Reply to “Comment on “Benefits of completing homework for students with different aptitudes in an introductory electricity and magnetism course””

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(Received 14 August 2016; published 16 November 2016)

We reply to Rieger, Reinsberg, and Wieman’s forgoing Comment [Phys. Rev. Phys. Educ. Res., Comment on “Benefits of completing homework for students with different aptitudes in an introductory electricity and magnetism course” 12, 028001 (2016)].

DOI: [10.1103/PhysRevPhysEducRes.12.028002](https://doi.org/10.1103/PhysRevPhysEducRes.12.028002)

We were happy to see the work presented by the University of British Columbia (UBC) group [1]. Indeed, one of our hopes in publishing our original article [2] was to prompt follow-up studies in order to examine whether results similar to ours would also be observed at other institutions. We found it quite enlightening that the UBC study showed different, and, in some ways, opposite effects than ours. Rieger, Reinsberg, and Wieman, in their Comment, correctly point out that different university contexts and student populations could account for these different results. They also speculate that the time demands on United States Air Force Academy (USAFA) students could affect their approach to homework. We certainly believe that could be a factor. We would also add that, because two semesters of calculus-based physics is a requirement for all USAFA students, the motivation and comfort with science will likely be different for our students than for students who are taking the class as part of a science or engineering major course load. Indeed, our estimate based on the publicly available enrollment numbers suggest that ~10% of UBC students take introductory physics (algebra-based or calculus-based) as compared to 100% of USAFA students who take calculus-based physics, suggesting that the students in the UBC courses represent a narrower range of the overall student body than do the students in the USAFA course.

Research on the benefit of homework is not definitive; not one institution can answer this question, but studies from many institutions are needed further our

understanding of the benefits of homework. A study published shortly before ours presented data” indicating that solving numerous physics problems does not directly affect academic achievements” [3]. In addition, a study published quite recently in this journal, which examined 20 consecutive semesters of a calculus-based electricity and magnetism course, showed no correlation between either homework score or time spent on homework with exam grades when all students are aggregated. The researchers did find a correlation between time spent on homework and performance on exams when comparing data between semesters, but they found that the additional time spent on homework in those semesters came at the expense of time spent reading the textbook. The researchers ultimately concluded that “reading time and homework time combine to form nonexam time, which consistently showed very small correlations. The time students invest outside of preparing for examinations had very little correlation with the scores on those examinations.” [4].

In conclusion, we are grateful to see the results from the UBC group and hope to see more such studies from other institutions. We wholeheartedly agree that the results from a single institution should not be viewed as definitive. Our findings, findings of the others referenced above, and the findings from UBC clearly shows disagreement in the published results about the effectiveness of homework. We hope these discussions will spur further research to elucidate how to make homework and other learning tools more effective for all students.

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