

NSF IUSE proposal awarded 7/30/2019

Title: Succeeding in Introductory Physics: Building math fluency in a physics context

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Funding: \$473k (OSU) + \$125k (ASU)

Nontechnical Description draft:

Students often struggle with relatively basic mathematics used in introductory physics courses that are prerequisites for STEM majors and health professions. These difficulties with math are especially pronounced in physics, which uses substantially more complex notation and contexts. The ultimate goal of this new NSF project is to improve student fluency with math skills in physics contexts that are critical for student success introductory physics courses. Using empirically-based principles and methods from cognitive psychology and education research, the project team will develop, implement, and assess a set of practice assignments using Essential Skills, an existing and empirically successful online platform used at Ohio State University in its introductory physics courses. Not only will this project advance our knowledge of how to address student difficulties with math skills essential for introductory physics courses, this project has the potential to significantly improve physics students' performance and retention in introductory courses nationwide with a research-based intervention that is both low-cost and logistically simple to implement. In addition to directly impacting over 15,000 students at two large public universities (Ohio State University and Arizona State University) during the three years of the project, the Essential Skills application will also be well adapted for expansion to other algebra- and calculus-based introductory physics courses that enroll nearly half a million students nationwide each year. Furthermore, while the Essential Skills application will be designed to help all students, it is likely to especially help underprepared students succeed and continue in physics courses, and in this way it can help to increase participation in STEM and the STEM workforce.