

MATHEMATICS EDUCATION — AND — LEADERSHIP NEWSLETTER

UtahState
University®

Spring 2018
Vol. 7, Issue 2

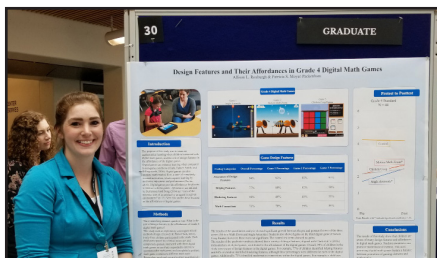
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Roxburgh Wins Presidential Doctoral Research Fellowship

Allison Roxburgh was recently selected to receive Utah State University's Presidential Doctoral Research Fellowship. The Presidential Doctoral Research Fellowship (PDRF) is the highest honor received by PhD candidates at Utah State University and includes \$20,000 of support per year for up to four years, covers 100% of tuition costs associated with the program of study, and 80% of the costs associated with graduate student health insurance. Allison was selected as the outstanding PhD student for a Graduate Teaching/Research Assistantship Fellowship position in Mathematics Education in the School of Teacher Education and Leadership. The expectations for the PDRF are to be an outstanding, productive graduate student researcher. Prior to pursuing her PhD, Allison



received her Bachelor's and Master's Degrees from Utah State University and was a classroom teacher in Grades 3 and 4 at Stansbury Park Elementary School and Wilson Elementary School.

The PDRF award includes opportunities to participate in the graduate student grant-writing seminar, participate annually in the Student Research Symposium, teach one university course each semester (online, face-to-face, or broadcast), gain experience mentoring undergraduate researchers, and be an ambassador for the department, college, and PDRF program. In April 2018, Allison presented a poster at the USU Student Research Symposium titled: *Design Features and Their Affordances in Grade 4 Digital Math Games*. This project showed that children in Grade 4 made significant gains on two of the three digital math games, and that the games with a better balance between the mathematics content and the gaming features may have contributed to these positive results.

Math Education Graduates: Spring 2018

Two students from the Mathematics Education and Leadership (MEL) concentration graduated with their PhDs in this year's spring 2018 graduation ceremony: Christina Lommatsch and Jennifer Throndsen. Patricia Moyer-Packenham was the Chair of Christina's dissertation. Moyer-Packenham and Jessica Shumway were the Co-Chairs of Jennifer's dissertation. Christina's dissertation was titled: *Learning Logic: A Mixed Methods Study to Examine the Effects of Context Ordering on Reasoning about Conditionals*. This study investigated how the ordering of teaching four conditional contexts influenced college students' reasoning about conditionals. Christina developed the Learning Logic App for the study and students were assigned to different conditions to play the app. The results showed that the most beneficial context ordering for learners' performance was symbolic-intuitive-abstract-counterintuitive, and that incorporating a catalyst at the beginning of the learning progression may aid learners in connecting with their prior knowledge and enhance their overall learning.



Left to Right: Patricia Moyer-Packenham, Christina Lommatsch, Jennifer Throndsen & Jessica Shumway

Jennifer's dissertation was titled: *Relationships among Preschool Attendance, Type, and Quality and Early Mathematical Literacy*. This study examined how preschool attendance, type and quality were related to kindergarten children's early mathematical literacy scores on the Kindergarten Entry and Exit Profile (KEEP) assessment. While attendance and quality did not influence mathematical literacy overall, there were positive benefits for several demographic subgroups. In addition, children who participated in online preschool programming experienced the highest mathematical literacy scores. The results suggest that children from diverse backgrounds experience positive benefits in mathematical literacy when they attend preschool.

Bullock Wins Two Dissertation Awards

Dr. Emma Bullock, an Assistant Professor of Mathematics Education at Sam Houston State University, and a 2018 graduate of the Mathematics Education and Leadership concentration in the PhD program at Utah State University, was selected as the 2018 recipient of the Outstanding Dissertation Award in two dissertation competitions. First, Dr. Bullock received the 2018 Outstanding Dissertation Award for the Mixed Methods International Research Association (MMIRA). This is a prestigious international award and Dr. Bullock will travel to Vienna, Austria to accept the award and the \$1,000 honorarium prize. Dr. Bullock received the second Outstanding Dissertation Award from the School of Teacher Education and Leadership at Utah State University. Dr. Bullock's dissertation Chair was Dr. Patricia Moyer-Packenham, and the members of her dissertation committee were Drs. Brynja Kohler, Beth MacDonald, Jessica Shumway, and Susan Turner.



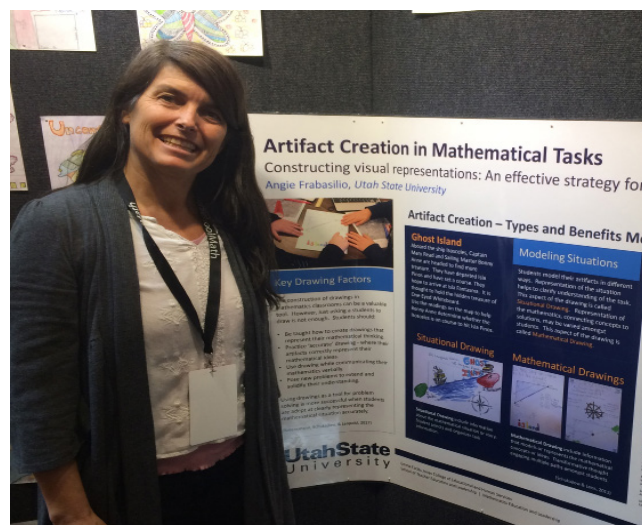
Dr. Bullock's dissertation was titled: An Explanatory Sequential Mixed Methods Study of the School Leaders' Role in Students' Mathematics Achievement through the Lens of Complexity Theory. This dissertation represents a unique contribution to understanding the

intersection of school leadership and mathematics education. While complexity theory has been used to model and explain the complexities of businesses and biological organisms, it has only recently been applied to understanding the complexities of a school. Dr. Bullock's experiences as a school principal and secondary mathematics teacher motivated her to investigate how school leaders implement changes to improve students' mathematics achievement. The results of this study showed that schools with achievement that was higher than expected showed evidence of the school leader: 1) promoting a shared vision of mathematics education among various stakeholders; 2) providing sustained, coordinated, and longitudinal mathematical supports for teachers; engaging in distributed ownership of data; and relying on licensed teachers and quality technology.

Frabasilio Selected for National MidSchoolMath Presentation

Angie Frabasilio, a second-year PhD student in the Mathematics Education and Leadership program at Utah State University, was selected by the CEO and Co-Founder of the MidSchoolMath Organization, to present her mathematics classroom work at the MidSchoolMath National Conference in Santa Fe, New Mexico on March 2-3, 2018. The MidSchoolMath conference brings together middle school educators to focus entirely on middle school mathematics topics. The MidSchoolMath organization was founded to address the severe decline in students' mathematics performance in the United States during the middle school years.

The title of Angie's poster presentation was: *Artifact Creation in Mathematical Tasks: Constructing Visual Representations – An Effective Strategy for Problem Solving*. This poster focused on student-created artifacts and drawings developed as a result of working on mathematical tasks. The poster described how Frabasilio's students use artifacts as a method for mathematical problem solving that lessens their cognitive load and enhances student understanding during less structured mathematical tasks. Angie was selected to present at the conference because she has shown an interest in mathematical tasks and leads her school Professional Learning Community team to explore and engage in using mathematical tasks as a learning tool. Angie is currently a seventh-grade mathematics and STEAM teacher at Sunrise Ridge Intermediate School in Springdale, Utah.

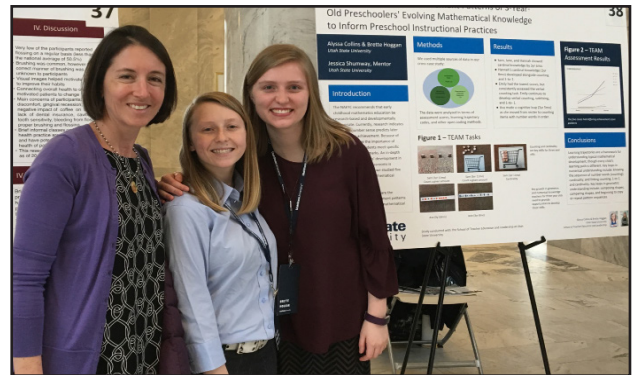


Shumway Mentors Undergraduate Student Researchers

Over the past year, undergraduate student researchers, Alyssa Collins and Brette Hoggan, have worked with Assistant Professor, Dr. Jessica Shumway, on the Preschoolers' Evolving Mathematics Project. The research group, named EMRG (Early Mathematics Research Group) investigated the ways 3- and 4-year-old children develop number sense. Alyssa and Brette presented their analysis of students' achievement patterns to legislators at Research on Capitol Hill in Salt Lake City and at the Utah Conference on Undergraduate Research at SUU in Cedar City. The results of their research highlighted key leaps in preschoolers' number and geometry understanding, such as cardinality and composing shapes. Their work also emphasized the importance of funding preschool teacher professional development focused on mathematics learning trajectories.

One of Dr. Shumway's former students, Cami Player, a teacher at Mount Logan Middle School, conducted a case study of a student struggling in mathematics. This study was part of Dr. Shumway's research on the development of number system knowledge interventions. Cami's presentation at the Fall Undergraduate Student Research Symposium at USU and at the Utah Confer-

ence on Undergraduate Research at SUU in Cedar City was titled: *Enhancing Number System Knowledge to Promote Number Sense and Adaptive Expertise: A Case Study of a Second-Grade Mathematics Student*. She and Dr. Shumway found that the student's participation in a number system knowledge intervention contributed to more instances of adaptive expertise in solving mathematical problems, which is the flexibility in solving problems and the ability to use a variety of reasoning strategies.



Left to Right: Jessica Shumway, Alyssa Collins & Brette Hoggan

Research Team Receives Outstanding Paper Award



Left to right: Allison Roxburgh, Christina Lommatsch, Jill Ashby, Kristy Litster & Patricia Moyer-Packenham

Members of the Virtual Manipulatives Research Group recently received the Outstanding Paper Award at the annual Society for Information Technology and Teacher Education (SITE) conference in Washington, DC, in March 2018. Authors of the award winning paper were: Patricia Moyer-Packenham (mathematics education faculty member) and Christina Lommatsch, Kristy Litster, Jill Ashby, and Allison Roxburgh (mathematics education doctoral students). Their paper titled – The Role of Design Features in the Affordances of Digital Math Games – took an insightful look at children's awareness of design features in high-quality digital math games. The participants in this study were 193 children ages 8-12. Children completed a pretest, interacted with three digital math games, completed a posttest, and answered interview ques-

tions about their interactions with the games. This mixed methods study found that children made significant learning gains when using 9 of the 12 digital math games. Children showed a high level of awareness of design features, identified many helping features, and were able to connect the digital games with the mathematics in the games. The results suggest the importance of design features and children's awareness of the affordances of those features to promote learning.

The group presented two additional papers at the conference: 1) *Mediators of Learning in Game-Based Mathematics Apps*, and 2) *Affordances of Simultaneous Linking Features in a Base-10 Blocks Mathematics App for Young Children*. In addition, the research team presented the following four papers at the American Educational Research Association (AERA) conference in New York City in April 2018: *Affordances of Digital Games for Mathematics Learning in Grades 3-6*, *Elementary Mathematics Apps: Balancing Gaming and Mathematics Affordances for Student Learning*, *Differences in Children's Affordance Awareness between Novice and Experienced Learners*, and *Preschool Children's Learning Progressions While Interacting with Touch Screen Mathematics Apps and How Affordance Access Matters*.





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Patricia Moyer-Packenham, PhD

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