CETL Weekly Teaching Tips presents

Use Discrepant Teaching Events to Address Students' Misconceptions

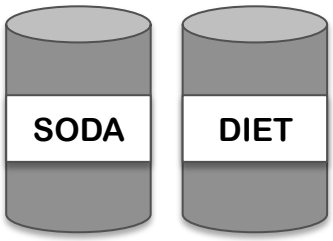
When learning new material, students often draw on prior knowledge and everyday experiences, which may not be accurate representations of disciplinary knowledge. These inaccurate ideas can mislead students and impede learning. Listen to students' ideas about critical concepts in your discipline and identify their misconceptions. Then design a discrepant teaching event that is student-centered and features hands-on/minds-on activities to confront their naïve conceptions.

Discrepant Events:

Demonstrations that produce unexpected outcomes

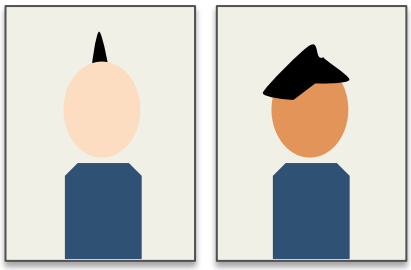
Discrepant events work in any discipline.

Science



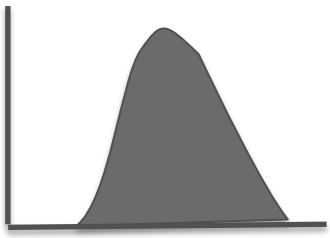
Will they float or sink?

Criminal Justice



How will you describe the perpetrator?

Math



Are the grades you calculated fair?

Find out the answer to these questions and how they worked in the classroom at **oakland.edu/teachingtips**

CETL adapted this material from Judith Longfield's contribution to the 2014-2015 Teaching Issues Writing Consortium.

Use Discrepant Teaching Events to Address Students' Misconceptions

When learning new material, students often draw on prior knowledge and everyday experiences, which may not be accurate representations of disciplinary knowledge. These inaccurate ideas can mislead students and impede learning. Moreover, decades of research have demonstrated that students do not easily give up their deeply held beliefs (Guzzetti, 2000; Lipson, 1984; Strike & Posner, 1992), leaving instructors wondering what to do about students' naïve conceptions.

Discrepant events — demonstrations that produce unexpected outcomes — are used in science to capture students' attention and to confront their beliefs about a "phenomenon by producing an outcome which is contrary to what their previous experiences would lead them to believe is true" (Misiti, 2000, p. 34). Science instructors have long known that the use of this teaching strategy is effective at uncovering students' preconceptions and activating their thinking. A discrepant event can be as simple as floating two identical cans of soda, one regular and one diet, and observing that one floats while the other sinks. Discrepant events work because they create puzzling situations which result in cognitive disequilibrium. This creates the need for students to *assimilate* (use existing knowledge to deal with new experiences) and *accommodate* (alter or replace existing concepts) their prior ideas in order to adapt to the unexpected and puzzling results.

You have probably heard of the criminal justice instructor who arranged to have a student from another class come to the podium and "hit" him. The "offender" then runs out of the classroom and the instructor, now recovered, asks students to write down what happened. He then uses the students' information to create a composite description of the offender and the crime for police. Of course, as the students begin to share their descriptions, it becomes apparent that eye-witness accounts are not as accurate as students had assumed them to be, which was the point of the lesson. Like the floating soda cans, this is an example of a discrepant teaching event.

An example from math involves the naïve belief that numbers don't "lie," with many students believing that the mathematical analysis of a set of numbers provides infallible right answers which can be used to make fair and impartial decisions. To address this misconception, an instructor professed confusion regarding grades on the first assignment, explaining that the grade distribution was not typical of past semesters. She asked students to help her decide the "best way to curve grades" and put the range of scores on the board, handing out raw scores to each student. Students then worked in groups to decide whether mean, median, or mode should be used to determine letter grades. They were unaware that the fictitious scores were distributed in such a way that some groups could get better grades using the mean, while other groups could improve their grades using the median or mode. Once students applied the three types of analysis to personal scores, the class used the results to make a "fair and impartial decision," with groups lobbying for the method that gave them the best grade. When the discussion became heated, the instructor explained that they had just experienced the way in which different methods of analysis can result in different outcomes. This discrepant teaching event helped students see the inadequacies of their previous thinking and to understand how numbers can be made to "lie." (Longfield, 2009).

As you can see, discrepant teaching events can be used in any discipline. To be effective, they must be vivid enough to help students become aware of the dysfunctionality of their current thinking. When outcomes are different from what is expected, tacit beliefs become visible and students are motivated to reconcile previous beliefs with what actually happened, resulting in a deeper understanding of the concepts being studied. Once the "need to know" is created, instructors must help students find intelligible, plausible, and believable explanations of the unexpected outcome.

The next time you're in your classroom, observe your students carefully. Listen to their ideas about critical concepts in your discipline and identify their misconceptions. Then design a discrepant teaching event that is student-centered and features hands-on/minds-on activities to confront their naïve conceptions.

Resources:

Guzzetti, B.J. (2000). Learning counter-intuitive science concepts: What have we learned from over a decade of research? *Reading & Writing Quarterly*, 16: 89–98.

Lipson, M.Y. (1984) Some unexpected issues in prior knowledge and comprehension. *Reading Teacher*, 37(8), 760-764.

Longfield, J. (2009). Discrepant teaching events: Using an inquiry stance to address students' misconceptions. *International Journal of Teaching and Learning in Higher Education*. 21(2) 266-271. http://www.isetl.org/ijtlhe/pdf/IJTLHE732.pdf

Misiti, F.L., Jr. (2000). The pressure's on. *Science Scope*, September 2000, p. 34-38.

Strike, A.K. & Posner, G.J. (1992) A revisionist theory of conceptual change. In R.A. Duschl & R.J. Hamilton (Eds.), *Philosophy of Science, Cognitive Science, and Educational Theory and Science* (pp. 147-176). New York: State University of New York Press.

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