TEACHING BIOSTATISTICS COURSE WITH FLIPPED CLASSROOM

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In recent years, flipped classroom, which delivers the course documents outside class and makes use of class time to apply the knowledge they newly learned, is popular due to abundant resources, advanced equipment, improved efficiency, and greater student collaboration and participation in the classroom. Although there are a few studies on flipped classroom, they are mainly for studies on undergraduate students from majors of natural science. There are very few studies on flipped classroom on graduate level biostatistics course with medium and small class size. In the study, the author performs an evaluation of students' performance and achievements in a graduate biostatistics course with a flipped classroom. The results indicate that the flipped classroom is promising learning tools in our study population.

DESCRIPTION

For statistics education, there are many different approaches proposed to improve students' performance and achievement. Blended learning, which generally includes any instructional setting combined with both online and face-to-face instruction, is preferred since it is shown that students in blended learning settings generally outperform those with traditional course delivery. Recently, one of the popular blended learning, the flipped or inverted classroom is adopted (2013). Flipped or inverted classroom is denoted as a pedagogical approach in which the students are exposed to didactic content outside the classroom and then actively use class time to apply the knowledge they newly obtained. The flipped classroom is popular with the evidence from the recent survey of faculty from higher education institutions in the U.S. and Canada (Faculty Focus 2015). There are a few studies that compare flipped and traditional course delivery, demonstrating flipped students outperformed their traditional counterparts (Carlson & Winquist, 2011; Day & Foley, 2006; Marcey & Brint, 2013; Peterson, 2016; Tune, Sturek, & Basile, 2013; Wilson, 2013). It is summarized by some researchers that flipped classroom facilitates more efficient and autonomous interaction with the materials (Snodin, 2013; Yang, 2012), allowing for greater student collaboration in the classroom (Bernard et al., 2014; Johnson & Johnson, 2009), and increased time and efficiency (Vaughan, 2007).

GOAL

The graduate school of Public Health (GSPH) of San Diego State University (SDSU) has a joint Ph.D program with University of California, San Diego. The graduate program offers both Master and Ph.D degrees within the GSPH, SDSU. Students in the program generally work full-time or part-time jobs while pursuing their degrees. The graduate biostatistics courses are generally offered with class size of 4-40+.

Flipped classroom with video tutorials is commonly used as online technology to optimize the role of the professor in the classroom. Some researchers indicated that using video tutorial will enhance/improve students' performance. Although there are a handful studies on flipped classroom, they are mainly oriented for undergraduate students for various different majors such as biology, computer, physiology etc. There have been very few studies on the flipped classroom specifically for the teaching of biostatistics for graduate students with medium class-size (less than 20 students).

The goal of the pilot study is to evaluate students' performance and achievement using flipped classroom in graduate biostatistics course comprised of both full-time and part-time students. The tutorial was provided in the biostatistics course: advanced biostatistical modelling in spring 2017. I hypothesize that the students would prefer the new teaching technique, get better aptitude, performance, and achievements with the flipped classroom. In the future, I will extend the approach to two different sections (same course) simultaneously with modified and improved materials.

APPROACH

Course Description

The flipped classroom with video tutorials was provided in the graduate course: advanced biostatistical modelling in the spring 2017. Students are generally required to have at least one undergraduate statistics course to enroll in this course. The course is comprised of two components: the theoretical and the application (computation using statistical software) sections. The class met once per week in a computer lab facilitated with computing software for 2.5 hours. The instructor held two 2-hour office hours per week.

The course is oriented for students for advanced biostatistical application in research and work. The major students are mainly from the graduate school of public health with some additional students from the external department (bioinformatics). Both lecture notes and pre-recorded multimedia micro-lectures were uploaded online and available to the students. The contents of the course is comprised of statistics sampling, estimation, hypothesis test, chi-square test, analysis of variance, linear regression, and mixed effects models.

Video Tutorials

To evaluate the effects of flipped classroom, all the students are required to review the video tutorials on statistical computation before each class. During the class, the instructor demonstrated the computational section using statistical software briefly, and the students were assigned free time to practice some problems through the online course website.

The video tutorials were filmed by the instructor during the academic year 2017-2018 specifically for the course. The instructor used the software TechSmith Relay to record the video tutorials on a tablet PC. Videos were edited and uploaded to the university blackboard. Students could access the video tutorials once the videos were posted online.

Data Collection

At the end of the semester, the students were asked to conduct an online anonymous quantitative survey for feedbacks about the flipped classroom. The survey was open for one month with weekly reminders sent to students. The survey was comprised of questions using a five-point Likert scale, assessing the aptitude, learning experience, and overall performances regarding the video tutorials. The Likert scale scores for each question were set as: 1-strongly agree, 2-agree, 3-neither agree nor disagree, 4-disagree, 5-strongly disagree.

In data analysis, we provided the descriptive statistics from the survey. For each question, we presented the number of responses for each of the fiver Likert scale results. Due to the small enrollment in this pilot study, we do not conduct any formal hypothesis test.

Table 1. Students survey summary

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Course objectives & procedures for evaluation were made clear at the beginning of the semester.	2	2			
Content, assignments, class activities, and evaluation procedures were appropriate for course objectives.	3	1			
Course content (lectures, handouts, or reading assignments) included current, state-of-the-art information	2	2			
Course resources (texts, handouts, guests, slides, films, etc.) were useful.	1	2	1		
Planned course content was reasonably covered by the end of the semester.	2		2		
Overall, this course was personally rewarding.	2	1	1		

Instructor was knowledgeable on the subject matter.	4				
Was professional & understanding in relationships with students.	3	1			
Encouraged interaction (questions, expressions of opinion).	2	2			
Materials such as video, handouts, and assigned documents are helpful for homework completion	3	1			
Learn same amount with materials such as video, handouts, and assigned documents vs. in-class lecture	1	2	1		
Understand materials better using materials such as video, handouts, and assigned documents	3		1		
Better able to manage my time with materials such as video, handouts, and assigned documents.	1	2	1		

From the survey, we can see the students are very positive with the flipped lecture. In particular, most students like video, handouts, and assigned documents for homework completion; most students feel the video, handouts, and assigned documents can help them understand the materials better.

DISCUSSION

In this study, we use the innovative flipped lecture approach with TechSmith Relay for online video turotial materials. The results indicate the students like the flipped lecture approach better than the conventional approach. Of course, there are also some limitations: there are no comparisons of same courses; also, the sample size for the study might be small; last the study is conducted at a single institution with a single instructor. Further study will be extended to bigger class to assess the effects of the flipped lecture approach.

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