

## Facilitating Deep Learning With a Lava Lamp and a Beer

By the last day of class, both the students and you, the instructor, are often running out of steam. How can you cross the finish line in a way that will engage students, neatly summarize the course content, and help the students make connections between the course and their experiences? Here is a simple and extremely effective activity that does all that. I use it in the introductory Material and Energy Balance course, but it could also be easily modified for any other course.

I gather 10-20 everyday items and scatter them throughout the classroom before the students enter. Here is a partial list of a recent semester's items:

Tea kettle	Lava lamp
Soda or beer can or bottle	Batteries
Checkbook register	Light bulb
Galileo thermometer	Coffee filter
Hand mixer	Cigarette lighter
Portable hand warmer	Hose splitter
Pressure gauge	The Harry Potter "sorting hat" that resides in my office
Measuring cup	Road map or compass

Some of these items would be reminders of illustrations or in-class demonstrations that I've used during the semester.

If students are not already divided into homework teams, ask them to sort themselves into teams of three to four students. I provide each student team with a one-page worksheet listing each of the items and give the following instructions:

*Comment briefly on how each item relates to the course content of Material and Energy Balances. The students whose groups are judged to be most insightful, most creative, and most thorough will each receive five additional points on their HW assignment that received the lowest grade.*

There's always lots of conversation and laughter as the student teams move around the room and puzzle over each item. Some teams go for speed and simply jot down quick observations or equations relating to each item, while others view the activity as a creative writing exercise and compose elegant prose. I'm always impressed with the depth of thought and insight that many groups invest in this challenge.

Besides being a novel and enjoyable way to finish the semester, students gain practice in applying the upper levels of Bloom's taxonomy (analyze, evaluate, and create). In addition, as Felder and Brent<sup>[1]</sup> note, "The more new information has meaning and makes sense to students, the more likely it is to be stored [in long-term memory]. Once stored, the more often the information is retrieved and rehearsed, the more effective the learning is." The more frequently and deeply students are challenged to relate your course content to their everyday experience, the greater the chances that they will understand the principles and methods you are teaching them. After the course is over, whenever they hear a dew point and relative humidity reported on TV or see a "sweaty" glass of cold iced tea or feel cold stepping out of a shower, the chances are equally good that they will understand what they are hearing and seeing and feeling to an extent that few educated people in our society ever do. If the course achieves both of these outcomes, you can take satisfaction in doing exactly what education is supposed to do.

### REFERENCE

- 1 Felder, R.M., and R. Brent, *Teaching and Learning STEM: A Practical Guide*, San Francisco: Jossey-Bass (2016) □

—LISA G. BULLARD, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NC

This one-page column presents practical teaching, advising, and diversity tips in sufficient detail that others can adopt the tip. Focus on the teaching method, not content. The column should be maximum 550 words, but subtract 50 words for each figure or table. Submit as a Word file to Phil Wankat <wankat@ecn.purdue.edu>.