

DF3 2:30 p.m. Investigating Student Difficulties Using the Problem Dissection Technique

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A number of studies in physics education research have documented that traditional teaching methods are relatively ineffective in providing a conceptual understanding of physics.¹ In such environments, students are able to obtain good grades by mastering skills in memorization and formulaic learning. To investigate student conceptual difficulties obscured in traditional problem solving, we have designed a research protocol in which we administer two instruments in succession during the same class period. The first one is a traditional quantitative problem, and the next consists of the same problem presented in the form of several conceptually linked multiple-choice type questions (“problem dissection”).^{2,3} We will present a preliminary analysis of our data from three separate traditional classes. These indicate that a significant fraction of the students (>50 percent) failed to grasp concepts fundamental to a true understanding of the problem, despite being able to obtain a correct numerical answer.

1. Richard R. Hake, “Interactive-engagement versus traditional methods: a six-thousand-student survey of mechanics test data for introductory physics courses,” *Am. J. Phys.*, **66**, 64 (1998).
2. David E. Meltzer and Kandiah Mannivannan, “Promoting Interactivity in Physics Lecture Classes,” *Phys. Teach.* **34**, 72 (1996).
3. Kandiah Mannivannan and David E. Meltzer, “Increasing Active Student Participation in the Classroom Through the Use of Flash Cards,” Proceedings of International Conference on Undergraduate Physics Education, edited by E.F. Redish and J.S. Rigden, Woodbury, New York: American Institute of Physics (1997). Part One: p. 821.