Work-in-Progress: Developing a Virtual Peer-Facilitated Workshop Experience for First-Year Engineering Students - A Comparative Study of Online and Face-to-Face Engagement

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Background and Motivation

Interventions for supporting student success in challenging courses are well-established and can take on various forms in engineering education [1]. At the University of Houston (UH), peer-facilitated workshops support key gateway courses in science, math, and engineering and require students to enroll in a 1-credit hour class at a specific time offering. Before the COVID-19 pandemic, these workshops were offered face-to-face and transitioned to online synchronous during the pandemic. Currently, these workshops are again offered face-to-face with a proven track record of improving student achievement in associated classes [2]. Workshops are led by undergraduate facilitators leading discussion and problem-solving sessions around previous problems or self-developed practice problems. This type of intervention improves student learning through an increased sense of community (belonging) and concept reinforcement. Students are in a small-group environment with other students that are highly motivated to learn and succeed [3]. However, for students to engage in this type of support, they need to pay the cost associated with an additional credit hour and have the time in their academic and personal schedules to attend. This disproportionally burdens underrepresented, first-generation, and non-traditional student limiting their access to such support. This work-in-progress seeks to develop a solution to address the equitability of peer-facilitated workshops by developing a virtual (asynchronous), open-access workshop experience.

Additionally, students continue to have a reliance on virtual material to support their learning process which provides the flexibility and access to support various student schedules and needs [4]. Students have benefited from various material deliveries and have a higher level of fluency with such support compared to previous student cohorts. However, asynchronous videos typically are rigid in the material they cover and not interactive. They rarely provide opportunities for engagement and community building that is foundational to peer-facilitated workshops [3]. Hence, this work seeks to develop asynchronous material that can be engaging and implemented as part of a virtual community of learners.

Previous literature links an increased sense of belonging to increased academic achievement resulting in improved retention [5] with a notable impact on underrepresented and underserved students [6]. However, asynchronous material by itself, has not been found to address a sense of belonging in the same way that face-to-face intervention strategies have done. Therefore, the approach outlined seeks to address the limitations of asynchronous student support by leveraging the success of peer-facilitated workshops with the benefits of an asynchronous online setting.

Course Context

The first-year engineering program at UH consists of two fundamental courses required for all engineering students. Approximately 700 students take the second-semester course, Introduction to Computing and Problem-Solving, annually across fourteen sections. Course deliveries range from face-to-face, online synchronous, hyflex, and hybrid. Students learn to problem-solve using MATLAB©. Additionally, the successful implementation of auto-graded assignments

through an integrated Zybooks© and MATLAB© Grader environment provides real-time feedback for students and supports a mastery-based assessment approach to learning weekly content. Because of a significant support structure integrated into the course by undergraduate teaching assistants (UTA), additional student success workshops had not been needed. However, in response to a significant drop in student achievement during the Fall 2021 semester, two traditional peer-facilitated workshops were implemented.

Research Question and Logic Model

This work seeks to answer the following question: How do the engagement and achievement of first-year students in engineering classes differ between online (asynchronous) and face-to-face peer-facilitated workshops?

Because the intervention aims to equally engage students, the following null hypotheses will be tested:

1. There is no significant difference between the engagement of students that fully participate in the online and face-to-face peer-facilitated workshop.
2. There is no significant difference between the achievement of students that fully participate in the online and face-to-face peer-facilitated workshop.

To address the question and test the hypotheses above, the project focus is to develop:

1. a virtual, open-access peer-facilitated workshop experience, and
2. asynchronous, interactive material that is part of a virtual community of learners.

For this work, interactive is defined as the ability for the user (student) to receive feedback on their work and ask questions. Figure 1 outlines the logic model for developing an open-access and interactive peer-facilitated workshop in the context of a first-year engineering course. The target population for the proposed intervention is first-year students enrolled in the second-semester first-year engineering course for Fall 2022 and Spring 2023. While the opportunity to participate will be open to all students enrolled in the course both semesters (approximately 700 students), it was anticipated that approximately 50 students each semester will fully participate for a total of approximately 100 students in the intervention group. The unique aspect of this logic model is that the intervention will feedback on the sample size of the target population as a metric of engagement along with a sense of belonging.

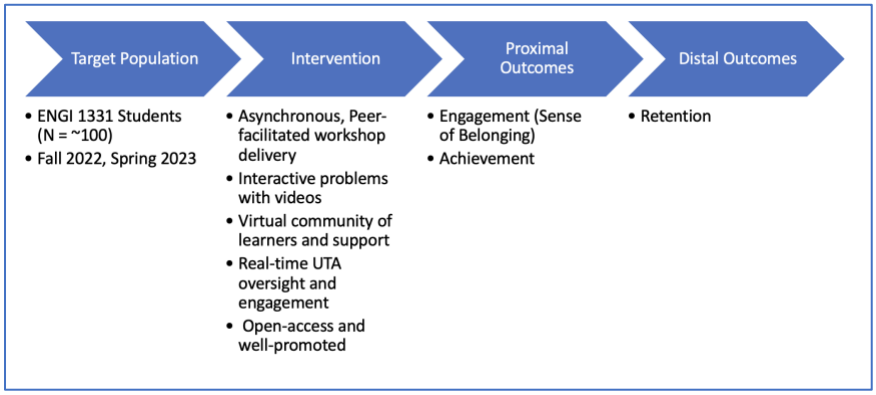

Figure 1. Logic Model for Open Access, Interactive Peer Support Workshop

Method

The intervention strategy includes asynchronous videos, interactive problems, and a virtual community of learners that will be included real-time UTA oversight providing opportunities for feedback and data collection.

To measure the success of the proposed intervention, both engagement and achievement must be assessed. For engagement, the percentage of students that are engaging partially or fully in peer workshop support will be determined through student surveys, activity on MS Teams, viewing records of videos on MS Stream, and attendance at live, virtual peer-facilitator check-ins. To assess if the intervention was able to create a similar community of learners (sense of belonging) among students, a tool will be developed to compare students that participated fully in a virtual workshop and students in a face-to-face workshop. For student achievement, final course averages will be compared among students that participated fully and students who did not. For all data collected, at-risk student groups will be differentiated within this comparison to investigate if the proposed intervention had a different impact on student groups that are anticipated to benefit the most.

Implementation and Future Work

The Fall 2022 implementation focused on content development during the first eight weeks of the course when student attrition is high. Over 20 hours of asynchronous peer-recorded support content and 10 associated MATLAB© Grader problems were developed, and 50% of students enrolled in the first-year course joined the MS TEAMS platform, with 20% engaging at least once through comments, questions, and MATLAB© Grader attempts. Qualitative responses were collected from participants in the virtual and in-person workshops, and normalized student achievements were collected for each group. While statistical comparison was inconclusive due to the small sample size and the response rate for the virtual workshop (n=5), key themes such as "support", "community", and "practice" emerged from qualitative responses, which are being used to inform a subsequent survey tool for understanding the student support experience broadly for all students in the class. The findings from the asynchronous participants have informed the development of a broader virtual course support system for Spring 2023, which integrates professional development, advising, undergraduate teaching assistant office hours, and peer-facilitated support material.

Spring 2023 implementation included integration into the course structure where regular teaching assistant virtual office hours are held. With this integration, over 90% of students enrolled in the courses joined the MS Teams platform; however, less than 10% of students engaged in the peer-facilitated support channels. Through preliminary qualitative results, the low engagement may be because most students felt in-person discussions with teaching assistants and faculty were sufficient. Data collection and further understanding of how and why students chose to engage with this virtual community is ongoing with qualitative interviews to take place in Summer 2023 to inform continued implementation.

The limitation of this work-in-progress currently is the sample size. The method described above will be part of future implementation and the tool will be informed and developed with an increased student sample size.

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