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### Tackling misconceptions in introductory physics using multimedia presentations

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#### Abstract

All too often when researchers attempt to measure the learning that occurs in physics courses, they find that very little actually takes place. On a basic level, the reason for this difficulty is not hard to identify. Students come into physics classes with ideas about the subject matter that do not align with the scientific

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conceptions they are expected to master. More complicated, however, is determining how specifically these alternative conceptions undermine the teaching and learning process. We have studied multimedia learning involving different areas of physics with more than a thousand students over three years. We have interviewed students and collected quantitative data not only about learning, but also about student perceptions of it. Taken collectively, our results support the conclusion that misconceptions inflict their damage in two ways: they give students a false sense of knowing, limiting the mental effort they invest in learning; and they interfere with memories of recently learned scientific conceptions. Our experiments show, however, that exposing students to common misconceptions, even in non-interactive settings, can help them overcome these difficulties. We propose that misconception-based multimedia can alert students to key inconsistencies in their reasoning, and help tether their old ideas to new, scientifically accurate ones.

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