Encouraging First-Year Engineering Retention through Course Help and Campus Community Engagement

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Work-in-Progress: Encouraging First-Year Engineering Retention through Course Help and Campus Community Engagement

Introduction

Low retention of first-year students is a common issue within engineering programs. There are many factors believed to influence student retention. Some are difficult for educators to address such as family support, a student's minority status, socio-economic status, etc [1]. However, other areas such as a student's engagement in the campus community [2][3], relationships with other students [1], and understanding how to use campus resources[3], are addressable within introductory courses. For this project, researchers present preliminary results from a study designed to increase student retention in a first-year engineering program by implementing course activities that encourage students to become engaged in the campus community and better understand how to use existing campus resources.

The pilot study occurred during the fall 2017 semester at a regional university that caters primarily to first generation scholars and commuters. The First-Year Engineering (FYE) program consists of a two course sequence: Engineering Fundamentals I (ENGR 101) and Engineering Fundamentals II (ENGR 102). The majority of students take ENGR 101 in the fall semester followed by ENGR 102 in the spring semester. ENGR 101 and 102 are designed to help students with math readiness, physics understanding, preparation for their future 200 level courses, and teach them general problem-solving, teamwork, communication, study habits, and professional development. This particular FYE course sequence started in the fall 2015 semester, and fall semester enrollment has fluctuated between 101 and 133 students.

Methods

To encourage student engagement, three student success topics were added to the ENGR 101 course: (1) Campus Resources for Course Help, (2) Time Management, and (3) Participation in Campus Activities. For each topic, instructors used a combination of an in-class presentation paired with a take-home assignment for students. The activities were designed to introduce the students to important student success topics, give them an opportunity to interact with important personel on campus, and help motivate them to overcome the initial awkardness new students can feel when trying new activities on a new campus. The specifics of each activity include:

1. Campus Resources: Representatives from the Student Success Center presented information about the different course help available to students on campus. The presentation highlighted two free campus tutoring centers, described professor office hours, and gave the students an opporunity to meet the Student Success Center advisors. The students were assigned to go to any office hours or tutoring before the first midterm. They were required to get the instructor's or tutor's signature as well as answer four short reflection questions.
2. Time Management: The College of Engineering Dean gave a presentation to the students about the importance of time management. The follow-up assignment had students complete a time budget of their weekly schedule and write a short reflection about the results.
3. Participation in Campus Activities: Involvement in campus activities are beneficial to students' college experience and potentially their future careers. To introduce students to

some campus activities available to them, instructors presented slides prepared by student organizations. The students were then assigned to choose two campus activities to attend before the second midterm and complete four reflection questions. The presentations only highlighted engineering related student groups, but students were allowed to go to any campus activity for the assignment.

The initial data sets collected for the pilot study included tutoring attendance from the engineering tutoring room, grade distributions on the first midterm, student enrollment lists from ENGR 101 (fall semester only) and ENGR 102 (spring semester only), and feedback provided on course assessment surveys and the completed reflections.

Pilot Study Results

After reviewing the solicited feedback within the completed reflection assignments (not annonymous) and end of the semester course assessments (annonymous), students appeared to enjoy the activities overall. Many students stated they originally thought the assignments were pointless, but ended up enjoying the experiences, particularly the mandated course help. There was one student who indicated tutoring was a waste of time and one student who felt the campus activities assignment was too difficult for a commuter student to complete. However, considering 133 students registered for ENGR 101 during the pilot semester, receiving only two negative comments was encouraging.

Using available tutoring data, the researchers found the number of tutoring visits by ENGR 101 students increased from 22 visits in fall 2016 to 44 visits in fall 2017. This increase was expected since attending tutoring was required during the pilot study. Although researchers expected an increase in total number of indepent tutoring visits during the pilot study, it was originally surmised that once students were over the awkwardness of an initial visit then they would be more likely to use the resource again. It was disappointing to find no change in the number of students with more than one tutoring visits. Fall 2016 had 17 students while fall 2017 only had 16 students visit tutoring more than once. For future semesters, the researchers plan to also track office hour visits to help assess a complete picture of what resources students are using.

Between the fall 2016 and fall 2017 semesters, the same instructors taught the lecture components of the ENGR 101 course, similar lecture materials and structure were used, and the same first midterm (Exam 1) was given. Because the Campus Resources assignment was due at Exam 1, researchers hoped to see a significant increase in Exam 1 scores between the fall 2016 and 2017 semesters. Figure 1 shows the grade distribution for Exam 1 graphed as percent of class versus letter grade received.

The percent of class was selected for the y-axis to account for the different enrollment numbers between the two study semesters. The first bar in each letter grade set is for fall 2016, the second bar is for fall 2017, and the final bar shows the difference between the two years calculated as fall 2017% - fall 2016%. The results show a decrease in Ds and Fs, a small increase in Cs and As, and a sharp increase in the number of Bs. The visible shift in grade distribution is promising and potentially indicates the mandatory tutoring is improving student performance.

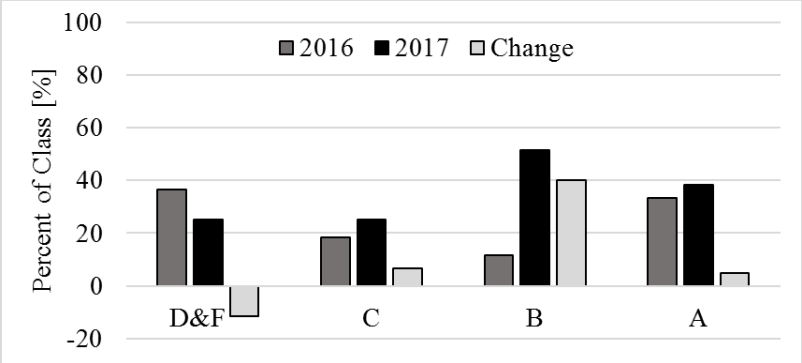

Figure 1. Grade distribution for ENGR 101 Exam 1

Lastly, retention rates for the FYE program were assessed by calculating the percent of students enrolled in ENGR 101 in the fall who subsequently registered from ENGR 102 in the spring. The results of this analysis for 2015-2017 are shown in Figure 2. 2015 and 2016 (pre-pilot study) had similar retention rates hovering around approximately 61%. Following the pilot study, retention rose over 15% to approximately 76%. These results indicate that the student success activities could be positively influencing student retention rates within FYE.

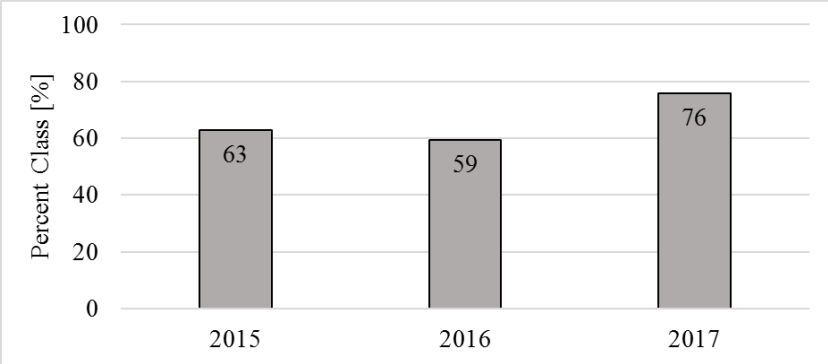

Figure 2. Retention rates between ENGR 101 and ENGR 102

Next Steps

The initial results were promising with increases in measured student performance and retention. Additionally, students indicated that they appreciated the assignments. However, the analysis has only been completed for one semester and results could vary once additional semesters are added. In fall 2018, this study is being expanded to a multi-disciplinary STEM project and the described activities will be implemented in multiple introductory courses.

[1] L. Thomas, “Student retention in higher education: the role of institutional habitus,” *Journal of Education Policy*, vol. 4, pp. 23-442, 2002.

[2] V. Tinto, “Research and practice of student retention: What next?” *Journal of College Student Retention: Research, Theory & Practice*, vol. 8, pp. 1-19, 2006.

[3] G. Crosling, M. Heagney, & L. Thomas, “Improving student retention in higher education: Improving teaching and learning,” *Australian Universities' Review*, vol. 51, pp. 9, 2009.