

# Community Science in Ranch Management: A Catalyst for Undergraduate Connections to Sustainability

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## Introduction

- Engagement in environmental socioscientific issues has been identified as a way to increase student content knowledge, however, following interventions students were unable to view themselves as agents of change (Ballantyne et al., 2016; Shepardson et al., 2011; Stevenson et al., 2014).
- Community (citizen) science is an instructional method within experiential learning and has been defined as “the engagement of non-professionals in scientific investigations – asking questions, collecting data, or interpreting results. Citizen-science projects generally include a partnership between amateur and professional scientists” (Miller-Rushing et al., 2012, p. 285).
- Following engagement with community science, undergraduate students were found to have increased their knowledge of the process of conducting science, motivation, and science agency (Borrell et al., 2016; Golumbic & Motion, 2021).

## Method

### Participants:

34 undergraduate science majors (12) and non-science majors (22) students enrolled in a ranch management core curriculum course at a private university in the southwestern United States (IRB approved: IRB#2022-237). All participants were 18 years and older during the time of the study.

### Data sources:

Pre- and post-community science intervention self-efficacy assessments of science and environmental action (Porticella, et al. 2017a; Porticella, et al. 2017b). Previous research has reported excellent psychometric properties for all the items in the self-efficacy for science (i.e., Cronbach’s alpha of .92; Porticella et al., 2017b) and environmental action (i.e. Cronbach’s alpha of .89, Porticella et al., 2017a) scales.

### Data analysis:

Descriptive statistics (measure of central tendency and variation) and inferential statistics (i.e., paired samples *t*-tests) were utilized to identify patterns and trends.

## Discussion

- Similar to previous studies (Smith et al., 2021), the results indicate that non-science majors experienced a higher increase in efficacy for learning and participating in science project-based activities (30% non-majors and 10% science majors) and environmental action (10% non-majors and -6% science majors) than science majors.
- The authors of SELDS and SEEA scales consider minor decreases in the post-intervention mean scores of participants with high efficacy (mean score above 3) as a positive outcome.
- Therefore, incorporating community science activities in undergraduate courses may benefit the science community in both the short and long term.

## Research Questions

- R1: To what degree do undergraduate students’ self-efficacy for learning and doing science and environmental action change after engaging in a community science intervention?  
R2: Is there a difference between undergraduate science majors and non-science majors’ self-efficacy for learning and doing science (SELDs) and environmental action (SEEA) after engaging in a community science intervention?

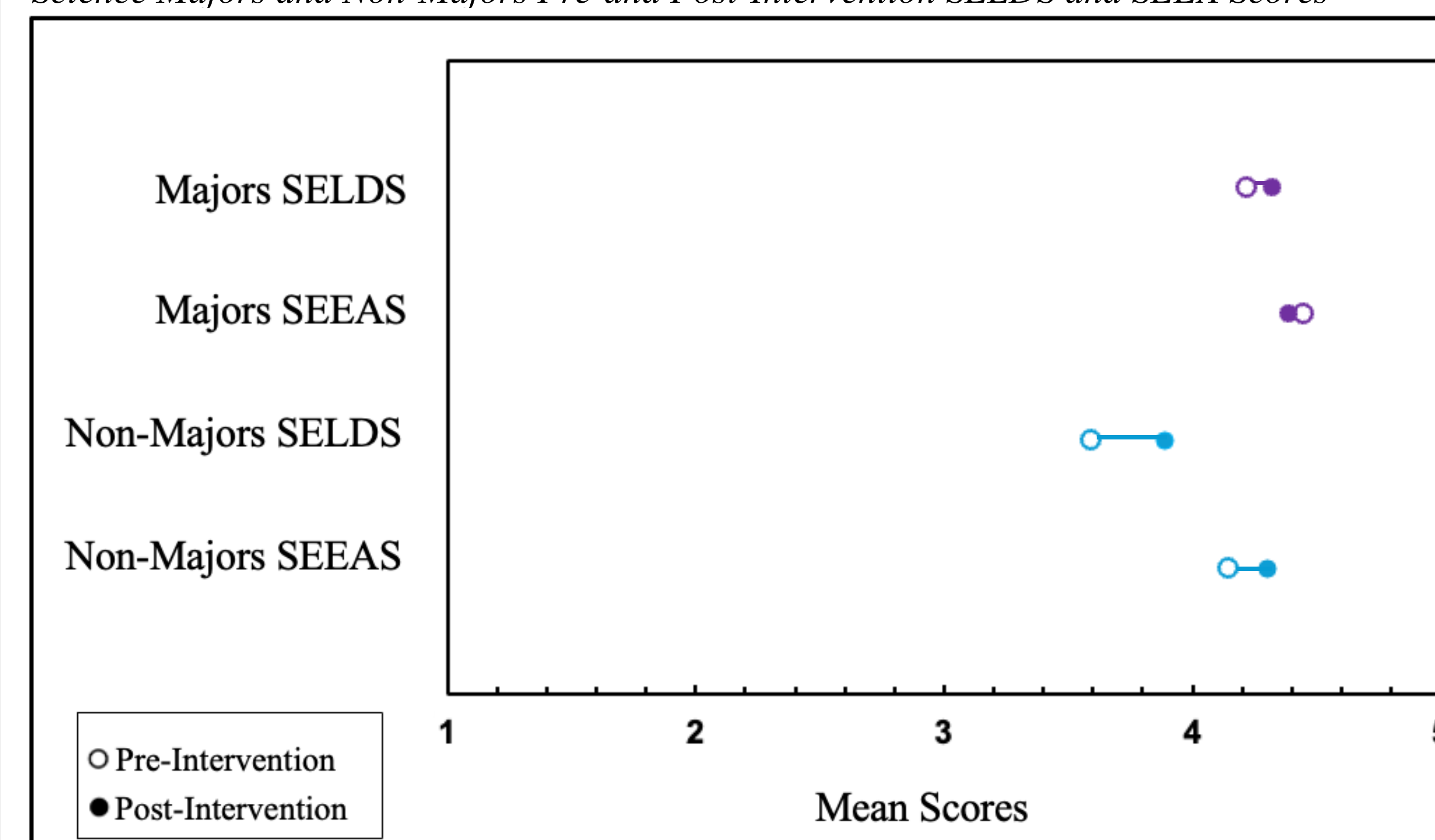
## Results

Table 1  
Participant’s Pre-and Post-Intervention SELDS and SEEA Scores

Construct	Pre-intervention mean score	Pre-intervention SD	Mean change score (post-pre)	Change score SD	p value	Effect size (d) Cohen’s d
SELDs	3.81	0.88	+0.22	0.23	0.05	0.66
SEEA	4.25	4.33	+0.08	0.02	0.49	0.68

Baseline (pre) mean scores and post-community science intervention change scores (post minus pre) depicting undergraduate students’ self-efficacy for learning and doing science (SELDs) and environmental action (SEEA) across all pre-post intervention participants during fall 2022 and fall 2023 (n =34). All items were rated on a scale from 1 (strongly disagree) to 5 (strongly agree).

Figure 1  
Science Majors and Non-Majors Pre-and Post-Intervention SELDS and SEEA Scores



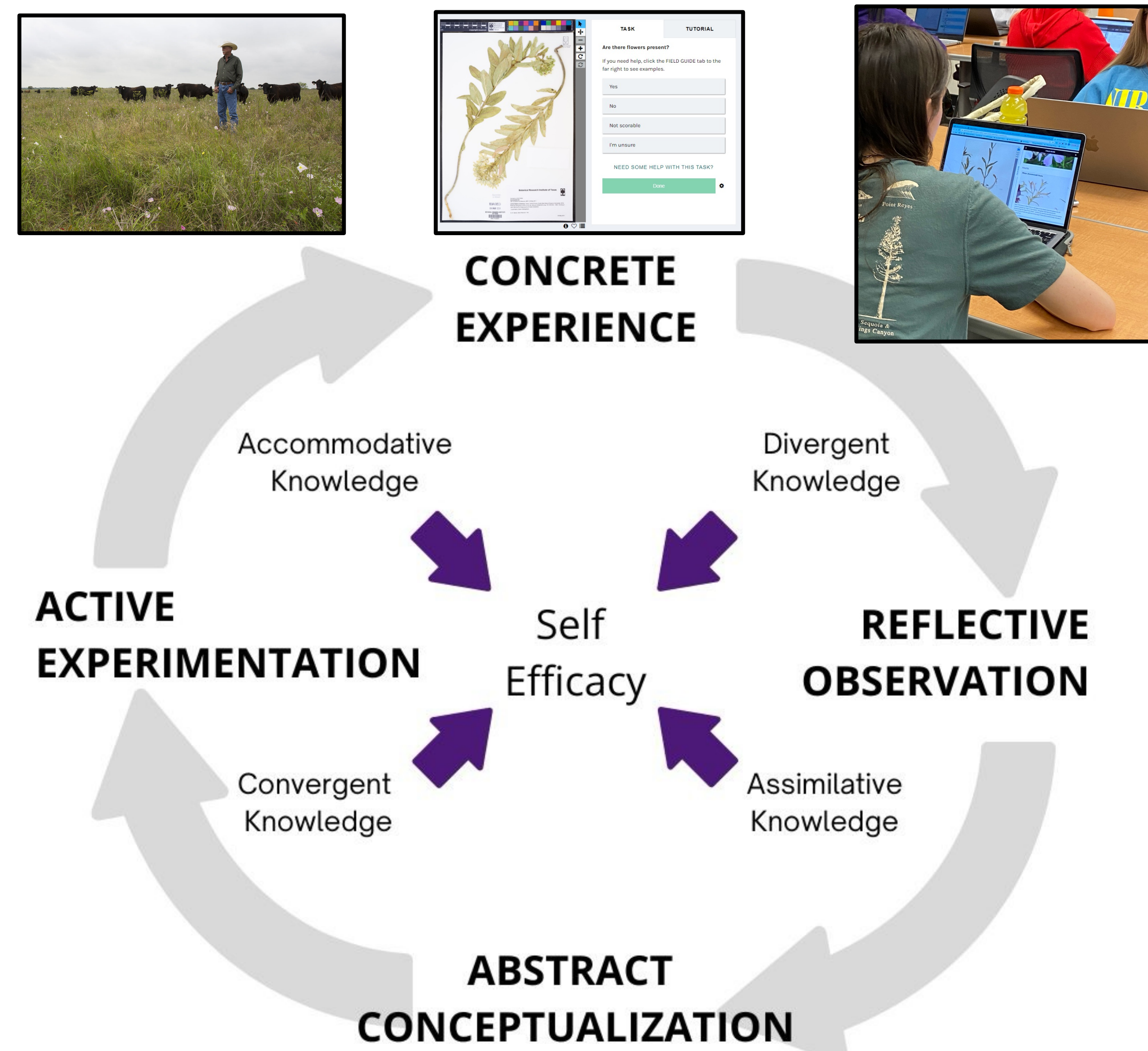
Pre- and post-community science intervention mean scores depicting undergraduate science major (n=12) and non-major (n=22) students’ SELDS and SEEA during fall 2022 and fall 2023. All items were rated on a scale from 1 (strongly disagree) to 5 (strongly agree).

## Limitations

Due to a small sample size, it is important to recognize that generalizations can not be gathered from the results of this study. The SELDS and SEEA scales were developed for adults volunteering to participate in community science activities. While the students volunteered to participate in the study, their participation in the course-assigned community science project was mandatory. Additional quantitative and qualitative research is needed to better understand undergraduates’ experiences with community science.

## Theoretical Framework

This study is rooted in social constructivism, social learning theory (Bandura, 1977), and experiential learning theory (Kolb, 1984).



Modification of the Structural Dimensions of the Process of Experiential Learning (Kolb, 2015)

## References

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