Pre-Calculus (MATH 1113) Course Redesign at Georgia Gwinnett College

Two Simple Course Interventions to Improve DWF Rates in a College Pre-Calculus Course

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This case study provides an example of two simple interventions adopted in a Pre-Calculus course. This was done to keep students motivated and persevering through the semester as well as a way to help them prepare for upcoming examinations in the midst of COVID-19 quarantine. Though these interventions are proposed for an elementary general education Pre-Calculus course, it can be adopted for any course seeing similar effects in their DFW rates due to lack of student motivation and study skills deficiency.

STATEMENT OF THE PROBLEM

Pre-Calculus is one of the elementary gateway mathematics courses offered at an open-access institution, Georgia Gwinnett College. Pre-Calculus serves students across various STEM disciplines in the School of Science and Technology at the institution. The pre-requisite to this course is College Algebra and upon successful completion, students are able to continue their study and start their Calculus course sequence. Traditionally, this course along with College Algebra have seen very high DFW rates among students. With continued efforts across the University System of Georgia to shift these outcomes, there are many initiatives currently in place for implementing change. In Fall 2018, the overall DFW rate for Precalculus was at about 35% and in Spring 2019, the overall percentage of students from 16 sections of this course that fell in this category of either DFW or FN were at 34%. The comparison of these rates across sections of Pre-Calculus is done every semester by reviewing assessment data. There is a need for more thorough analysis and investigation by the faculty to understand the data and the reasons causing these outcomes. Student grades in this course vary greatly depending upon course delivery and how instructors opt to give credit for various classroom activities such as homework, quizzes and exams. In additions, course grades also are affected by students' overall course load and personal responsibilities. Student course evaluations and work samples are yet to be compared for this gateway course at the discipline level. But the faculty assessment has brought to light two reasons that have been resounding over the past years as contributing to these high DFW rates. First reason is attributed to students' loss of motivation to continue learning and persevering as the semester progresses and the second reason is the lack of basic study skills when it comes to exam preparation. The current redesign focuses on alleviating the effects of these two elements on student success by introducing timely interventions such as weekly check-ins to sustain student motivation and mandatory test reviews for credit to improve students' preparation for examinations.

METHODS

Students' success in Precalculus is critical as this sometimes deters students from further pursuing their study in the STEM disciplines. Two factors resounding among various sections of the course as contributing to a high DFW rate are students' lack of motivation to continue learning and persevering as

the semester progresses and their lack of basic study skills when it comes to exam preparation. In order to alleviate the effects of these factors, this redesign takes the simple approach of introducing two timely interventions: (1) Weekly check-ins and/or motivators to help sustain student interest in the course and (2) Requiring mandatory reviews for all exams conducted in the course.

Weekly Check-ins and Motivators

One-on-one check-ins between the instructor and students allow students to be held accountable for the work that was completed in the course as well as assignments that should be prioritized and submitted. Instructors met with students individually at the end of the week while other students did in-class assignments to make sure that students were on track with their work. Instructors reviewed for the completion of assignments that the students had to turn in via the LMS and if there were any missing, gave them a timeline for completion. This also gave the student one-on-one time with that instructor during class to ask quick clarifying questions about anything the students wanted to discuss during that time. For some instructors, this was coupled with weekly motivators including either the class watching a short video followed by a quick in-class discussion or motivational prompts in discussion boards on the LMS that students respond to individually.

Mandatory Exam Reviews

Another important intervention implemented during the semester that we believe helped students was requiring them to complete mandatory assigned exam reviews for a percentage of their exam grades. The mandatory review was open book and to be completed in class with one other student. We believed that by students interacting one-on-one with their peers, it forced discussion and review of concepts that may have needed further clarity. We had students work in pairs which also allowed for engagement such as peer-teaching. Scholars such as Goodlad and Hirst (1989) and Topping (1998) suggest that some of the benefits of the peer teaching are as follows: Students receive more time for individualized learning; Direct interaction between students promotes active learning; Students feel more comfortable and open when interacting with a peer; Peers and students share a similar discourse, allowing for greater understanding. Further, one student with more knowledge on a particular content area in the course can support another that did not fully understand the concept to reinforce learning. Before COVID-19, mandatory assigned exam reviews were completed by students in class and graded for immediate feedback by faculty. Concept areas requiring further attention by students were identified so that students could address weak spots before the exam. Once classes moved to an online format due to COVID-19, mandatory exam review problems were still assigned, but submitted via LMS and students were given feedback through that system. Due to students varying situations outside the classroom during this time, some students turned the assignments in while others were unable to due to a lack of technology access outside the classroom.

OUTCOMES

In Fall 2019, this course redesign had a very different perspective in improving student success in this class. It was focused highly on student performance by providing opportunities for tutoring outside of class to encourage students to ask questions and help their learning process. Four instructors took part in this first round of piloting the course and each provided time (2 hours per week / instructor) when students from any of the sections could walk in to clarify their doubts and obtain points (10%) of their final grade. Despite offering a grade for attendance, only a handful of students made use of this opportunity and student attendance dwindled as the semester progressed. GGC caters to a large commuter population of students many of whom are non-traditional and have only have a fixed number

of hours they can afford or able to be on campus. This affected largely to what extent students could take advantage of services most beneficial to them. The redesign was therefore revamped and took a simpler approach by introducing two timely interventions during class time. First the weekly check-ins to help sustain student motivation coupled with a weekday motivator (started after COVID-19) and second were mandatory exam reviews. During the fall semester both instructors had a large percentage of highly motivated students. Not many needed reminders during check-ins about keeping up with their assignments. But to ensure that this trend stayed a weekday motivator was introduced. This included either broaching an inspirational topic and having a short discussion in class or having the class watch a quick inspirational YouTube video followed by an in-class discussion. These short discussions helped to clear students minds and refocus their energies to something positive. This was a great way to start or end a class/week. After COVID-19 (during the quarantine period) this intervention had to take on a new format. The weekly check-ins were more frequent and via an app called GroupMe. They were not all individual check-ins as much as check-in with the whole class. These really helped to reassure the student that they were in a space that was supportive and focused on their success and was not setting them up for failure. The weekly motivators now were Monday motivators and were a discussion post on the student learning management system. Students were presented with a quote and had to respond as to why they liked it and state an example from personal experience. This accounted for their attendance grade (5%) in class. Instead of the mandatory tutoring sessions, students had to complete exam reviews in class. They were open book and students could collaborate in groups of two. Their work was graded while in class. This worked as a great just in time review facilitated by peer collaboration. This account for 25% of their exam grade. This ensured that students were caught up to speed in case they missed any lectures. These collaborations in the classroom also helped to improve the classroom environment by building a sense of community.

PLANS FOR CONTINUATION AND EXPANSION

The feedback received from this past semester was more qualitative, and due to the unexpected and unusual circumstances, may be an outlier to be used in the study. This will be implemented again in the Fall semester in two sections of Precalculus with the current online platforms used for course delivery to further understand the effects of these simple interventions on student performance. We will also look for potential sections where these interventions can be implemented this Fall 2020. This summer will be used to designing feedback survey for the course to obtain the necessary data. With the current situation due to COVID-19 it is now furthermore necessary to have the various resources for this course in a more user-friendly platform and streamlined for easy access and delivery in an online environment. The chairs of this committee will be working on this during the summer 2020 semester.

LESSONS LEARNED AND POTENTIAL IMPLICATIONS

One of the important lessons to take away is that instructors need to be quick to grasp overall motivation index in the class and to make class expectations clear. Instructors also need to adapt to on online environment if instruction deliver has to change. Like other courses in the present circumstance of COVID-19 it is important that the course material be adaptable for both in class and online delivery.

REFERENCES

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Topping, K. J. (1998). Peer assessment between students in colleges and universities. *Review of Educational Research*, 68, 249-276. https://doi.org/10.2307/1170598