

Proposal for the Mellon Grant for Evidence-Based Teaching Innovations

Title: “Improving achievement in CS111 through personalized coaching with student advocates”

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Implementers

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Background

CS111, *Computer Programming and Problem Solving*, is the intro course for the computer science major. The course is offered every semester and has seen considerable growth in enrollment over the last several years. Between 70 and 100 students have completed the course each semester in recent years.

There are cumulatively 45 hours of help available outside lecture and lab time in CS111, including professors' office hours, help room, SI (supplementary instruction), and peer mentor meetings. Despite the ample support offered, less than 15% of the Black and Latinx students who signed up for the course in fall '16 and spring '17 received a B- or above (total n = 27). More than 60% of White and Asian students who signed up for the course finished with a B- or above (total n = 100). These data suggest that underrepresented minority students may not be utilizing these resources effectively, as there may be barriers to access for certain students. Furthermore, since the majority of the students in CS111 are first year students, they may be less likely to know how to access resources or to feel comfortable doing so.

Project Description and Goals

The goal of this project is to improve achievement for all students in CS111, particularly underrepresented minority students, first generation college students, low-income students, and students with disabilities, and to reduce the achievement gap for students in these groups. We also hope to increase utilization of resources, particularly SI and professors' office hours, especially for students who are part of these underrepresented groups. We intend to begin the initiative during the Spring 2018 semester.

We would like to employ 3 students who have already taken CS111 to serve as student advocates. The role of student advocates would be to provide 1-on-1 support to students in CS111, including encouragement and identifying and reducing barriers for students' accessing of other resources already available in the course. Student advocates would not provide help on course content, nor would they be a part of the CS111 staff team or attend team meetings. They will serve primarily as a "connector" or liaison to existing resources in the course. They will receive training on resource referral and active listening at the beginning of the semester.

Student advocates would be selected based on their experience accessing resources in CS111 and would be chosen to represent many of the groups currently underrepresented in the department. This will be done to ensure that students in the program can identify with their student advocate, as previous research has indicated that peer mentor programs are more effective when students share demographic characteristics with their peer mentors (Dennehy & Dasgupta, 2017). Students will be selected to receive advocates prior to the beginning of the semester based on their QR score, which has been shown to predict performance in the course. Students who are first generation or who have a QR score less than 12 will be invited to participate in the program. Students who agree to participate will read a short bio written by each student advocate, rank the advocates they would like to work with, and then each be assigned an advocate whom they do not already know. Throughout the semester, the student advocate will meet with their assigned students as needed. Student advocates will keep track of how often they meet with students and check in with students periodically. Partway into the semester, other students may be identified who struggle on course quizzes and may be added to the program.

Student advocates would differ from tutors and SI's in that they would not provide help with course material. Instead, their goal would be to identify sources of frustration and disengagement for the student and coach the student in identifying and engaging strategies for long-term success. This might include going through the student's schedule and planning when to attend which resources during a typical week, introducing the student to one of the SI's, or helping the student refine or verbalize questions to ask a professor during office hours.

Evidence in the Research Literature

There is evidence in the existing literature that help accessing resources can improve students' achievement in introductory computer science and that trained peers can effectively provide this kind of support.

An intervention was conducted at Swarthmore College to recruit and retain more women and URM (underrepresented minority) students in their introductory computer science course (cs1). They implemented a peer mentor program and hired a full-time peer mentor coordinator. One role of the peer mentor coordinator is to “monitor the progress of all students taking CS1 and proactively seek out students at the first sign of trouble to get them assistance immediately.” Students at Swarthmore often felt more comfortable going to the coordinator’s office hours than faculty office hours, and the coordinator encourages students to go to faculty and also helps communicate student need to faculty. The intervention was successful at improving recruitment and retention of women and URM’s (Newhall, Meeden, Danner, Soni, Ruiz, & Wicentowski, 2014).

Shook and Keup’s 2012 overview of peer leader programs dedicates an entire section to the importance of peer leaders as resource and referral agents, noting that students, “peer leaders are especially useful as resource and referral agents not just because of their relevant knowledge, specialized training, and general accessibility but also because of their proximity to the student experience” (p. 9). Since, in CS111, students aren’t utilizing SI well, student advocates who meet 1-on-1 with students can serve as this first line of referrals.

Preliminary Research

In order to evaluate whether barriers to accessing resources hinder students’ success in CS111, a survey was conducted to evaluate students’ comfort accessing resources, their experience in the course, their availability to attend outside help (i.e. SI, help room, peer mentor meetings, and office hours), and their utilization of these resources. The survey was taken by 61 students enrolled in CS111 in fall 2017 during the 13th week of the semester. Ample support was found that barriers to accessing resources do exist, particularly for students from underrepresented groups. Students rated their comfort doing various course-related activities like attending SI and asking a question in class on a 5-point likert-type scale from very uncomfortable (1) to very comfortable (5). Students also rated how much they agree with a variety of statements on a likert-scale from strongly disagree (1) to strongly agree (5). Statements included “I feel satisfied with my level of success in the course”, and “I feel overwhelmed by everything I have to do for the class.”

Overall Results:

46% of students agree or strongly agree with the statement, “I feel overwhelmed by everything I have to do for the class.”

A paired-samples t-test revealed that students felt more comfortable attending a professor’s office hours when they had a specific question than when they felt very lost/confused. This indicates that students who are behind in the course may be less likely

to seek help than those who feel up-to-speed. Furthermore, there was a significant correlation between students' satisfaction with their level of success in the course and their comfort answering a question during lecture or lab, attending help room. There was a marginally significant correlation between students' satisfaction with their level of success in the course and their comfort and attending office hours to ask a specific question ($p = .066$).

Existing peer mentor meetings and SI sessions are not well-utilized. These resources are likely to be the ones where students address their underlying comprehension of content, as opposed to having specific questions about problem sets answered. 47% of students report never having attended SI, while 40% report never having attended peer mentor meetings. In contrast, only 8% of students report never having attended help room.

First Generation Students (N = 11):

Independent samples t-tests revealed that first generation students feel less comfortable attending peer mentor meetings and help room than non-first generation students. Furthermore, first gen students agree less with the statements, "when I have a question or feel confused about course material, I know where to go for help" and "I feel connected to others in the course." First gen students also report finding help room and SI ($p = .071$) less helpful. A chi-square test for independence revealed that they are significantly more likely to report never having attended peer mentor meetings.

Underrepresented minority students (N = 6; 5 Latinx, 1 American Indian):

URM students report feeling less comfortable attending SI ($p = .071$) and help room. 100% of URM students have never attended SI, while only 40% of non-URM students have never attended. The lack of comfort and lack of attendance indicates that comfort may be a significant barrier for URM students attending SI.

Low-income students (N = 16):

16 students reported identifying as low-income. These students feel less comfortable attending peer mentor meetings, SI, help room, and professors' office hours when they feel very lost or confused than non-low-income students. 38% of low-income students say they would feel uncomfortable or very uncomfortable attending a professor's office hours when they feel very lost or confused, while the same is true for only 12% of non-low-income students. Low-income students agree less with the statements, "when I have a question or feel confused about course material, I know where to go for help," "I feel proud of my work so far," and "I feel connected to others in the course." They are more likely to have never attended SI (75% have never attended) and peer mentor meetings (63% have never attended).

Evaluating Effectiveness of the Intervention

The effectiveness of the initiative will be evaluated in a number of ways:

1. Grades/achievement of students in the program - We hope to see an increase in the portion of these students who earn a B- or above in the course.
2. Retention of students from underrepresented groups: We also hope to see a decrease in the amount of students in the program who drop the course.
3. Attendance at SI and professor's office hours - we hope students in the program are more likely to attend SI and office hours during the semester.
4. Increased comfort accessing resources. We will re-run the survey described above and compare the results to the Fall '17 results. We will look for an increase in comfort accessing resources and satisfaction with level of success in the course, particularly among students participating in the program.
5. We will also add a few questions to the reflection students take after completing the first problem set to measure sense of comfort and belonging in computer science. We will ask these same questions at the end of the semester. We hope to see increased comfort and belonging among students who participate in the program compared to their peers.

References

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