

EB4 10:30 a.m. Use of Multiple Representations in an Active Learning Environment to Increase Student Learning

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Use of multiple representations of knowledge such as verbal, pictorial, graphical, and mathematical/symbolic is an effective way to increase students' understanding of physical concepts.^{1,2} To master problem solving skills, students must be able to go back and forth among the various representations. Different representations may not be equally effective in communicating a particular concept.³ We have already developed highly interactive methods in which "Flash Cards" are used as a tool for gauging student understanding and promoting active student participation.⁴ Presently, we are using activities in which a particular problem or concept is presented in several different representations. These are then "dissected" into several linked conceptual and numerical components to develop multiple-choice questions for flash-card use. Using examples, we will demonstrate the effectiveness of these interactive multiple representations in promoting student learning.

1. Alan Van Heuvelen, "Overview, Case Study Physics," *Am. J. Phys.* **59**, 898-907 (1991); *ActivPhysics*, CD-Rom and Workbook, Addison Wesley Interactive (1997).
2. Randall D. Knight, "Physics A Contemporary Perspective," Addison Wesley (1997).
3. D. E. Meltzer, "Comparative Effectiveness of Conceptual Learning with Various Representational Modes," *AAPT Announcer* **26** (4), 46 (1996).
4. David E. Meltzer and Kandiah Mannivannan, "Promoting Interactivity in Physics Lecture Classes," *Phys. Teach.* **34**, 72 (1996).