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Synthesis Problems: How to help student to solve physics problems with multiple concepts.[1] ANDREW HECKLER, Ohio State University, RYAN BADEAU, Columbia State Community College, BASHIRA IBRAHIM, LIN DING, Ohio State University — The ability to solve physics problems that require multiple concepts from across the physics curriculum, or 'synthesis' problems, is often a goal of physics instruction. Here we discuss student difficulties with synthesis problems for introductory and second year physics courses, and some ways to help students to improve their performance. Students have difficulties with synthesis problem that are different and beyond the difficulties they show with single-concept problems. We show that students have difficulties with multiple concept recognition and joint application, and these difficulties interact with the variation of the underlying mathematical difficulty of the solution path. We also show that synthesis problems that employ concepts sequentially are significantly easier than problems that must employ concepts simultaneously. Using carefully designed worked examples and guiding students through self-explanations and analogical comparisons of the structure can significantly improve performance.

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