MATHEMATICS & SCIENCE EDUCATION RESEARCH SEMINAR SERIES 2015

Undergraduate Learning in Mathematics & Science

Chris Rasmussen
Dept of Mathematics & Statistics
San Diego State University

Renee Cole
Dept of Chemistry
University of Iowa

Friday, May 1, 2015

9:00 – 10:30 am

Natural Sciences Auditorium (Rm 1205) UCSD

Sponsored by the UCSD/SDSU Mathematics & Science Education Ph.D. Program and a charitable gift from Larry & Judy Sowder

Abstract: In this presentation I first provide a brief overview of the chapter on post calculus research in undergraduate mathematics education and highlight common themes from the research on student understanding of particular concepts. I then provide more detail on recent research that has examined undergraduate mathematics teaching. In the 2007 Handbook chapter on research in undergraduate mathematics education there was little if any review of the literature on the teaching of advanced mathematics. This was not an error of omission, but rather a reflection of the state of the field. There simply was not a substantive body of research to review. In the last decade the situation is quite different, with a considerable increase in empirical work that examines instructor practices, knowledge, beliefs, and even professional development in post calculus courses. The shift in attention to *how* mathematics is taught is in part attributable to the pressure and concerns to strengthen teacher preparation, accountability and assessment of college mathematics instruction and student success, especially as it relates to STEM majors, and the recognition of the needs of a diverse student body as well as the needs of client disciplines.
My review of the research on undergraduate mathematics teaching includes studies that examine lecture-oriented instruction, research that examines inquiry-oriented instruction, and research that examines professional development.

Abstract: The results of discipline-based education research provide a significant resource to inform teaching strategies and the design of instructional materials. A case study was used to document how an instructor's implementation of the POGIL (Process Oriented Guided Inquiry Learning) materials influenced student argumentation and conceptual understanding of thermodynamics. Toulmin's model of argumentation was used as a lens for examining how the class related ideas through collaborative discussion. Argument components were then characterized in terms of the level of representation addressed (macroscopic, sub-microscopic, or symbolic). Instructor discursive moves in whole class discussion were classified using the Inquiry Oriented Discursive Moves framework. By examining the interplay between instructor discursive moves and classroom reasoning across levels of representation, specific features of classroom interactions that promote reasoning across macro, sub-micro, and symbolic levels can be identified.