

Fall 2019 Colloquium

Department of Physics & Astronomy, TAMU-Commerce

Sep 26, Thursday, 4-5 PM in Science Building 127

(coffee and cookies will be served at 3:50 PM)

Physics Education

Supporting the integration of numerical computation in physics education

Dr. Marcos Caballero

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Marcos (Danny) Caballero is a physics education researcher who studies how tools and science practices affect student learning in physics, and the conditions and environments that support or inhibit this learning. Danny earned his B.S. in physics from the University of Texas at Austin in 2004. He worked on opto-microfluidics transport and control experiments at the Georgia Institute of Technology earning his M.S. in physics before shifting his research focus to physics education. He helped found the Georgia Tech Physics Education Research group in 2007 and earned the first physics education focused Ph.D. from Georgia Tech in 2011 working on computational modeling instruction and practice.

Danny moved to the University of Colorado Boulder as a postdoctoral researcher in the Physics Education Research group. Presently, Danny is the Lappan-Phillips Associate Professor of Physics Education and co-directs the Physics Education Research Lab at MSU. He also serves as research faculty at the University of Oslo's Center for Computing in Science Education. More information about Dr. Caballero can be found at

<https://pa.msu.edu/profile/caballero/>

Abstract

Computation has revolutionized how modern science is done. Modern scientists use computational techniques to reduce mountains of data, to simulate impossible experiments, and to develop intuition about the behavior of complex systems. Much of the research completed by modern scientists would be impossible without the use of computation. And yet, while computation is a crucial tool of practicing scientists, most modern science curricula do not reflect its importance and utility. In this talk, I will discuss the urgent need to construct such curricula in physics and present research that investigates the challenges at a variety of all scales from the largest (institutional structures) to the smallest (student understanding of a concept). I will discuss how the results of this research can be leveraged to facilitate the computational revolution in science education. This research will help us understand and develop institutional incentives, effective teaching practices, evidence-based course activities, and valid assessment tools. This work has been supported by Michigan State University's CREATE for STEM Institute, the National Science Foundation (DUE-1431776, DUE-1504786, DUE-1524128, DRL-1741575, DRL-1812916), the Norwegian Agency for Quality Assurance in Education (NOKUT), the Norwegian Research Council, and the Thon Foundation.