

# Flipping a Programming Class to Improve Student Performance and Student Satisfaction

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## ABSTRACT

Flipped classrooms are an instructional strategy that is becoming popular in educational contexts, particularly higher education. The principle of Flipped Classroom is that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa. Various studies have reported increased student performance and satisfaction after switching to a flipped classroom. However, most of these studies are based on students' perceptions of their own learning, not based on teachers' assessment of students' achievements. This article presents the results of flipping a computer programming course. It first describes how this course was flipped, then it presents the results of comparing the average marks awarded to students between those that took the course offering in flipped mode and those that took the course in the traditional mode. The comparison showed an increase in student performance in a flipped mode. Furthermore, the increase in student performance was sustained for 3 years, which is the full duration of this study. The comparison of student satisfaction showed an increase in student satisfaction in one campus, while the student satisfaction remained steady in another campus.

## KEYWORDS

Active Learning, Blended Learning, Computer Programming, Flipped Class, Video Lecture

## INTRODUCTION

The Flipped classroom is a relatively new blended learning instructional strategy. Flipped classrooms or simply ‘flipped classes’ have become a buzzword in academic circles (Bishop & Verleger, 2013) where there has been an increased number of publications on this topic (Uzunboylu & Karagözlü, 2017). Many of these publications report a positive impact as the result of the change to flipped class (Hung, 2015; McLaughlin et. al., 2014; McLean et. al., 2016; Sankey & Hunt, 2013). The principle of Flipped Classroom is that events that have traditionally taken place inside the classroom (e.g. lectures) now take place outside the classroom and vice versa (King, 1993; Lage et al., 2000).

There is no single model for the flipped classroom (DeLozier & Rhodes, 2017; O’Flaherty & Phillips, 2015; Tucker, 2012). Most descriptions of the flipped classroom involve some form of material presentation using prerecorded video (made available online) or other existing online resources. Students are supposed to study the material before class. During the class, student-centered activities are conducted such as working on problems, case-based presentations, team-based discussions, panel discussions, expert-led discussions, role-plays and student presentations, discussions, and debates. The flipped classroom model frees face-to-face contact time from the demands of pure content delivery (which is mostly passive on the part of the student) and makes the most of face-to-face contact to engage students in valuable learning activities.

The flipped classroom model allows students to benefit from both in-person and online learning. Allowing students to consume information online provides greater flexibility for the student. Students can peruse the content at any time that suits them allowing the student to fit their studies around other life activities and also reduces the transportation burdens of time and cost. Consuming content online also allows students to progress at their own pace and with their own style of learning. Students can also easily revise content that may not have been clear to them. These aspects may contribute to better student outcomes in flipped classrooms. It should be noted that the flipped classroom does not eliminate contact time between students and instructors instead the aim is to increase the value of the time students spend in the classroom with other students and instructors.

For the instructor, the flipped approach allows for greater scalability. In very large courses with more than one lecture, or courses offered across different campuses, or courses with an online cohort, prepared content made available via the web reduces unnecessary duplicate delivery of content for the instructor. However, producing high quality online content may require more time than typical lecture delivery, which may be an additional burden particularly for courses with content that changes frequently.

Despite many perceived benefits of flipped class, recent literature reviews on flipped class suggest that most of the researches do not provide direct evidence regarding student learning outcomes or academic performance in a flipped versus traditional (lecture-based) classroom (DeLozier & Rhodes, 2017; O’Flaherty & Phillips, 2015). Most of the research around flipped classrooms is based on student’s perceptions of their own learning, which can be inaccurate as students are often unable

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