REDESIGNING AN UNDERGRADUATE STATISTICS COURSE USING A FLIPPED CLASSROOM MODEL

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INTRODUCTION

Enrollment in our undergraduate statistics course has grown after the course became a co-requisite for introductory Chemistry and Biology courses. As such, we felt that it was necessary to redesign the course to meet the needs of these new students combining aspects of a flipped classroom as well as team-based learning to encourage student engagement and success.

THE COURSE REDESIGN

The main learning objective for the course is that students will learn the basics of data analysis, including the descriptive and inferential statistics commonly used in the health sciences. In order to increase student success in this course as well as co-requisite Chemistry and Biology courses we altered the content of the existing course to include a unit on data modeling using linear, exponential, and logistic function models. While this is not a topic typically associated with an introductory statistics class, the addition of this topic was requested by the collaborators from other departments to ensure student success in their concurrent courses.

The second major shift was to change the course from a 3 hour lecture course to a 2 hour lecture course, with the third hour being devoted to a lab time. A second learning objective of the course is that students will learn how to model real-world data and explore function patterns through hands-on exploration of meaningful data sets in Excel. During the lab time students are asked to use Excel to perform the statistical techniques which they have learned in the previous week in class. We created videos for each topic which explain the process of analyzing the data using Excel and added complementary assignments which ask students to practice the techniques prior to attending lab each week. This structural shift to a flipped class design allows students to work in balanced partnerships during lab with minimal instructor guidance while completing the Excel assignments. This shift frees students to concentrate on the statistical questions of interest and analysis in lab as they are not burdened by the distraction of simultaneously having to master the process for completing the lab tasks. Another unique feature of our course is that we hire exceptional former students and assign one to each lab section to assist students during class and lab with assignments, to grade low stakes assignments, and to offer review sessions prior to exams.

The third shift was the addition of reading quizzes, hand calculation videos, and Readiness Assessment Quizzes. These resources were also inspired by flipped classroom designs and ensure that students engage with the course material outside of class time to prepare before class and to review material after class. Reading quizzes are low stakes assignments which help determine if students have read the course material prior to covering the material in class. Hand calculation videos are resources we developed in which instructors recorded the process of working through a hand calculation for each topic covered in the course. This allows students to review difficult concepts if they still experience confusion after class. Finally, Readiness Assessment Quizzes are online quizzes featuring questions from previous course exams. Students are given the same amount of time to complete these RAQs as they are the course in-class exams. The online quiz allows students to receive instant feedback about which types of questions they missed to further guide their studying in preparation for the upcoming exams.

CONCLUSION

In the years since this course redesign was undertaken the failure and drop rates have decreased for the course and the passing rate and percentage of A's awarded have increased. Additionally, we saw an increase in completion rates for homework and lab assignments. We utilized the same final exam across the entire transformation period and noted as well that students experienced knowledge gains in course content for the transformed versus pre-transformed course.