitative results at the USU Student Research Symposium and USU Fall Undergraduate Student Research Symposium. Next they presented the results on teachers' talk moves, student engage-

ment, and student achievement outcomes at the Utah Conference on Undergraduate Research. Jessica and Monika tried new ideas that extended the intervention



Jessica Shumway, Jessica King, and Monika Burnside

research by implementing several lessons with second-grade students at the Edith Bowen Laboratory School. Jessica and Monika, and mentor Dr. Jessica Shumway, presented pedagogical techniques at the

Utah Council for Teachers of Mathematics Conference in Utah, and at the National Council of Teachers of Mathematics Annual Conference in San Diego, California. Monika Burnside graduated with a BA in Elementary Education and a mathematics emphasis in December 2018 and is now a fourth-grade teacher at Ellis Elementary in the Logan City School District. Jessica King graduated with a BA in Elementary Education and a mathematics emphasis in May 2019 and was honored as TEAL's 2019 Undergraduate Researcher of the Year. She has accepted a position as a fifth-grade teacher at Bridger Elementary in Logan City School District.

Litster Receives Multiple Awards



Kristy Litster, a fourth-year PhD student in the Mathematics Education and Leadership concentration in the School of Teacher Education and Leadership, recently received multiple awards and accolades for her outstanding scholarship and service. At the Society for Information Technology and Teacher Education (SITE) International Conference, held in March 2019 in Las Vegas, Nevada, Kristy, and co-author Patricia Moyer-Packenham, received the Outstanding Paper Award for a paper titled: *How the Balance of Gaming and Mathematics Elements Effects Student Learning in Digital Math Games*. Key findings of the study indi-

cated the importance of a balanced focus on both gaming and mathematics affordances to support student learning with digital math games. In April 2019, Kristy received the School of Teacher Education and Leadership's Graduate Student Researcher of the Year Award. Kristy received this award based on her outstanding scholarship record, which includes a total of 14 publications, including 3 refereed journal articles, 1 monograph, 1 book, 9 refereed conference proceedings, with two of these receiving outstanding paper awards. In April 2019, Kristy received the Outstanding Service Commendation from the Research in Mathematics Education Special Interest Group (SIG-RME) of the American Educational Research Association (AERA) at a ceremony in Toronto, Canada. As the Graduate Vice President of the RME-SIG, Kristy instituted new initiatives and important mentoring sessions between senior and junior scholars to promote academic growth and collaboration across members of the RME-SIG. She was also recognized as the Volunteer of the Year for her service as the Chair of the Science Fair for Logan City Schools, Logan, Utah. Congratulations Kristy!

Spring 2019 Graduation

Four students in the Mathematics Education and Leadership concentration, Lauren Burton, Kami Dupree, Melanie Durfee, and Andrew Glaze, were awarded the PhD in Education degree at this year's spring 2019 graduation ceremony.

Lauren Burton's dissertation was titled: *A Case Study on How Meeting the Academic Needs of Students Substantially Below Grade Level in Mathematics Affects Their Self-Efficacy Beliefs and Engagement* (Major Professor: Beth MacDonald). Results of this study suggested that the structure of a mathematics class can relate to students' increased self-efficacy, cognitive engagement, and behavioral engagement. Kami Dupree's dissertation was titled: *Secondary Mathematics Teachers' Responses to Pivotal Teaching Moments* (Major Professor: Patricia Moyer-Packenham). Dupree's results confirmed existing classifications of pivotal teaching moments and teachers' responses to them, and suggested a relationship between pivotal teaching moments and teacher knowledge development.

Melanie Durfee's dissertation was titled: *An Exploratory Case Study of How High-Performance Team Training Develops Sociomathematical Norms and Differing Levels of Math-Talk* (Major Professor: Beth MacDonald). This study showed the important role of the teacher in maintaining high levels of math-talk through problem selection, understanding context,

and self-identification of errors. Andrew Glaze's dissertation was titled: *Teachers' Conceptions of Mathematics and Intelligent Tutoring System Use* (Major Professors: Max Longhurst and Patricia Moyer-Packenham). Glaze found that mathematics teachers used Intelligent Tutoring Systems primarily for procedural practice and filling gaps in student understanding. Congratulations graduates!



Drs. Lauren Burton, Andrew Glaze, Melanie Durfee, and Kami Dupree



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About Us

The Mathematics Education and Leadership Programs in the School of Teacher Education and Leadership in the Emma Eccles Jones College of Education and Human Services provide students with a variety of advanced study options in mathematics education at the graduate level. Students can select the Mathematics Education and Leadership Concentration in the PhD program, the Elementary Mathematics Endorsement emphasis in the Master of Education Degree in Elementary Education, professional development credit in the online Elementary Mathematics Teachers Academy, or the Secondary Mathematics Emphasis in the Master of Education Degree in Secondary Education. The Mathematics Education and Leadership Programs at Utah State University provide students with opportunities to focus on enhancing their mathematics education expertise and develop leadership skills for positions at all levels of mathematics teaching, learning, supervision, and research. Contact the director today to begin your graduate work in Mathematics Education and Leadership at Utah State University!

Patricia Moyer-Packenham, PhD

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