

**Title:** Course Enhancement: Enhancing students problem solving skills through blended learning

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**Budget:** \$1500

**STEM Courses involved in the proposal:** Wood Frame Construction - 21900 - ETCM 1363 – 02 –  
Expected Enrollment: 24

## Project narrative

### Executive Summary

In my experience teaching introductory STEM courses, students who cannot keep up are more likely to develop learning gaps that grow as they tackle more difficult material. In my classroom, I deliver the content to students over the course of a few lectures, set assignments to measure student comprehension and move on once it is complete. At the end of the semester, an exam measures overall achievement. I understand that this system does not account for students who have not achieved mastery in a given topic. The STEM CENTER Teaching Enhancement Grants will enable me to improve my instructional activities particularly for ETCM 1363, an introductory and required course for all students in the Construction Management program. My goal is to close learning gaps and build a solid foundation for more advanced work in the upper level courses. I plan on using a [Cooperative Learning Principles](#) in which instruction will be delivered through small groups and students will be encouraged to work together to master concepts before they move on. As a response to COVID-19, the course delivery shall be modified to reduce classroom density. To make the most of the limited time we have for face-to-face interaction, I plan on grouping students for a timeframe that lasts a few lectures or weeks and designing the goals of the ongoing assignment. My hope is that cooperative learning would create an atmosphere that would encourage students to think creatively when solving problems as well as increase their confidence when solving problems.

### Project Narrative

#### Rationale:

Active learning encompasses a wide range of pedagogical tools and strategies that help students make meaningful connections to course concepts; working in groups is among these pedagogical practices. Probably the main advantage is that students can apply concepts, solve problems, and, in general, engage cognitively with course content with the support of peers. ETCM 1363 is a lecture/lab course with 3-hour lectures and 1-hour lab per week. The labs rely on the use of structured groups that engage in specific wood framing activities. The hands-on lab component of this course gives me a unique opportunity to apply pedagogical strategies such as cooperative learning and team-based learning where students can be assigned specific roles that operate throughout the semester. I have taught this course one time in Spring 2020 and want to incorporate active learning pedagogies into my course for Spring 2021. Most of the students in my Spring 2020 class tended to wait until I presented a solution to a problem and try to copy my work and not solve the problem at all. In real world, students should assert themselves when working with problems instead of waiting for the solution to come to them. Students could not create a solution using manipulatives unless they were given explicit directions as to how to use them or how they can be used in solving a problem. It has been decided to use a hybrid model and deliver the lecture content via Blackboard and instructional videos for Spring 2021. I plan on using more learner-centered pedagogical practices to make the most of the limited time I have for face-to-face classroom interaction. My hope is that cooperative learning would encourage students to think creatively when solving problems as well as increase their confidence when solving problems.

## **Materials and Methods**

I plan on using the station rotation method as a popular blended learning technique, where students rotate through group activities. The station rotation is a great option for Spring 2021 because there will be limited access to the lab due to COVID-19. First, a mini lesson will be delivered, and a short quiz will be used as a formal check for understanding. Students who demonstrate proficiency are ready to rotate to the wood lab to complete independent practice or personalized practice. Students who need additional assistance get to work with me (the instructor) in a small group in the moment. My role in a lab rotation model can be very similar to a traditional teaching model, in that I may still deliver whole class instruction. The main difference is that I can intervene with a small group without having to manage the entire class of students at the same time.

Currently, the lab activities are given with step-by-step instruction and no problem-solving process is carried out. The course material can be revised to improve students' creativity and problem-solving skills through blended learning techniques. Instead of providing step-by-step instruction to meet the outcome (e.g. a wood planter box), the final product is identified, and students should develop creative and practical solutions (e.g. what should be used for the joints, wood glues or nail or screw connections, what are the feasible decisions based on the available tools). Once a solution is agreed upon, the team must decide how to realize that solution by building the product. Students work together in small groups and the problems are posed in a wide variety of contexts and representations.

## **Expected Results and Dissemination Plan (if any)**

The foundation of this study is comprised by this research question: How cooperative learning can improve my student's problem-solving skill in woodworking? Data will be collected through a student survey. When the semester initially begins, students will be given a pre-survey which will be the same survey given at the conclusion of the project/semester. The results will be analyzed and included in the Project Report. These results can be featured on the STEM Center website and included in STEM Center promotional materials.

## **Budget and Brief Budget Justification**

I will assume responsibility for the overall project, revising course material, developing and conducting surveys, performing survey analysis, and writing reports. I will commit around 10% of my research appointment to this project; \$1,500 is requested as a faculty stipend. Without this budgetary line item, I won't be able to spend enough time for developing cooperative learning components for my Spring 2021 class. The requested faculty stipend will be used toward the following objectives:

- Revise the course materials by developing cooperative learning components through group activities in ETCM 1363 Wood Frame Construction.
- Research and implement new teaching methods and pedagogical innovations to integrate problem solving skills into the hands-on lab activities.
- Research and implement new assessment strategies to assess the effectiveness of the proposed popular blended learning technique.