

Project Accelerate: A Blended Program for Underserved High School Students

Authors: Mark D. Greenman and Andrew G. Duffy, Department of Physics, Boston University

Project Summary

Project Accelerate is a NSF-funded project aimed at helping prepare underserved high school students for the AP Physics 1 exam. The students, currently in Massachusetts, West Virginia, and New York City, attend schools that do not offer AP Physics 1. All Project Accelerate students are enrolled in a scaffolded small private online course (SPOC) on edX edge that takes them through the physics material in an interactive way. A significant fraction of the students, including all those in the Boston area, also attend weekly sessions, 2.5 hours in length, on campus to do hands-on lab activities and to do recitation exercises. These sessions are led by undergraduate students who have pedagogical training.

2017-2018 represents the second full year of Project Accelerate. We currently have outcome data from the first year as well as from the previous year, when we did a pilot project with a small group of students. Our data indicate that Project Accelerate participants do at least as well on the AP Physics exam as similar students who take an AP Physics 1 class at their school.

One of the main goals of Project Accelerate is to give underserved students access to a rigorous science course, helping these students to build a solid foundation for a possible undergraduate degree in STEM.

Background

The Project Accelerate SPOC on edX edge grew out of an edX Massive Open Online Course (MOOC), *Preparing for the AP Physics 1 Exam*. The MOOC was developed in 2014 by Andrew Duffy and Mark Greenman, with contributions from four experienced Boston-area high school physics teachers (Aaron Osowiecki, Brandon Schmidt, Tyler Wooley-Brown, and Adam Wolf). The MOOC ran for the first time in Spring 2015, and was then switched to a September-May course to match the high school schedule. The MOOC is running now, 2017-2018, for the fourth time.

The materials in the MOOC were designed to take advantage of the interactive features of the edX platform. The course, by design, downplays talking-head videos, and instead offers students many opportunities for interactive engagement and self-assessment. The course consists of thirteen content modules, all with on-line lab activities (some built around Peter Bohacek's Direct-Measurement Videos), quizzes, interactive simulations, and an end-of-module assessment in the style of the AP Physics 1 exam.

Mark Greenman, who had three decades of high school teaching experience before coming to Boston University, then transformed the MOOC into a SPOC for underserved high school students. He has added a timetable of due dates to make sure all the students stay on track; come up with a set of hands-on lab activities that the students in the blended class do on campus, and that the students at distant sites can also do at their own schools; added more structure to the course, including four end-of-term exams styled after the AP Physics 1 exam.

Funding for the development of the MOOC and the pilot year and first year of the SPOC was provided by Boston University's Digital Learning Initiative.

Project Details

Project Accelerate, funded through the National Science Foundation's DRK-12 program (NSF DRL 1720914), is a partnership program between Boston University, West Virginia University, and high schools bringing a College Board accredited AP® Physics 1 course to schools not offering this opportunity. Economically disadvantaged high school students in many urban, rural, and small suburban communities don't have access to rigorous physics courses. Lacking such an opportunity, these demographic groups are hard pressed to compete in Science, Technology, Engineering and Mathematics (STEM) fields and academic programs with their peers from more affluent communities.

Project Accelerate combines supportive infrastructures from the students' home school with a private edX online instructional tool containing scaffolding specific to the target high school population, multiple assessment tools, simulations, and a suite of virtual explorations emphasizing science process practices. Partner high schools provide time during the school day, equivalent to other major courses, for the student to work in the online instructional tool. A professional member of the high school staff is appointed as a liaison to facilitate communication between the local school and Project Accelerate staff. The course is recorded on the student's high school transcript and report card, and grades and midterm performance reports are provided by Project Accelerate staff. All students in the program are required to take the AP Physics 1 exam and Project Accelerate reimburses AP registration fees for students on free/reduced lunch or equivalent programs.

Nationally, there is a critical need to develop STEM competencies among youth from demographic groups under-represented in the STEM workforce (*e.g.*, low income and racial/ethnic minorities). Thousands of students attend schools where the opportunity to engage in a rigorous physics curriculum is not available. A disproportionate number of these schools serve under-represented students and/or economically disadvantaged students. Project Accelerate is a scalable solution removing an important education barrier keeping many low-income students and under-represented students from succeeding in STEM fields.

During our pilot year, students in Project Accelerate performed as well or better on the College Board AP Physics 1 exam than their aggregate peer groups enrolled in AP Physics 1 in traditional classroom-based courses. Defining success as scoring a 3 or higher, our students from outside the Boston Public School system achieved a 71% success rate on the College Board test compared to the Massachusetts' state average of 43%. Our Boston Public School students achieved a 14% success rate compared to the Boston Public School average of 8%. Project Accelerate has grown from its initial 6 partner high schools in 2016 to an anticipated 20 high school partners for 2018-2019.