

Indigenous-focused Course-based Undergraduate Research Experiences

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INTRODUCTION

Students from underrepresented minority groups (URM) face on-going educational barriers including community disinvestment, curriculum bias, and inadequate school funding. In addition, many Indigenous, Native American, and Alaskan Native (NA/AN) students have distinct experiences of historical trauma, responsibility to one's tribal nation, and maintaining cultural/linguistic identity. **Therefore, to improve access to STEM fields for AI/AN students, there is a critical need to expand undergraduate research programs with an Indigenous focus.**

NSF IUSE-EHR Engaged Student Learning Track 1 grant aims:

1. Create a professional development training course to educate faculty in culturally responsive pedagogy that is relevant to NA/AN students.
2. Guide faculty in the development of an Indigenous focused sophomore-year, course-based undergraduate research experiences (SY-CURE).



Figure 1. FLC is one of only two public four-year colleges in the nation to grant tuition waivers to qualified Native American students from any federally recognized tribe. The Native American body at FLC represents 185 Tribes and Native Alaskan Villages, with most students from the regional reservations shown here.

Through this training faculty will gain valuable skills in mentoring diverse students in undergraduate research experiences and will develop a SY-CURE that is aimed to engage students in STEM-based research projects of sociocultural and professional relevance to our predominantly NA/AN student population at Fort Lewis College (FLC) (Durango, Colorado). The SY-CUREs will utilize authentic and place-based research to help students develop evidence-based reasoning and problem-solving skills in environments that provide meaningful contexts. As part of this training, faculty will begin to learn how to incorporate Indigenous ways of knowing, which sees the whole person (physical, emotional, spiritual, and intellectual) as interconnected to land and in relationship to others (family, communities, nations), into their SY-CURE. This will support better alignment between research experiences and the interests and needs of the Native students who will be working on these projects, as well as those of regional tribal communities (Figure 1). The faculty training will be provided across our STEM departments, resulting in SY-CUREs being deployed in an array of our sophomore year STEM courses at FLC, a primarily undergraduate institution (PUI) and Native Serving Non-Tribal Institution (NASNTI).

PROJECT WORK PLAN

| Activity | Pre-Grant | Year 1 | | | Year 2 | | | Year 3 | | | Post-Grant funding |
|--|-----------|--------|------|-----|--------|------|-----|--------|------|-----|--------------------|
| | | Fall | Sprg | Sum | Fall | Sprg | Sum | Fall | Sprg | Sum | |
| Assess: resources for faculty training course (FLC Mellon LIT Grant) | █ | | | | | | | | | | |
| Build: faculty training modules | | █ | | | | | | | | | |
| Assess: faculty training course review | | | █ | | | | | | | | |
| Revise: faculty training course based on review feedback | | | | █ | | | | | | | |
| Recruit: STEM faculty to participate | | | | | █ | | | | | | █ |
| Launch: faculty training modules | | | | | | █ | | | | | █ |
| Build: SY-CURE courses (thru faculty development course) | | | | | | | █ | | | | █ |
| Launch: SY-CURE courses | | | | | | | | █ | | | █ |
| Assess: CURE survey instructor report & CURE student survey | | | | | | | | | █ | | |
| Assess: student focus groups & faculty self reflection | | | | | | | | | | █ | |
| Revise: faculty training modules based on assessment data | | | | | | | | | | | █ |
| Disseminate: publish faculty training modules to Canvas Commons | | | | | | | | | | | █ |
| Disseminate: share results | | | | | | | | | | | █ |
| Disseminate: FLC curricular review of new SY-CURE courses for permanent adoption | | | | | | | | | | | █ |

FACULTY DEVELOPMENT COURSE

As of year 2 of our NSF IUSE project a total of 7 faculty members have completed the Creating Culturally Responsive CUREs faculty development course and 3 are currently enrolled in this course. This has resulted in the launch of **7 SY-CURE courses that have enrolled a total of 167 students.**

Indigenous Focused SY-CURE Courses Launched:

- Analytical Chemistry (Chem 365) - 20 students
- Organic Chemistry (Chem 250) - 28 students
- Molecular Microbiology (Bio 208) - 14 students
- Social Determinants of Health (PH 275) - 12 students
- Geological Field Methods (Geol 202) - 20 students
- Issues in Ecology (Bio 245) - 48 students
- Historical Geology (Geol 114) - 25 students

Indigenous Focused SY-CURE Courses in progress:

- Anthropology of Food (ANTH 2**)
- Mathematics for elementary teachers (MA 318)
- Engineering Statistics (MA 319)



Figure 2. FLC's SY-CURE project is grounded in the **Four R's of Indigenous research** methodologies and pedagogy: Relationality, Responsibility, Respect, and Reciprocity (Kirkness & Barnhardt, 1991; Brayboy, Gough, Leonard, Roehl, & Solyom, 2012).

CREATING CULTURALLY RESPONSIVE COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCES (CURES)

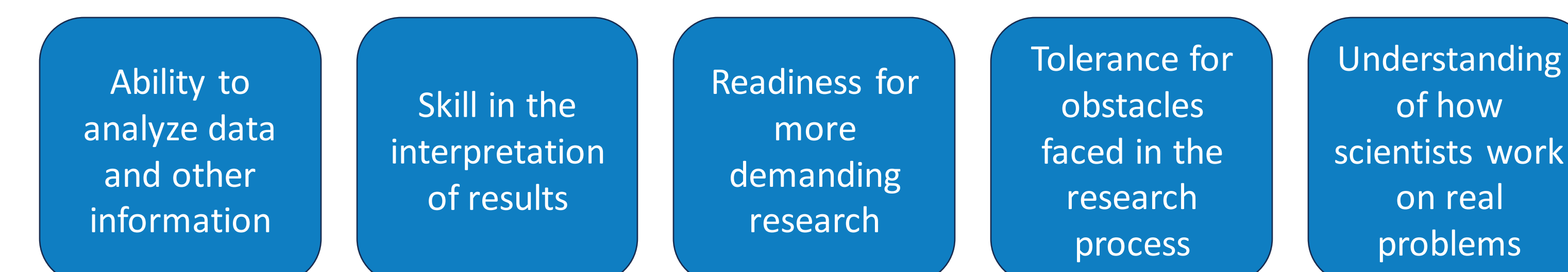
- MODULE 1: What is a CURE?
- MODULE 2: Introducing Cultural Awareness into CURES
- MODULE 3: Importance of inclusion, access, and equity in CURES
- MODULE 4: CURE course design
- MODULE 5: Implement - CURE in action

Figure 3. The faculty development course, titled "Creating Culturally Responsive Course-Based Undergraduate Research Experiences" is available to faculty asynchronously through the Canvas learning management system and is organized topically in five modules.

STUDENT OUTCOMES

Key findings from student post SY-CURE surveys:

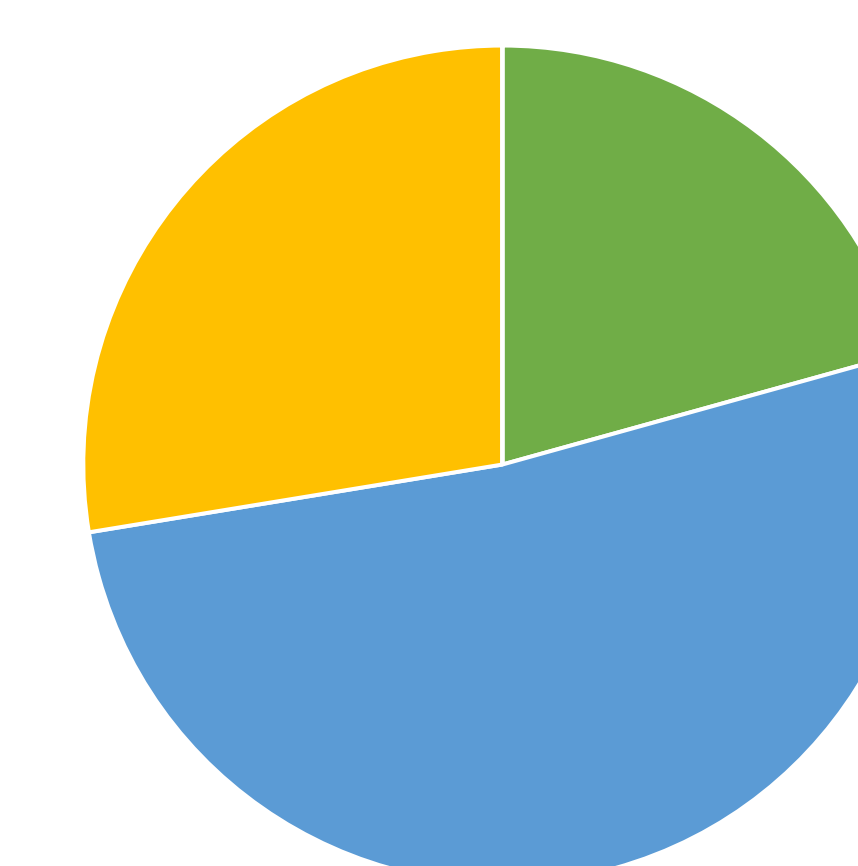
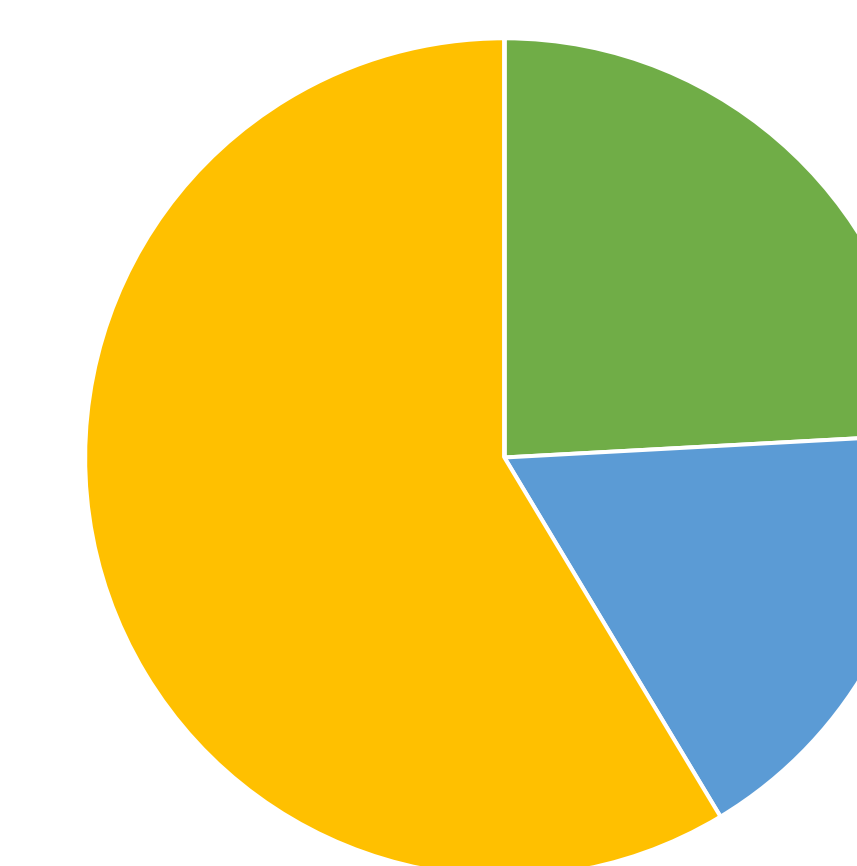
Students were asked to consider a variety of possible benefits they gained from their CURE. Items most frequently rated as having the largest learning gains:



Students were asked to rate their agreement with the following items:

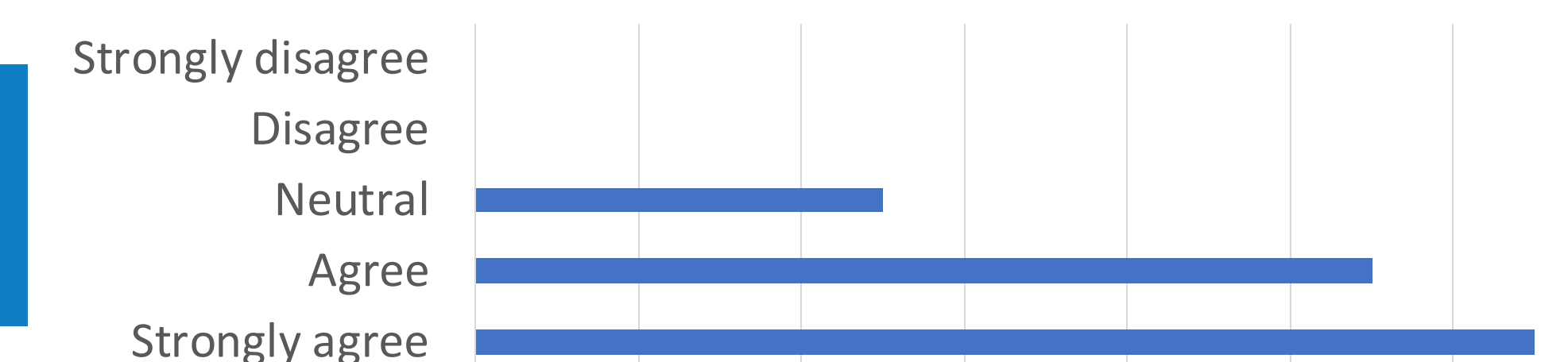
To what degree did this course affect your confidence in your abilities to do research?

To what degree did the content in this course make you feel your cultural, racial or ethnic identity was respected in this course?

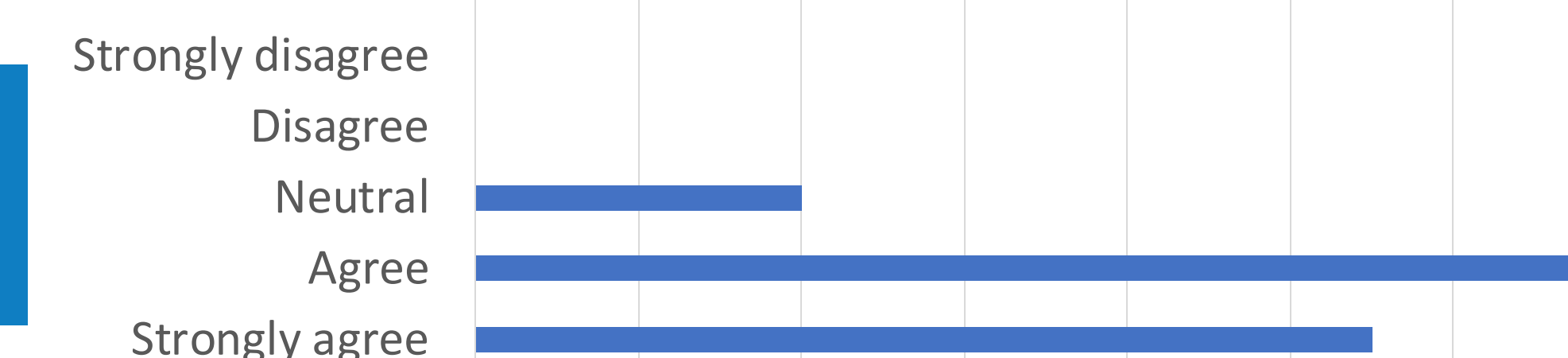


Legend: Strongly agree (green), Agree (blue), Neither agree nor disagree (yellow), Disagree (dark green), Strongly disagree (dark blue)

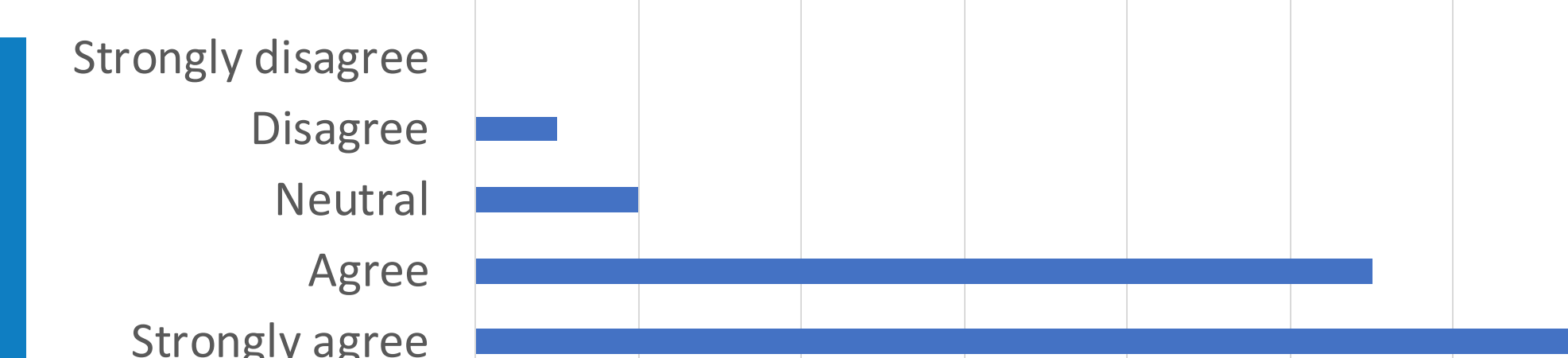
This course was a good way of learning about the subject matter



This course had a positive effect on my interest in science



This course was a good way of learning about the process of scientific research



REFERENCES

- Brayboy, B. M., Gough, H. R., Leonard, B., Roehl, R. F., & Solyom, J. A. (2012). Reclaiming scholarship: Critical Indigenous research methodologies. *Qualitative research: An introduction to methods and designs*, 423-450.
- Kirkness, V. J., & Barnhardt, R. (1991). First Nations and higher education: The four R's—Respect, relevance, reciprocity, responsibility. *Journal of American Indian Education*, 1-15.