

Learning to Learn Mathematics: A Learning Sciences Approach to Improving Mathematics Performance

Matthew Watts, *Red Rocks Community College*
Wade Ellis, Jr., *West Valley College (Emeritus)*

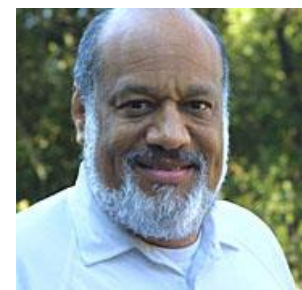
Mathematics education has been a discipline for at least 150 years, but little research exists on the learning process in mathematics (mathematical learning) and how to teach this process (i.e., learning to learn mathematics). This paper summarizes and expands upon the existing scholarship and practices of learning to learn mathematics as well as introducing the key components of new research. After identifying the forms of knowledge and levels of learning necessary for the undergraduate mathematics classroom, we take the set of risk factors most affecting undergraduates and identify additional specific risk factors that inhibit the learning of mathematics. These risk factors and the characteristics that mitigate them are then correlated so that the Profile of a Quality Mathematical Collegiate Learner can be established. The abstract generalization of the learning process, the Learning Process Methodology, is revised in the context of learning mathematics to create the Mathematics Learning Process Methodology. Finally, we see how the cultural changes needed to reform higher education, the transformation of education, can be applied in the context of mathematics higher education. The Learning to Learn Mathematics approach includes both learning mathematics and learning how to learn mathematics—both expanding knowledge and improving skills (growth). We believe every student will be more successful in learning mathematics if the mathematics education community embraces “Learning to Learn Mathematics.”

Keywords: learning to learn, forms of knowledge, methodology, levels of learning, generalized transferable knowledge, learning performance, active learning, learning process methodology, profile of a quality collegiate learner



Matthew Watts is currently an assistant professor at Red Rocks Community College in Lakewood, Colorado. Matthew recently moved from Virginia where they were active with VMATYC and served as Treasurer for the Academy of Process Educators. Matthew has a BS in physics from James Madison University and an MS in applied mathematics from the University of Arizona. They focus on helping students improve the way they learn mathematics.

Wade Ellis, Jr. is an accomplished mathematician with primary interest in teaching and was a mathematics instructor at West Valley College in Saratoga, California for 20 years. He was president of the California Mathematics Council of Community Colleges and has served as a member of the Mathematical Sciences Education Board, and the National Research Council Committee on Science Education. He is the coauthor of numerous books on the use of computers in teaching and



learning mathematics. Among his many honors are the AMATYC Mathematics Excellence Award, the Outstanding Civilian Service Medal of the United States Army, the Hayward Award for Excellence in Education from the California Academic Senate, and the Distinguished Service Award from the California Mathematics Council, Community College.