

Report on Provost Diversity Curriculum Grant Outcomes

Project Title: Increased Retention in Math with a Focus on Diversity in College Algebra

Investigators: Eva Strawbridge and Travis Olson

Grant Objectives and Priorities: Revise an existing course to increase access, retention, diversity, and inclusion in College Algebra

Overview: In math, as with many sciences, the under-representation of women and minorities is particularly glaring. Moreover, even here at JMU the enrollment differences in student populations between Algebra (Math 155) and Calculus (e.g. Math 235) show dramatic differences in the populations being reached. For example, in Math 155 over the past four years on average 8.9% of students identified as black, however, in Math 235 this number drops to 4.8%. Similarly, in Math 155, 44.7% of students are female while in Math 235 this number drops to 35.8%. This trend is also observed, though to a less dramatic degree, for American Indians/Pacific Islanders, Hispanics, and non-traditional aged students. While some of this can be explained by a larger enrollment of traditional-aged international students in Math 235 versus Math 155 (2.78% vs 0.81%) the reality is we have greater access to groups which are minorities in STEM fields in College Algebra than we do in Calculus. This affords us the opportunity to substantially increase our positive impact on underrepresented groups in these courses, leading to greater recruitment and retention, not only of students in general, but of underrepresented groups especially.

Our project involved coordinating a flipped class model for Math 155. We used the funds from the Diversity Curriculum Development Grant to buy the technology needed to design and create the lecture videos for this flipped class. A robust body of evidence suggests that increased in-class engagement through a flipped instructional approach improves student attitudes and outcomes towards math. Additionally, for ESL students at JMU, keeping up with listening and taking notes is an overwhelming challenge. The opportunity to engage in 'lecture' at their own pace, pause to look up vocabulary and formulate questions before class can greatly aid the ability to fully participate in classroom discussion and group work.

Proposed Outcomes: Math 155, College Algebra, is taught every semester and has served 2,946 students over the past four years with growing enrollment numbers projected. This proposal is part of a broader approach we hoped to take with math 155 which would include the hiring of a fulltime course coordinator (which was partially addressed as some of the duties of T. Olson in Spring 2021). The goal of this initiative was to better serve this group of students and lower the DWF rates and increase retention in math.

Because of the onset of the pandemic in March 2020, we began implementation of a version of this flipped class environment as soon as JMU went online in Spring 2020. During this time T. Olson taught one section of Math 155 (combined 05 and OP01) with a total of 11 students and

E. Strawbridge taught two sections of Math 155 with a total of 65 students. During the 2020-2021 (including Summers 2020 and 2021) academic year 10 sections of Math 155 were taught between the two investigators reaching a total of 341 students, 4 of them were in OP sections. Ultimately, we also implemented some of what we learned during this project in other math/stats courses as well including Math 205 (totaling 213 students from Spring 2020 to Spring 2021) and Math 220 (11 students in Spring 2020) and Math 342 (13 students in Spring 2020 and 20 students in Spring 2021).

The technology purchased through the diversity grant was instrumental in generating several hundred instructional videos for five different courses (not just Math 155). These videos allowed students to access and preview before class the main ideas covered each class, and then review the big ideas covered after class on their own time. In class screen-sharing apps were used to conduct a responsive, synchronous discussion which was accessed by students as far away as Azerbaijan and Saudi Arabia. At times the notes generated during each class were made available on canvas for students to access immediately after class.

Because of COVID-19, we were unable to assess the impact of this approach in any meaningful way that could be compared to pre-covid data, however, we are hopeful that the techniques and materials developed will be implemented in post-COVID classrooms when impact and outcome comparisons might be more realistically assessed. Both investigators created and used lecture videos tailored to student needs based on the textbook as well as online formative assessment and homework assignments. Because of the flipped and online nature of the courses due to COVID, tailored in-class activities which could be used in a Zoom or WebEx setting were also developed. The initial design of these projects was used in both the sudden transition to online in Spring 2020 as well as in the online summer classes of 2020. Feedback was collected from these experiences and the lecture videos and products were then edited for use in the 2020-2021 academic year.

While feedback from students was generated via end-of-semester questionnaires, neither this data nor the distribution of course grades or DWF rates can be directly compared to pre-COVID data without the conclusions of such comparisons being highly suspect. However, qualitatively assessing the feedback from students and anecdotal evidence suggests that students did find this approach accessible and inclusive. The in-class activities helped to create a sense of community even while online, in a difficulty setting and the tailored lectures appeared to help the students feel more connected to the professors while also allowing them to have time to “rewind” and collect questions for the in-class time. In conclusion, while this project was implemented under unexpected and trying circumstances, the investigators are more confident than ever that this approach, or one similar, is a good means of creating a more inclusive and accessible environment and should be implemented and examined in a post-COVID setting as well when assessment and comparisons are possible.