Flipping a Highly Interactive Class—a Goal-Based Approach That Works

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We created a flipped classroom (Herreid & Schiller, 2013) model for a highly interactive computer programming class. The QM (Quality Matters)-certified course is designed as a hierarchy of modules and lessons. Students fulfill realistic lesson goals (Robinson & Snipes, 2009) by studying offloaded material ahead of time, then solving problems in class in an interactive environment. The model has been used in both face-to-face and online sessions, where the desired interactivity has been achieved using online tools.

Outcomes:
1. Design modules and lessons with realistic goals for a flipped course
2. Create relevant offloaded material, such as lecture videos, author resources, and readings from the textbook and the web
3. Create comprehensive quizzes that help students re-enforce their knowledge of the offloaded material
4. Create effective hands-on assignments that assist students to learn by doing, master the concepts, and achieve the lesson goals
5. Successfully re-use the course content for both face-to-face and online sessions
6. For online sessions, communicate with students using tools such as email, Skype, and Collaborate in order to achieve the desired level of interactivity

Category: Application

Describe the theory, approach, and revision that you applied in your course, curriculum, or program. Describe what you saw in your students', colleagues', or institution's behavior that you wanted to change. Describe the learning objectives you wanted students or colleagues to better achieve as a result of your application.

Research (Herreid & Schiller, 2013) has shown that the flipped classroom is a more effective method than the lecture-based model. But traditionally, the former has been used in fields where students have to assimilate a vast amount of content, for example, in medical fields (Tune, Sturek, & Basile, 2013) and then demonstrate that they have acquired the required knowledge.
In contrast, we are using a flipped classroom technique for a highly interactive computer programming class and applying this model for both face-to-face and online sections. Our university, as well as our department, is still heavily face-to-face, though there is a university-wide initiative to create and offer QM (Quality Matters)-certified online courses. In the light of that, this course was completely redesigned to fit the flipped model.

The course is divided into a hierarchy of modules and lessons. Each lesson has a number of realistic goals (Robinson & Snipes, 2009) that are easily achievable by the students. This has a strong empowering effect (Robinson & Snipes, 2009) on students.

Students are responsible for studying a variety of offloaded material, such as lecture videos, author resources, and readings, before they come to class. But computer programming is a skill that is best learned by doing. We start the class with a comprehensive quiz to reinforce the topics, and then work on assignments in an interactive environment. All assignments are graded, which motivates the students to complete them. In the online session, the desired level of interactivity is achieved by tools such as Skype and Blackboard Collaborate.

This is a model that can be created once and effectively reused for both face-to-face and online. The students highly appreciate the availability of the offloaded material at any time. The goal-based module-and-lesson approach breaks down the course into manageable content areas and makes development easier.

Describe the project's related course(s) or curriculum, its students, and its place in the curriculum or program.
CS 1361: Computer Science I is an introductory programming course mainly intended for freshmen, but students from other levels are not uncommon. Majors from diverse disciplines, such as physics, mathematics, chemistry, biology, and psychology, take this course, along with computer science majors. For CS majors it is a required foundation course that is followed by two more required programming courses. Many sections of this class are offered every semester.

How is your application different from ones that others have tried?
Traditionally, this class is still being taught face-to-face in a lecture format. Other faculty are still resistant to adopt the flipped and online approach, as the approach requires a high level of interactivity in terms of describing the concepts, demonstrating how programs work, going around the room and helping students in programming, and so on.

In contrast, I have used tools such as Panopto and Kaltura to create videos that capture my voice, Powerpoint slide presentations, and my computer screen with programs working. These videos are watched by students ahead of class, and they effectively replace my need to lecture in class. Instead, class time is freed up totally to focus on hands-on assignments. In the
face-to-face class, students interact with each other and me. In the online class, we use Skype and Blackboard Collaborate, an online screen-sharing and chat tool, to achieve the desired interactivity.

**Assessment and baseline: Indicate how you determined the success and effectiveness of your application.**
The class success is being assessed by measuring the programming competency of students in terms of completed and correct assignments and three exams. As mentioned before, all activities in class, such as quizzes and assignments, are graded. A significant improvement has been observed in their assignments as well as exam grades after adopting the new approach.

**References:**


**Organization:**
The session will be first presented with a Powerpoint presentation that describes the course model and methodologies followed. Ample examples will be demonstrated from the course to show the techniques, such as dividing the course in a module and lesson hierarchy, goal-setting for lessons, creating Kaltura lecture videos, quizzes, and assignments, communication with students, and online interactive screen-sharing tools such as Collaborate.

Participants will be given time to interact with each other to brainstorm about courses in which they would like to apply such techniques. Participants will then share ideas with the rest of the audience, and a discussion will follow.
Keywords:

Course/Curriculum Design/Redesign
Flipped Classrooms
Learner/Student Centered
Online Teaching and Learning