Examining the effectiveness of a collaborative laboratory activity on college students' sense of community and scientific identity

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Purpose

- At Lynn University, science courses run in 8-week semester-blocks. These shortened blocks might result in a lack of a sense of community among students.
- The purpose of this study is to examine whether a learning community enhances students' sense of community and other academic variables.

Introduction

- Indicators are commonly used as a signifier of enzyme activity, but students often conflate the reaction signified by the indicator with the reaction catalyzed by the enzyme. What's more, they can confuse an indicator reaction with experimental manipulations in the study of enzyme activity.

$$H_2O_2 \xrightarrow{indicator} \text{color change}$$

- We have chosen catalase as a commonly available, easily detectable enzyme to show enzyme activity in our introductory biology course.

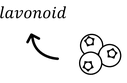
$$H_2O_2 \xrightarrow{catalase} H_2O + O_2$$

- Catalase is also advantageous, because students can delve deeper into catalase activity using a colorimetric indicator along with Beer's law to quantify activity.

$$2\,H_2O_2 \xrightarrow{catalase} 2\,H_2O + O_2 \xrightarrow{indicator} \text{no color change}$$

- In this series, students in two courses in the biology major, introductory biology II and organic chemistry II, will work together to propose a source of dietary flavonoid from which to test on catalase activity .

$$H_2O_2 \xrightarrow[\text{flavonoid}]{catalase} H_2O_2 + H_2O + O_2 \xrightarrow{indicator} \text{color change}$$



- In addition, students build their lab technical skills including micropipetting, extraction, and searching and interpreting the primary literature.

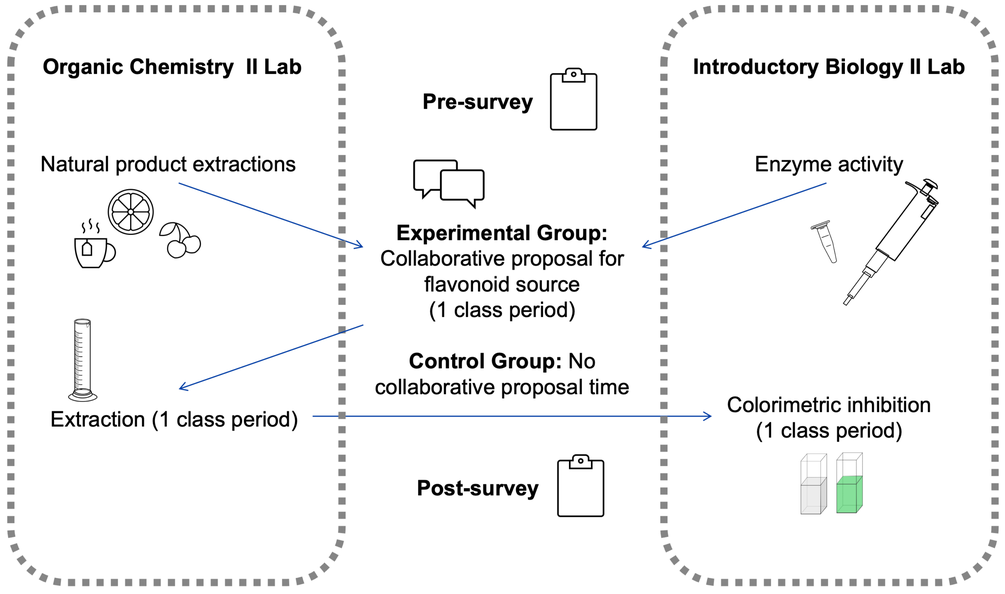
Method

- Participants were given a pre- and post-activity survey to measure:
  - **Scientific attitudes**: Persistence in the Sciences (PITS) (Hanauer et al., 2016)
  - **Sense of community**: Learning community survey (Leibowitz et al., 2020)

References are available in the ABLE shared folder for this poster.

Class Activities

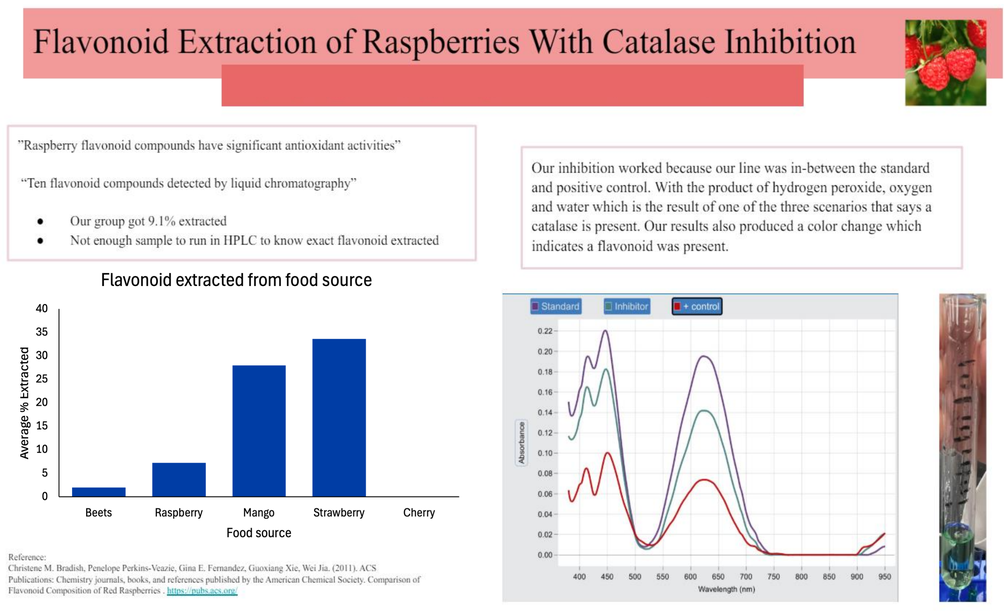
Figure 1. Class activities for parallel organic chemistry II and introductory biology II lab courses.



Note. These activities include background on extractions from natural products in organic chemistry and enzyme activity in biology. Students from these classes collaborated on proposing a flavonoid source. Students in organic chemistry extracted their flavonoid. Students in biology received the product and used it as an inhibitor in their own enzyme activity experiments.

Example Student Project

Figure 2. Example student fire talk presentation from the experimental group.



Note. Students from sections of Organic Chemistry II and Biology II had class time to work on it together and presented it to the combined courses.

Results

- Nine students in the control group and 15 students in the experimental group completed both surveys. This was evenly split between the two courses.
- Using mixed-model ANOVA, there was a significant increase in scientific community values for both groups over the course of the project, suggesting class experience had an effect rather than the cross-class project.
- There was a significant decrease in networking in the experimental group but not the control group. This could be due to variation in number of students from each group (2 from biology and 4-5 from organic), interpersonal conflicts, and/or difficult group members.
- In general, we saw an increase in agreement for negative project emotions and a decrease in positivity. We suggest this finding may be confounded by the short block schedule.

Table 1. Words with the greatest change between pre- and post-intervention.

	Condition	T1 M (SD)	T2 M (SD)	ΔM
Inspired	Control	4.00 (0.71)	3.89 (1.17)	-0.11*
	Experimental	4.13 (0.99)	3.53 (0.74)	-0.60*
Determined	Control	4.33 (0.71)	4.44 (0.73)	0.11
	Experimental	4.40 (0.99)	4.00 (1.19)	-0.40
Afraid	Control	1.67 (1.00)	1.67 (1.00)	0.00
	Experimental	1.53 (0.83)	2.07 (1.28)	0.53
Nervous	Control	2.78 (1.30)	3.33 (1.00)	0.56
	Experimental	2.53 (1.25)	2.60 (1.18)	0.07

Note. *, statistically significant change (p = 0.05)

Discussion

- Due to the small sample size of we cannot draw any conclusions. Next academic year, we are hoping for more participants since biology II students will now be in the organic II laboratory.
- We will add a question about whether the block schedule influenced their responses to the survey. We will also include open-ended responses about how students felt about the project.
- Continuing to run this study each academic year could also provide more evidence of community building.