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Probing student reasoning in physics through the lens of dual-process theories.[1] PAULA HERON, University of Washington, CODY GETTE, MILA KRYJEVSKAIA, North Dakota State University, MACKENZIE STETZER, University of Maine — Research on conceptual difficulties has led to the development of many effective instructional interventions. However, some problems still prove very difficult, even for students who can demonstrate adequate conceptual understanding. We are using dual-process theories of reasoning to identify cases in which the tendency to reply on quick, intuitive judgments is a deciding factor in student success. In addition, we are using the findings to enhance the effectiveness of instructional interventions. An example in the context of buoyancy will be used to illustrate the process. In introductory physics courses we conducted experiments in order to gain greater insight into the factors affecting student performance on the "five-blocks problem," which has been used in the literature to probe student thinking about buoyancy. We found that instructional modifications designed to diminish the intuitive appeal of the intuitive response led to significantly improved performance, without improving student conceptual understanding of buoyancy concepts. These findings represent an important first step in identifying strategies for using cognitive science theories to guide the development and refinement of research-based instructional materials.

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Paula Heron
University of Washington

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