

*Texas State University
Department of Mathematics Colloquium
Friday, April 1, 2022
3:30pm on Zoom*

Using Design-Research to Improve Precalculus Teaching and Learning



Marilyn P. Carlson
Arizona State University

Abstract: There have been many attempts to address student attrition and low learning gains in precalculus level courses with few approaches leveraging research on student learning and teaching of the course's key ideas. This has led to the perpetuation of curriculum that is predominantly focused on methods for obtaining answers and students completing precalculus with weak understandings of the course's key ideas (e.g., the meanings of function and rates of change) that are needed for learning calculus and modeling in the sciences. The Pathways Project is one response to this problem. In this talk I will provide an overview of a design research project that has produced the 8th edition of *Pathways Precalculus* student curriculum, instructor support tools and companion professional development. I will share data that reveals the impact of the *Pathways* cognitively scaffolded materials and professional development on precalculus teaching and students' mathematical thinking and learning of foundational ideas for continued mathematics study.

Speaker Bio: Dr. Carlson is currently a professor in the School of Mathematical and Statistical Sciences at Arizona State University. Her *Project Pathways* research is studying transitions in precalculus level teachers' *Mathematical Knowledge for Teaching* (MKT) in relation to their teaching practice and students' learning. She was the Coordinator of the MAA Special Interest Group for Research in Mathematics Education, and co-edited the MAA Volume, *Making the Connection: Research to Practice in Mathematics Education*. She received an NSF CAREER award to study student learning in calculus and has engaged in sustained research on teaching and learning of precalculus and beginning calculus since 1990. In 2007 she received the MAA Selden Award for Research in Undergraduate Mathematics Education, and in 2013 she received the Outstanding Doctoral Mentor award at Arizona State University. She has mentored 14 PhD students in conducting studies of student learning and teaching in precalculus and calculus. She leads professional development workshops for community college and university faculty, and secondary precalculus teachers and has over 50 published articles related to teaching and learning precalculus and beginning calculus.