

## SCALE-UP Learning Applied to a Computer Science Sequence

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In recent months, the value proposition for higher education has been the subject of a great deal of public scrutiny. Faced with increasing public access to high-quality instructional materials through programs like Khan Academy and EdX, institutions have been exploring for ways to add value to the classroom environment beyond the traditional lecture mode of instruction. The “flipped classroom” – an active learning model in which out-of-class, web-based lectures are augmented with in-class group exercises and projects, has recently been gaining traction as an effective mode of instruction. The idea of flipped classrooms has caught the attention of the national media, garnering space in such venues as the New York Times<sup>1</sup>, USA Today<sup>2</sup> and The Washington Post<sup>3</sup>.

Flipped classrooms reverse the traditional roles of the lecture and the homework. Students are expected to watch a pre-recorded lecture or complete reading assignments prior to class time. In the classroom, students work in teams to demonstrate and enhance their command of the material. Student Centered Active Learning Environment for Undergraduate Education (SCALE-UP) is one style of flipped classroom. In addition to the inverted class format, a SCALE-UP classroom integrates the use of technology to aid in learning. Typically, students work in groups of three students one laptop computer available to each group. Screens and whiteboards around the classroom allow the groups to collaborate and display their work. Student exercises are designed to leverage the technology resources in the SCALE-UP room to enhance student participation, and inter-group sharing of results.

The SCALE-UP classroom has shown promising results for students studying physics. The number of students failing decreased, attendance increased, and student retention increased<sup>4 5</sup>. However, while there are many positive outcomes coming from SCALE-UP classrooms, there are still many questions regarding this mode of teaching that remain unanswered. This research will endeavor to answer some of these issues. Specifically, we will explore the impact of SCALE-UP learning on the upper, middle, and lower levels of student learning, to ensure that the success of one group is not being increased at the expense of another. It will also examine the impact of the SCALE-UP classroom when applied over a multiple year series of core courses to see if the positive effects of SCALE-UP yield diminishing returns over time.

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