



Course Delivery Methods, Student Success, and Self-efficacy in Introductory Programming

Christopher Bogart

cbogart@cs.cmu.edu

Carnegie Mellon University

Pittsburgh, PA, USA

Can Kultur

ckultur@cs.cmu.edu

Carnegie Mellon University

Pittsburgh, PA, USA

Eric Keylor

ekeylor@cs.cmu.edu

Carnegie Mellon University

Pittsburgh, PA, USA

Jaromir Savelka

jsavelka@cs.cmu.edu

Carnegie Mellon University

Pittsburgh, PA, USA

Majd Sakr

msakr@cs.cmu.edu

Carnegie Mellon University

Pittsburgh, PA, USA

ABSTRACT

Self-efficacy has been claimed to be a predictor of students' motivation and learning [1]. It has been found to be sensitive to students' success, and to affect their academic achievement. In the CS/IT education context, where the drop rates are high, it is important that students not only gain knowledge and skills, but also self-efficacy, so that they persist in the program. In this study, we investigate 602 students taking an introductory Python course via different delivery methods: (i) traditional in-person; (ii) cohort in-person; (iii) synchronous online; and (iv) asynchronous online. Although modality predicted retention and success, we found no apparent links among learning, student retention, and self-efficacy. However we found evidence that cohort learning may in particular help struggling students catch up with their peers.

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1 CONTENT

We administered a self-efficacy survey for course learning objectives at the start and end of each term for 37 instances of a course delivered by instructors at 15 schools, mostly community colleges. We measured the effects of different course delivery methods on the changes in students' self-efficacy, and its relationship with success in the course.

Instructors were allowed to deliver the course in any modality they wished; their choices fell into four main categories.

- (1) **In-person (Traditional):** Classes met regularly in a physical classroom face to face (F2F). Students do not necessarily take other courses together. (11 sections; totaling 140 students)

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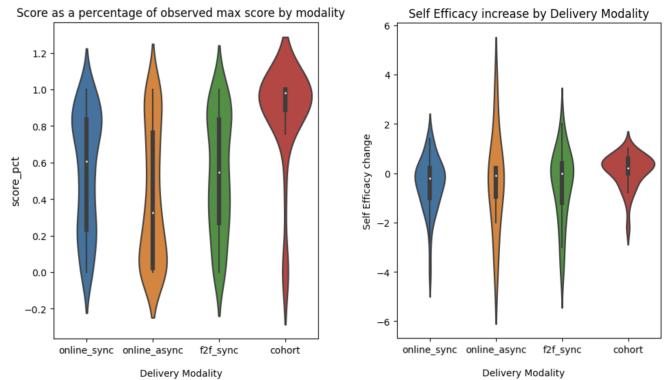


Figure 1: Score (proportion of possible points) and self-efficacy change, by course modality

- (2) **In-person (Cohort):** Students take multiple courses together as a group, often following a set curriculum and timeline. (2 sections; 34 students)
- (3) **Online (Synchronous):** Course offered online, with synchronized shared deadlines and online sessions or support to keep students in a similar pace. (10 sections; 205 students)
- (4) **Online (Asynchronous):** Students proceed at their own pace, and instructor provides online support as needed. (14 sections; 223 students)

Fig 1, shows that students in the cohort modality had significantly higher scores than the other modalities. (F test, $p < .01$ and R-squared 0.09). Spread of student scores was less in cohort learning (s.d. = 29% of grade) than in other modes (s.d. = 35% of grade) and skewed towards the top of the scale; some factor in the cohort modality helps struggling students catch up to their peers.

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