

# Switching to *Stay Home* Instruction: Impacts of the Coronavirus Pandemic on Learner Performance for an Introductory Computer Science Course

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## ABSTRACT

The coronavirus pandemic of 2020 has caused significant interruptions of the regular approach to teaching. Here, we compare the impacts of *Stay Home* orders on the student learning outcomes in an introduction to algorithms and data structures university course. We describe an example course modification based on student feedback at the semester's half-time point, and how students performed the remainder of the semester in comparison to a comparable prior semester. We find several differences in the overall participation from the electronic textbook as well as the course overall. We do not find that there is a significant change in the overall course outcomes when contrasting the Spring 2020 course offering with that from the prior semester.

## CCS CONCEPTS

• **Applied computing** → **Computer-assisted instruction; Interactive learning environments; Distance learning.**

## KEYWORDS

Introduction to programming; coronavirus; online instruction; electronic textbook

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## 1 OVERVIEW

Recent years have seen the emergence of several different approaches to support introductory computer science and information technology courses, such as in [1, 2, 4]. In prior works, we found that the utilization of electronic textbooks (i.e., ZyBook) including code submission and automatically graded examples can greatly benefit students [3]. Oftentimes, however, it is significant that students, especially on the novice level, have an ability to iterate there developing skills together with their peers or an instructor, as that would

enable them to correct misconceptions and gain additional non-explicit skills. The 2020 Spring semester pivot to online-only course delivery in the middle of the semester switched to a predominantly asynchronous format with live availability during lecture times. We compare this approach to the prior Fall 2019 semester, with most course content and learning assessment items remaining identical. Participation measured by ZyBook example completions dropped after the pivot, especially for the more challenging course content. This is corroborated through comparison of assessment items from before and after the switch to *Stay Home* instruction, which shows a significant drop of about 12%. The overall performance at the mid-semester (and mid-term exam.) pivot was comparable to the prior semester. However, the more theoretical part of the semester resulted in significantly lower performance in the Spring 2020, with reduced participation in the ZyBook while other assessment items presented mixed results. However, students heavily made use of opportunities to make up missed portions in the preparation for their final exams. In turn, the interesting outcome of the pivot to *Stay Home* instruction is that when combining all final grade items and opportunities, there is no significant difference between semesters.

Switching to a different interaction mode in the middle of the semester from in-class hands-on time to fully online (a)synchronous interaction, enabled through the already employed ZyBook, ultimately resulted in comparable measured semester scores between a fully regular as well as the pivoted instructional mode.

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