

# Mediated Learning

*A Newsletter by and for the Instructors of The University of Montana*



## Using Research to Inform Teaching Practice

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Professor Mark Cracolice

I was recently invited to attend a National Science Foundation conference featuring educators who contributed to “invention and impact,” in course, curriculum, and/or laboratory improvement. A question addressed at the meeting was: Why do teaching improvements, especially those supported by confirming research, often fail to be disseminated and fail to have wide-reaching national impact?

### Human Reasoning

Psychology research answered this question long before this conference. The work of Amos Tversky and Daniel Kahneman is among the most important in contributing to our understanding of the human reasoning process. Kahneman was awarded The Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel in 2002 “for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty.” In 1982 Tversky and Kahneman wrote a book chapter in which they stated, “Our thesis is that people have strong intuitions about random sampling; that these intuitions are wrong in fundamental respects; that these intuitions are shared by naive subjects and by trained scientists; and that they are applied with unfortunate consequences in the course of scientific inquiry. We submit that people view a sample randomly drawn from a population as highly representative, that is, similar to the population in all essential characteristics.”

In other words, no matter how intelligent and/or educated we may be, all human beings tend to make an important error in reasoning: We project our personal preferences about learning onto our students. When the sample drawn from a population is you, it even more strongly is assumed that your preference matches that of the population. In teaching, we tend to structure our curricula to match *our* preferred learning style. As Tversky and Kahneman said, this has “unfortunate consequences” in the classroom. It creates a significant resistance to utilizing research results in planning teaching. Instead of learning from research on how students learn and looking to experts in the field for advice, we believe that our own opinions about teaching are as good as, if not better than, those who study the learning process. All who teach become experts on teaching, and all opinions become equally valid. Worse yet, when we talk with someone who supports our personal opinion about effective teaching, it reinforces our belief.

### Research on Teaching

So what does research say about effective teaching? Put bluntly, lecturing is the worst approach to large group instruction. Almost every high-quality study that compares lecturing to a more active approach shows that the active approach is better in promoting conceptual understanding and in developing

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## Teaching Profile: Rafael Chacón, Department of Art



Professor Rafael Chacón

*Katherine Sather  
Senior, Print Journalism*

For the past 10 years Rafael Chacón has been the University of Montana's lone professor in the art history department. The role has required his classes to cover centuries—from ancient American art to art in the 20th century. Chacón, who is from Cuba, specializes in European Renaissance and Baroque work, with an emphasis on Italy and Spain. But he says he doesn't mind teaching about art from all ages. "I've always loved the history," he said. "It doesn't matter so much when and where it happened. I'm fascinated by all of it." Next fall he'll get some extra help in the department when a second professor of art history arrives at UM, which will help divide up the work.

Chacón spent part of his childhood in Cuba. When he was seven, his parents elected to leave the Communist government and fled the country—the last of his family to make the journey. They settled in the midwestern United States on the outskirts of Chicago, where his father worked in the steel industry. He began college at Wabash College in Indiana, where he studied art and biology. Chacón was pre-med, but an internship at the Metropolitan Museum of Art in New York persuaded him to pursue art instead. He opted to study art history as well as teaching. "I've always been making art since I was little—I've had an organic connection to it," he said. "There's all the clichés that art is an unnecessary thing but nice when you get it. But I think it's necessary and central to the well-being of humans and civilization."

Chacón completed his PhD in art history from the University of Chicago in 1995. He worked as assistant curator at the Art Institute of Chicago and logged his first teaching experience back at Wabash College, where he taught for two years. In 1994 he accepted a

full-time teaching position at UM. "It's a privilege to share the knowledge," he said. "There's nothing I don't like about teaching." Ideally, Chacón said, his classes would take place in art galleries and places where students could view artwork in person. Since that's not possible, his classes are taught with media such as slides. He tries to keep it exciting. "I try to break up the media as much as possible so I'm not always talking to them about an image on the screen," he said.

His position at UM is evolving. Since his arrival at UM in 1994, the art department opened its first Art History and Criticism Resource Center, complete with a student reading room, a collection of art journals, a slide collection and a library of materials. In addition, the arrival of a second art history professor next fall will allow more travel abroad and different course offerings. "For 10 years I've been saying that one person can't cover this field," he said.

Chacón said he still paints on occasion, and he especially enjoys making caricatures, but he devotes most of his time to research and writing. He's finishing up his first book, a biography of A.J. Gibson, a Missoula architect who constructed many historic Missoula buildings at the turn of the century. Gibson designed the first five buildings on the UM campus, including the Math Building and Main Hall. "I ran across his work and realized nobody had written a biography on the best known architect in Missoula," he said.

After searching the archives in the Mansfield Center, Chacón found a wealth of information, including Gibson's original drawings, and his family scrapbooks. "I was able to piece together his life story," Chacón said.

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## Teaching Practice

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students' intellectual skills. However, since most of us who became college instructors flourished in lecture-oriented courses when we were students, we fall into the trap of believing that what worked well for us works well for everyone. Additionally, since lecturing is generally the least time-consuming way to teach, we have additional incentive to defend its effectiveness.

In a recent article in the journal *Science*, the most prestigious research journal in the sciences, a group of science faculty wrote, "There is mounting evidence that supplementing or replacing lectures with active learning strategies and engaging students in discovery and scientific process improves learning and knowledge retention.... These results are neither isolated nor discipline-specific.... If research universities marshal their collective will to reform, ... classrooms will be redesigned to encourage dialogue among students, and they will be filled with collaborating students and teachers."

### Research-Based Teaching

As an example of how research can inform teaching practice, Richard Hake of Indiana University published an excellent article in the *American Journal of Physics* in 1998. In this study, student performance on the "gold standard" of standardized introductory physics exams was compared between students in classrooms with passive-student lectures versus those with at least part of the time devoted to interactive engagement of students. The results were dramatic. From the 6,542 students across 65 courses that were studied, *all* of the passive classrooms fell into the lowest one-third in concept knowledge gain. In other words, no matter the level of course, type of institution, or profile of student population, students in lecture courses uniformly learn less than those in classes where at least part of the lecture is replaced by an interactive engagement strategy.

I urge you to consider how you can make your classroom a more interactive learning environment. Start small. Consider changing just part of one of your two or three lectures per week. Use an information first–concept second strategy to organize your presentations. After presenting data or information from which the key concepts in your discipline were formed, and before you draw conclusions, give students the opportunity to draw conclusions for themselves. This is the critical point at which interactivity can improve student learning. If you feel the need to lecture, consider writing a handout instead.

When you make the decision to make a change, be sure to collect some data to gauge its effectiveness. Compare an exam question or two covering the same topic, before and after you initiate an active learning approach. Be cautious in interpreting the data, however, because sometimes you need a semester or two to become a skilled interactive instructor. When we first instituted our peer-leader strategy in freshman chemistry, exam scores initially showed no change, but after a number of years of refinement, scores are up about 20% when compared with our baseline data.

### Goodbye—for now

My colleagues in the Department of Chemistry have asked me to assume the role of chair for the next three years, and thus I must step down from my role as Director of the Center for Teaching Excellence. It has been a tremendous pleasure working with everyone across campus, and I wish only that there were enough hours in a day for me to stay in the Center. I hope to continue to find time to contribute to the development of teaching excellence at UM, and I hope that I have an opportunity to return to the Center at a future date. Until then, best wishes in mediating your students' learning!

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