

DAMOP17-2017-020016

Abstract for an Invited Paper  
for the DAMOP17 Meeting of  
the American Physical Society

### **Students' views about the nature of experimental physics<sup>1</sup>**

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The physics community explores and explains the physical world through a blend of theoretical and experimental studies. The future of physics as a discipline depends on training of students in both the theoretical and experimental aspects of the field. However, while student learning within lecture courses has been the subject of extensive research, lab courses remain relatively under-studied. In particular, there is little, if any, data available that addresses the effectiveness of physics lab courses at encouraging students to recognize the nature and importance of experimental physics within the discipline as a whole. To address this gap, we present the first large-scale, national study ( $N_{institutions} = 71$  and  $N_{students} = 7167$ ) of undergraduate physics lab courses through analysis of students' responses to a research-validated assessment designed to investigate students' beliefs about the nature of experimental physics. We find that students often enter and leave physics lab courses with ideas about experimental physics that are inconsistent with the views of practicing experimental physicists, and this trend holds at both the introductory and upper-division levels. Despite this inconsistency, we find that both introductory and upper-division students are able to accurately predict the expert-like response even in cases where their personal views disagree. These findings have implications for the recruitment, retention, and adequate preparation of students in physics.

<sup>1</sup>This work was funded by the NSF-IUSE Grant No. DUE-1432204 and NSF Grant No. PHY-1125844.