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POS-A2 – Home-Based Labs to Develop Broadly Applicable Scientific Skills and Attitudes

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First-semester physics labs typically aim to confirm and mirror relationships explored in the lectures. Often using computer-interfaced equipment to measure physical variables, students investigate relationships with time or other variables. We took our move to online delivery in the pandemic as an opportunity to re-think physics labs. We report here a suite of remotely delivered labs developed to introduce scientific attitudes and skills. Emphasized attitudes were collaboration, creativity, perseverance, decision making, communication, and innovation. Skills such as moving from question to hypothesis, spreadsheet basics, linearization, and introductory statistics leveraged simple experiments (time to roll down a ramp, period of a pendulum) into hands-on introductions to scientific tools and ways of thinking. We abandoned the lab manual model, instead requiring students to create plans and communicate their work. Experiment plans included details on the objective/hypothesis, equipment used, experimental setup, detailed procedure of data acquisition, and specifics of data analysis. Sharing created plans occurred before data acquisition. Choosing not to rely on each student having a particular device, we explored kinematics using basic household items, and analysis utilized university-provided Microsoft Excel. Focusing on physics-specific nomenclature (such as uncertainty) gave way to adopting standardized statistical ideas like t-prime comparisons. We believe these labs emphasize attitudes and skills that are more valued across the scientific disciplines than those typically developed in traditional introductory physics labs.

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