TRESTLE Course Transformation Report Outline Spring 2018
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Increasing success of diverse students in STEM majors through the improvement of college algebra materials

Objectives:

- Enhance the curriculum with inclusive content, specifically focusing on representing people of color, women, and non-binary persons
- Create self-assessment placement process
- Implement new technology

How did the Student Academic Success Center (SASC) achieve the objectives?
Inclusion: SASC's Fall 2017 section of precalculus (MATH-1150), a course that is the combination of material from college algebra and trigonometry courses, achieved its goals of enhancing the curriculum, implementing new technology, and creating a self-assessment. In Summer 2017, a senior instructor was hired to develop the precalculus course with a new online platform and new textbook. The online platform allowed the instructor to create more inclusive content, primarily through increasing the representation of people of color, women, and non-binary persons into the problem sets.

Self-Assessment: The instructor also created a self-placement exam for students to take on the first day of class and again during the second week of class. This placement exam was an essential piece to the supporting the project's overall goal of increasing the success of diverse students, because the University of Colorado no longer requires students to take a placement exam for mathematics courses. Instead, a predictive algorithm is used to place students into math courses based on the student's prior math performance in high school and standardized test scores. Performance on standardized tests is linked to wealth, and therefore, race, so the creation and implementation of a self-assessment helps ensure that traditionally underserved students take the appropriate math course based on their skill level. The SASC self-placement exam was administered on August 27th and September 1st. Following the second exam, students were given information about switching into College Algebra (course prior to precalculus in the sequence) and Calculus (course following precalculus) based on their comfort with the pre-requisite material.

Technology: The precalculus course and curriculum were transformed by the use of technology, specifically by the My Open Math software. The online platform has a digital textbook, homework sets, assessments (quizzes, exams, projects), a gradebook, and calendar system. The instructor also used technology (clickers) to informally assess student knowledge on topics covered in the lecture. The use of clickers in small class sizes (< 20) is new to SASC, and instructors have decided to implement this practice in their other courses for the spring semester.

Assessment Plan

- Compare past semester data on course performance
- Measure student persistence by analyzing year-long performance

Did the changes in the Fall 2017 SASC course have an effect on course performance?

- Fall 2016 SASC MATH-1150 Course GPA: 2.49
- Spring 2017 SASC MATH-1150 Course GPA: 2.50
- Fall 2017 SASC MATH-1150 Course GPA: 2.51
- Spring 2018 SASC MATH-1150 Course GPA: 2.57

Student performance, as determined by final grade in course, was nearly identical for the Fall 2016 and Spring 2017 semester. After the change in course structure in Fall 2017, there was a slight increase in student performance for the Fall 2017 and Spring 2018 semesters. The slight difference in grade performance could be attributed to the changes in the course structure and implementation of the self-assessment, as students in the Fall 2017 and Spring 2018 sections of precalculus had similar characteristics and backgrounds to students in the course during the Fall 2016 and Spring 2017 semesters. The grading structure of the course was also consistent for all four semesters. Since the highest course GPA was recorded in Spring 2018, SASC will continue to monitor future course grades to determine if this increase in performance is related to the changes in the course and is not a random occurrence.

Is student persistence from MATH-1150 Precalculus to MATH-1300 Calculus affected by the course changes?

- Fall 2016 SASC MATH-1150 Ds/Fs Rate: 19%
- Spring 2017 SASC MATH-1300 Ds/Fs Rate: 16%
- Fall 2017 SASC MATH-1150 Ds/Fs Rate: 13%
- Spring 2018 SASC MATH-1300 Ds/Fs Rate: 6%

Student persistence in SASC is measured by analyzing the D/F rates in courses. Withdrawal rates (Ws) are not included in the persistence percentages, because SASC does not view dropping a course as a negative action; instead, we view it as a chance for students to recalibrate their approach to learning. The D/F rates have been declining over the last four semesters, with the largest decline in Spring 2018. This might suggest that the course changes in precalculus have affected the D/F rate. As stated in the previous section, SASC will continue to monitor the course grades and persistence rates in the precalculus to calculus sequence.

Broader Impacts

- Share results with MATH, APPM, Discipline Based Educational Research (DBER) group, Gold Shirt Engineering Program, and Miramontes Arts and Sciences

How have the results been shared?

MATH: Regarding the Math department, SASC was able to recruit the Math Undergraduate Chair, Nat Thiem, to attend a one-day seminar on inclusive pedagogy in the classroom. The seminar focused on the five dimensions of multicultural education: inclusive content, metacognition, classroom climate, inclusive pedagogy, and inclusive excellence. Information about the use of technology, clickers, and the new online platform, My Open Math, will be shared with the new coordinator of precalculus for the fall semester.

Discipline Based Educational Research Group (DBER): The project is now complete, and I plan to share the results with APPM, Engineering, and Miramontes Arts and Sciences Program through a presentation at DBER in the 2018-2019 school year.

An unrelated but notable broader impact that has resulted from this project is that this project supports CU's interest of using Open Educational Resources to enhance the student experience and reduce cost. Students in precalculus with SASC were not charged any fees for their textbook, online homework system, or self-assessment since the course utilized My Open Math. This reduced the costs to students by $240.

Next Steps

- Future Assessment Plans
- Implementing the changes in other SASC math courses
- Improving the use of the Open Education Resource

The SASC math program has already begun to implement practices from this course into other courses, like Calculus and College Algebra. The calculus faculty will use clickers for informal assessments and have created a self-assessment using MyOpenMath. College Algebra is only taught once per year in SASC, and in Fall 2018, the faculty member will utilize all of the precalculus materials for the course (technology, software, self-assessment). The Calculus faculty are examining an open platform for calculus and may implement the system in the 2019-2020 academic year.

The week before the Fall 2018 semester begins, SASC math faculty will be expected to further develop their courses in MyOpenMath and make tweaks in the self-assessment exams. Specifically, there is a coding feature in MyOpenMath that allows faculty to fine tune problems to include different features (graphs, specific functions, videos), and this will be the main focus during this weeklong training.