



Seminar

Friday, September 12, 2008, 3:30 – 4:30 pm  
112 Brackett Hall

## **Assessing and Improving Problem Solving**

Dr. Melanie Cooper

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Clemson University

Problem solving is one of the most important goals of any science or engineering course. However it is notoriously difficult to improve students' problem solving abilities, and many students never develop competence. This is particularly true for open-ended or case-based problems – which are also more difficult to assess. We use a number of methods including a suite of software tools and inventories that allow us to assess both student problem solving strategy, student ability, and metacognitive activity as they change over time. Using these tools we can predict how a student will perform on subsequent problems with a 90% probability.

Now that we have a set of fairly robust assessment materials, we have begun to develop and investigate intervention methods designed to improve student problem solving strategies and abilities. These methods include collaborative grouping, metacognitive strategies, laboratory projects, and concept maps. The effects and implications of these interventions will be discussed, with regard to student ability, developmental level, and gender.

### **Presenter Biography**

Melanie Cooper is the Alumni Distinguished Professor of Chemistry at Clemson University and Interim Chair of the Department of Engineering and Science Education. She received her B.S. M.S. and Ph.D. from the University of Manchester, England, and she carried out postdoctoral work in organic chemistry before turning to chemical education as her area of research. She has been a faculty member in the Clemson chemistry department since 1987, where she teaches general and organic chemistry and chemistry education courses. Her appointment was ground-breaking, not only at Clemson but nationally, in that it was one of the first tenure track appointments in chemistry education in a chemistry department. Her research has focused on problem solving in a wide variety of areas, including laboratories and large enrollment lectures. She is interested in methods to assess and improve students' problem solving abilities and strategies, and has focused on interventions that promote metacognitive activity. An outgrowth of this research is the development and assessment of evidence-driven, research-based curricula. She is the author of a lab manual Cooperative Chemistry Laboratories, is the co-editor of the Chemists' Guide to Effective Teaching series, and a co-author of the ACS Chemistry text, in addition to research papers in chemical education. Her most recent project is a new general chemistry curriculum, Chemistry, Life, the Universe and Everything, in which the principles of chemistry are developed within the context of the emergence and evolution of life on Earth. Melanie is a Fellow of the AAAS and has received a number of awards for excellence in teaching. In 2002 she was named an Alumni Distinguished Professor. She has also held a number of elected positions within ACS and was the Chair of the Division of Chemical Education in 2007. She is currently the Co-Chair of the College Boards Science Standards Committee and has been the PI or Co-PI on a number of grants.

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