

Abstract Submitted  
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**Direct measurement of the impact of teaching experimentation in physics labs**<sup>1</sup> EMILY SMITH, Colorado School of Mines, MARTIN STEIN, COLE WALSH, N. G. HOLMES, Cornell University — For the last three years, we have been transforming the labs for the calculus-based introductory physics courses at Cornell University. The redesign has focused on shifting the labs from reinforcing physics content to emphasizing experimentation. In this talk, I will discuss results of a controlled experiment of labs that have goals to reinforce physics content to those that emphasize experimentation skills. All students attended the same lecture and discussion sections, had the same homework and exams, but attended labs that had one of two aims: teaching experimentation or reinforcing content. I will describe how we compared the impacts of students' exam performance, how students spent their time in lab, and students' attitudes and beliefs about experimental physics between these two lab curricula. We find that labs designed to teach experimentation did not measurably impact students' exam performance, and, encouragingly, engaged students in expert-like experimentation practices and improved their attitudes and beliefs about experimental physics. The results of this study demonstrate benefits of using labs to teach experimentation and show that shifting instructional goals in labs can happen without cost to students' performance on exams.

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