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An online HW-based intervention to promote proportional reasoning facility in physics contexts

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A hallmark of physics is mathematization, the use of mathematics to describe and support insights into physical phenomena. Proportional reasoning is foundational for mathematization—physicists use ratio quantities to characterize systems and describe processes. Unlike experts, students may struggle to interpret ratios in context or construct ratio measures from given values. These students may be overwhelmed by the rapid succession of ratio and product quantities introduced in a physics course. After speed at the beginning of mechanics, students are faced with acceleration, spring constant, momentum, angular velocity, electric field, and so on—about 100 new ratio and product quantities over a year-long course. Instead of making physical sense of these quantities, students may revert to algorithmic manipulation as a survival strategy. This talk describes common difficulties with ratio reasoning, as well as an intervention intended to promote facility. The intervention, implemented in introductory mechanics, consists of three online sessions in which students practice with feedback on a variety of modes of reasoning about ratio quantities in physics contexts. Pre- and post-course assessments will be presented as evidence of the effectiveness of the intervention.