

## Active, Collaborative Learning in Physics: Modeling Energy Dynamics with Energy-Interaction Diagrams

Date: **10/11/2019**

Time: **3:00 PM**

Location: **COB1 265**

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### Abstract

Over the years, numerous graphical representations have been proposed that allow learners of physics to visualize energy states and dynamics in particular situations. Each diagram highlights different aspects of energy and therefore may represent different conceptualizations of energy. The Energy-Interaction Diagram is a representation for energy dynamics in a physical system that highlights energy conservation and the quantitative relationships between different types of energy. As a tool for the derivation of a specific mathematical model, it allows students with limited mathematical training to quantitatively model complex energy scenarios. I will show how in an active-engagement introductory physics class for non-

physics majors, the Energy-Interaction Diagram structures students' collaborative quantitative modeling of and reasoning about energy dynamics.



### About the Speaker

Benedikt W. Harrer is an Assistant Professor of Physics at San José State University (SJSU). He earned his Ph.D. in physics at the University of Maine, and he holds a graduate degree in physics and mathematics with a concentration in science and math education from the Ludwig-Maximilians University in Munich, Germany. Before joining the Department of Physics and Astronomy at SJSU, Benedikt taught in the Cal Teach program at the University of California, Berkeley, and co-directed the Berkeley Engineering Research Experiences for Teachers program. In his dissertation work, Benedikt investigated the nature of productive classroom interactions for learning about energy. Inspired by ethnomethodological conversation analysis and responsive teaching, Benedikt's current research focuses on understanding how students and instructors achieve productive interactions in physics learning encounters, from peer talk in laboratory investigations to large lecture discussions, and how these interactions can be structured by representations and models.