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Work in Progress: Success and Retention Strategies for STEM Gatekeeper Courses in a Community College

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Introduction

Students encounter many challenges in their first year, including adjusting to the college environment and taking demanding courses. These challenges manifest in poor retention rates. Recent statistics at our institution show that the one-year retention of full-time first-time entering students is 57% [1]. The likelihood of students quitting a major or dropping out of college is significantly increased when they fail a course [2]. This project is being developed to address high course failure rates by tackling some of the obstacles to success that students face.

The proposed project initiatives will address issues such as lack of sense of belonging in college, low perceived value of the curriculum, poor time management skills, inadequate prioritization of study, and insufficient self-efficacy. These have been identified as contributing to student attrition rates [3] [4]. The initiatives are: 1) Implementation of an active learning strategy where most lecture classes start with a conceptual or application question, 2) Improvement of student engagement with academic support services, and 3) Introduction of a student leader or embedded tutor to a course. The project will initially focus on historically difficult courses with high failure and withdrawal rates (gatekeeper courses).

Method

An Active Learning Approach

Research has shown that active learning leads to increased student engagement and learning gains compared to a traditional lecture format [5]. As part of this project, instructors will start most class sessions with a conceptual / application question (an active approach) to capture student interest and engage students actively in research and discussion. The question may require the application of prior knowledge or the research of new information. Students work individually for several minutes, and then in groups for several more minutes, before sharing results. After this introductory work, the theory is presented, and at the end of class students are encouraged to return to the question if they did not solve it earlier.

In this new approach, the work on the conceptual question plants “hooks” of new ideas in the students, priming them for the lecture to follow and energizing them to learn. Students engaged actively at the beginning of class are more likely to stay focused and alert for a longer period of time. Additionally, introduction of application questions increases the perceived value of the curriculum as students can connect the theoretical concepts to real-world problems.

A flipped classroom approach was considered. However, one challenge of the flipped classroom is that students do not always complete the required work prior to coming to class [6]. Starting the class with the conceptual questions overcomes this challenge as it does not rely on students reading the material beforehand.

Improving Student Engagement with Academic Support Services

When students struggle, especially during the first year, lack of timely academic support can decrease their motivation and self-efficacy [3]. This initiative addresses time management, prioritization of study, and learning skills. Although support services like tutoring, access to a learning specialist, and mental health counselling are available to students, they tend to be underutilized. To improve student engagement with support services, relevant information and links will be included as part of the course shell in the Learning Management System (LMS).

An important feature of this new approach is that the support services are presented at the course level rather than the individual level, and students are asked to establish contact with the services proactively. Simple assignments throughout the semester, given to the whole class, ask students to engage with support services and provide feedback about their experience.

This approach has the following strengths:

- Emphasis on proactive versus reactive interaction with support services through course assignments. By the time a student realizes that the course is not going well and schedules support sessions, weeks may have passed from the time when help would have been most effective. Having active engagement before help is needed enables students to react more quickly when the need arises.
- Initial engagement with support services is course-based. There is no stigma attached to an individual student as being in need of "help".
- Ease of use, as all information is in one place in an LMS course.
- Semester-long instructor involvement encourages students to view support services as part of the college experience.

Student Leaders / Embedded Tutors

Student leaders are students who took the course successfully in the past and are prepared to share how to effectively study for the course and maximize the potential for academic success. In addition to assisting students with learning, this initiative has the potential to increase their sense of belonging in a college.

Student leaders host weekly sessions open to all students enrolled in a targeted course. The sessions are held at a convenient time for students and are in addition to the student leader being present during labs. Examples of activities during these sessions include content related application assignments, discussion of readings and class review notes, development of organizational tools, and exam preparation strategies.

Student leaders will receive training at the beginning of the semester from a learning support department to increase their knowledge of learning strategies and important topics such as time management and organization, learning styles, stress management, and test-taking techniques.

It is expected that the presence of the student leader will help students as they navigate the college and the demands of a particular course. This role combines elements of a peer tutor, a lab assistant, and a friendly sophomore student willing to give advice and answer questions.

Preliminary Results

Currently, the details of the project are being finalized. A pilot run is proposed for select gatekeeper courses. At the end of the pilot, the pass rates of selected courses will be compared to average pass rates over the last three years, and students will be surveyed for feedback.

As the project was being developed, preliminary versions of these strategies were introduced to an engineering technology course. Though the sample size was small (one class), initial results show improved class attendance and increase in class pass rates. One hundred percent of students passed the class compared to an average of around seventy percent in past semesters.

Furthermore, students developed as a strong, collaborative team over the semester. This is especially impressive considering the difficulties faced by students attending commuter colleges. In addition to attending school, many students are also working (some full time,) and some are returning adults with family responsibilities. The weekly informal sessions and lab support led by a student leader greatly contributed to the collaborative spirit in the class. Students got to know each other and found common interests outside of the class. A group of these students embarked on setting up a new college club.

At the end of the semester, students evaluated their class experience. They were asked two questions: “What is your opinion on starting the class with a conceptual question?” and “What is your experience with the student leader’s help?” Their responses indicated one hundred percent positive feedback to the introduction of conceptual questions and a student leader to the class.

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