

2013-2014 Audeamus Project Summary

Flipping the Classroom: Biology 231 Course Revision

Robert Sheehy and Tara Phelps-Durr

Introduction

On November 11, 2013 \$5700 was awarded to Drs. Robert Sheehy and Tara Phelps-Durr by the CSAT Leadership Team for the Audeamus proposal entitled “Flipping the Classroom: Biology 231 Course Revision Proposal. This award provided Drs. Sheehy and Phelps-Durr extra salary to revise the Biology 231 (Genes, Development and Evolution) course. This course is the third course in a sequence of 4 required courses within the Biology major.

For many semesters, the Biology 231 course was taught in the traditional lecture style format, where the students come to class, listen to a lecture, complete problem solving sets at home and periodically take exams over the material covered in class. During this time both Drs. Sheehy and Phelps-Durr gave a pre- and post-assessment in the course and found that there was no improvement in the students’ post-course assessment when compared to the pre-course assessment. After much discussion and consultation of pedagogical literature, Drs. Sheehy and Phelps-Durr decided to try the “flipped classroom”. In this approach, students are given reading or video module prior to meeting for the lecture portion of the course. These modules cover basic concepts and facts that are required in order to perform higher levels skills such as problem solving and data analysis. Modules include embedded interactive questions to help the student assess her individual understanding of the material. Additionally, students are required to complete a short quiz at the end of each module. During in-class portion of the course, the students are allowed to ask the instructor questions over the module in order to clarify any basic information. Then the students work in groups to complete problem solving and data analysis activities.

As outlined in the Audeamus proposal, Drs. Sheehy and Phelps-Durr had started making online modules for the Biology 231 course in the summer of 2012. Creating these modules took longer than anticipated and when the “flipped classroom” was launched in the fall of 2012, we did not have a complete set of modules and there were many technical difficulties that caused the modules not to properly embed into the D2L system. During the Audeamus funding period, the Drs. Sheehy and Phelps-Durr enhanced the already existing modules by adding short video lectures recorded by the instructors and editing the modules so that they would better integrate into D2L. In addition, the instructors created more in-class activities and explored other technologies, such as Learning Catalytics, to more easily assess the students during the in-class portion of the course.

Results

For several years the students in the Biology 231 course have been given a 25 question, multiple-choice assessment at the end of the semester. Despite being a multiple-choice assessment, the majority of the

questions require the students to problem solve or analyze data. A comparison of three sections of the Biology 231 course is shown below; one section was offered before the “flipped classroom” approach was initiated, the other two after.

	number of students	average score	high score	low score	#of students scoring >60%	#of students scoring >80%
Before flipped classroom	22	10	15	4	1 (~4%)	0 (0%)
After flipped classroom	43	12.82	23	5	17 (~40%)	10 (~23%)

Conclusion

Drs. Sheehy and Phelps-Durr have gathered assessment data and have anecdotal evidence that suggests that the “flipped classroom” approach to Biology 231 has improved student learning. The “flipped classroom” model has only been around for a few years and the effectiveness of this model has just recently begun to be reported (see <http://www.flippedlearning.org/research> for a variety of reports). Using active learning techniques, such as the “flipped classroom” does enhance student learning in the STEM fields although not dramatically (Freeman et al. 2014). These results suggest that the “flipped classroom” approach works very well for some students while being ineffectual for others. Despite the modest increase in student learning that we have seen in the Biology 231 “flipped classroom”, the instructor’s will continue to use this method because we believe that the students are gaining skills that we are currently not assessing. For example, there is likely an increase in student participation and an improvement in the students’ ability to work in teams.