

Lessons learned: Emerging best practices from the CAB project



Collaborating Across Boundaries to Engage Undergraduates in STEM Learning
 PIs: Sarah Monisha Pulimood (Computer Science), Diane Bates (Sociology), and Kim Pearson (Journalism)
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Abstract

Since Spring 2020, participants in the Collaborating Across Boundaries to Engage Undergraduates in STEM Learning (NSF Award #1914869) have been testing a curricular model that seeks to boost STEM literacy through interdisciplinary teaching collaborations. Two undergraduate courses from different disciplines - at least one of which is in STEM or Social Science - collaborate with a community partner on a community-identified problem. We estimate that by the time the project is concluded, 18 faculty, more than 700 students and about 15 community partners will have participated. The projects are wide-ranging and participating faculty and students come from six of the seven schools in the College. This poster presents initial learning outcomes data and emerging best teaching and administrative practices from the project, with particular attention to adjustments that became necessary because of the Covid-19 pandemic.

Problem Statement:

Problems that need to be addressed in the world are becoming more complex and there is a need not just for experts in science, technology, engineering and math (STEM) fields, but also for non-STEM experts to recognize how STEM concepts can be applied to solve these problems.

Goals:

- To develop a deeper understanding of STEM concepts for students in undergraduate STEM and non-STEM majors.
- To determine how the CAB model with interdisciplinary course collaborations focused around community-engaged project-based learning can improve general STEM learning.

Hypothesis:

Immersing students in interdisciplinary collaborative courses, where STEM and non-STEM students work together and with community partners to address community-identified issues, will result in deeper STEM learning for all of the students involved. We expected that minorities students would be particularly attracted to interdisciplinary collaboration emphasizing problem-solving in a gender-neutral, culturally and ethnically diverse community.

Research Questions Focused On:

- Best practices for interdisciplinary, community-engaged pedagogies.
- Effectiveness of the CAB model as an approach for improving undergraduate learning outcomes across all majors, including historically underrepresented student groups for those majors.

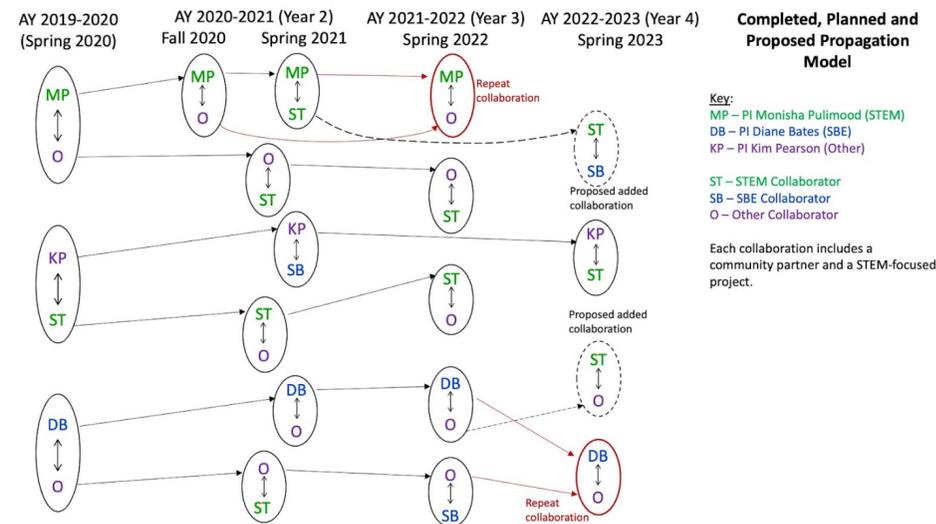


Fig. 1 CAB Propagation Model

Student outcomes

- Students develop a strong foundation in applying disciplinary knowledge to solve real-world problems and they can recognize and articulate the interconnectedness of different disciplines.
- Student confidence in their own scientific understanding increases from pre- to post-test (regardless of teaching mode), with the change being greater among students in non-STEM classes
- Student self-reported community engagement increases from pre- to post-test (regardless of teaching mode), with the change being greater among students in STEM classes
- Systematic analysis of limited qualitative reflections indicate that students took projects more seriously and generally enjoyed the projects, learned more about the other class subject
- Objective measure of change in scientific literacy (measured by the Test of Scientific Literacy Skills*) has produced inconsistent results across teaching modes

*Gormally, C., Brickman, P., & Lutz, M. (2012). Developing a Test of Scientific Literacy Skills (TOSLS): measuring undergraduates' evaluation of scientific information and arguments. *CBE life sciences education*, 11(4), 364-377. <https://doi.org/10.1187/cbe.12-03-0026>

Best practices

Joint “Lab” in Course Management System

- Common Communication across sections
- Facilitates co-grading
- Needs Dean’s Permission
- FERPA concerns and notation in registration system
- Appears as a “Lab” – may depress some student interest

Community Engagement

- Campus Center for Community Engagement can help identify partners, but personal relationships outside of these bolster collaboration
- Plan early and often
 - Community partner helps define the project
 - Community partner visits (Zoom has facilitated)
 - We have not done site visits due to pandemic
 - Partner provides intermediate and final project feedback

Class management

- Clear deliverables on specific dates - project has same weight in each class
- Deliberately foster flexibility and communication skills
- Mechanism for accountability
 - Check in/ check out from at the beginning and end of each week
 - Class-based teams in addition to collaborative teams
 - Get student buy-in by stressing how project aligns with course goals and reinforces skills valued by employers