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Teaching Critical Thinking in a First Year Physics Lab

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First year physics labs provide a rich environment for developing students' critical thinking. In a multi-year study at the University of British Columbia, we have developed a relatively simple form of scaffolding that dramatically enhances the quality of student reasoning. From the outset, students are asked to make comparisons after completing some measurements, to reflect on the comparison, make a plan based on their reflection, then execute the new plan. The experiments are simple enough that they can do this cycle more than once, modeling a more realistic, iterative approach to experimentation. We find that after several weeks, when the scaffolding has been removed, students continue with this more expert-like behavior. More importantly, in a comparison before and after this scaffolding was introduced to the course; we find that the quality of the students' reasoning about data and models is improved dramatically by this approach. The improved reasoning even continues on into a second year laboratory course, showing strong signs of transfer in these skills.