Stony Brook University
The Graduate School

Doctoral Defense Announcement

High School Physics Equity, Access, Teaching, and Learning

By

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This research is comprised of a three-part examination of equity, access, achievement, and learning in precollege physics. The first study examined teacher-level and school-level predictors of student performance in physics, with a focus on isolated teachers in New York during the 2016-17 academic year. Results indicated 40% of physics teachers were isolated, and their students tended to have weaker physics performance scores than students of non-isolated teachers. For the subset of isolated teachers, urban locale and school-level socioeconomic status were found to be the main negative predictors of student physics performance, while rural physics locale and professional age were positive predictors of physics performance. Teaching experience was a mediator of the predictive value of poverty and urban locale with regard to physics performance.

The second study examined academic and demographic predictors of physics enrollment and performance in New York high schools during the 2017-18 academic year. Results indicated physics was taken by fewer students when compared to the other core sciences, and participation and performance were significantly differentiated by ethnicity and socioeconomic class. Socioeconomic status was found to be the main predictor of student *enrollment* in physics, however, physics enrollment was partially mediated by chemistry and algebra II enrollments as well as chemistry and geometry performance. School-level *performance* in physics was negatively predicted by the percentage of students traditionally underrepresented in STEM but was partially mediated by chemistry and algebra II performance.

The third study examined the intersectionality of ethnicity and gender when considering participation and performance in Advanced Placement (AP) physics courses in the U.S. in 2019. There were significant decreases in course enrollment from first- to second-year AP physics courses. Enrollment disparities among genders and ethnicities grew as the courses became more rigorous. Women from underrepresented ethnic groups were found to have high failure rates of over 80% in the AP Physics 1 examination, and failure rates near 50% for both the AP Physics 2 and the AP Physics C courses compared to non-minority men with approximately half the failure rates. Recommendations for educational policy reforms are discussed for improving secondary precollege physics access, equity, and achievement.

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