Abstract Submitted
for the NWS18 Meeting of
The American Physical Society

Probing student reasoning approaches through the lens of dual-process theories: a case study in buoyancy[1] PAULA HERON, Univ of Washington, CODY GETTE, MILA KRYJEVSKAIA, North Dakota State University, MACKENZIE STETZER, University of Maine — A growing body of research indicates that student performance on physics problems depends on many factors, including conceptual understanding. However, in contexts in which significant conceptual difficulties have been documented, it can be difficult to isolate such factors because students' responses rarely reveal the full richness of their conscious and, perhaps more importantly, subconscious reasoning paths. In this investigation, informed by dual-process theories of reasoning and decision-making, we conducted a series of experiments in order to gain greater insight into the factors impacting student performance on the "five-blocks problem," which has been used to probe student thinking about buoyancy. In particular, we examined both the impact of problem design and the impact of targeted instruction. Instructional modifications designed to remove the strong intuitive appeal of the first-available response led to significantly improved performance, despite failing to improve student conceptual understanding of the requisite buoyancy concepts. These findings represent an important step in identifying systematic strategies for using advances in cognitive science to guide the development and refinement of research-based instructional materials.

[1]Supported by NSF through DUE 1432765

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Date submitted: 20 Apr 2018 Electronic form version 1.4