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Culturally responsive teaching strategies in CUREs

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Extended Abstract

Increasing inclusivity in undergraduate science courses is recognized as critical in addressing disparities in who enters and remains in STEM. Yet, people of color and persons with disabilities are vastly outnumbered in the sciences. This perpetuates inequalities in academia as to whose knowledge is recognized and valued. A promising approach to changing the status quo is culturally responsive pedagogy (CRP), an inclusive instructional framework that honors and validates student's cultural heritage and social identity, while linking instruction to socio-political realities. While research in K-12 shows CRP improves student outcomes, implementation of CRP practices is less common in undergraduate education. Course-based Undergraduate Research Experiences (CUREs) offer an excellent opportunity to apply culturally responsive instruction given their unique approach that emphasizes inquiry, collaboration, and connection to community relevance. In this mini workshop we discussed strategies instructors can use to incorporate culturally responsive teaching in their CUREs. By the end of the workshop, participants reported having an enhanced understanding of what culturally responsive teaching looks like in a CURE course and developed plans to include culturally responsive activities in their own classrooms.

The workshop began by asking participants to engage in a short activity that could be used as an icebreaker between students on the first day of the semester. Participants were asked to form groups of no more than four individuals. Each person was asked to share about themselves for 90 seconds, the only rule being that they were unable to share anything about what they did as a job or career (for students, this could be equivalent to not being allowed to share their major). Instead, they were asked to describe "who" they are. The moderators modeled this by taking 30 seconds each to describe themselves. For example, "I am a first-generation American, I am a daughter, I am a plant mom, I am a huge fan of science fiction." The goal of this activity is for participants to hold space for the full 90 seconds without being interrupted by another person. After the 90 seconds, the next person takes their turn, and the activity continues for 4 x 90 second rounds (total 6 minutes). Participants were also asked to actively listen to one another without interrupting as each team member introduced themselves. After the activity, participants were asked to share how they felt during the experience. Many commented that it was a very different experience to describe themselves in ways that were not "what they do" but instead who they are or how they identify. Some also commented that it was difficult to hold the space only for themselves for 90-seconds. This exercise can be used as an entry way into inviting students to bring their whole selves into the classroom, acknowledging that in this classroom they will not be asked to compartmentalize who they are, but instead to use

their past experiences, knowledge, and identities into what they are learning.

After the activity, participants were asked to reflect on what the word “culture” meant to them, followed by a reflection on what “culturally responsive teaching” meant to them. A subset of answers to these reflections are listed in Table S1 (supplementary material). Overall, most faculty participants had a well-formed idea of what culture and culturally responsive teaching was but expressed that the more challenging piece was knowing how to implement it in the classroom.

A handout was provided to the participants with a list of published culturally responsive teaching activities that can be implemented in biology laboratories, in particular in CUREs (Table S2, supplementary material). Participants were asked to review the list and reflect on the following questions, 1. “Which teaching practices do you already use OR would be interested in using”, and 2. “What are some challenges that you may foresee that may prevent you from implementing these strategies?”

Participants had excellent ideas of how to modify their existing CUREs using some of the examples provided. For example, one participant runs a CURE where students research a gene that interested them. The participant then suggested modifying this activity in the future by asking students to research a gene that expresses a trait that is personally relevant to the student, their family, or their cultural background.

Based on the faculty responses to this mini-workshop, participants left with a greater understanding of how they could practically implement culturally responsive teaching practices in their biology laboratories.

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About the Authors

Anna J. Zelaya has been an Assistant Professor at the California State University, San Bernardino since Fall 2022. She teaches Introductory Biology for majors and incorporates CUREs in the laboratory component of the course. She conducts research in both microbial ecology and STEM Education. Her microbial ecology research focuses on the environmental factors that influence microbial community dynamics. Her education research focuses on how active-learning approaches and culturally responsive teaching improves outcomes for persons historically excluded from STEM.

Heidy Contreras is Assistant Professor in the Biology Department at California State University San Bernardino, a Hispanic Serving Institution (HSI). She was Associate Professor in the Biology Department at the University of La Verne (also an HSI) from 2012-2022, before transitioning to her current institution. She has experience teaching a variety of undergraduate courses including major and non-major, lower and upper division, capstones, field courses (national and international) and CUREs. Although she is trained as a physiological ecologist, she is devoted to improving undergraduate education and currently is focusing her research on STEM education.

Ethell Vereen is an assistant professor in the Department of Biology at Morehouse College. His educational research focuses on diversity and inclusion in natural resources, Pan-African pedagogy, and Virtual Reality for teaching, learning and assessment. His scholarship of discovery (traditional research) is focused on understanding the sources, transformation, transport, and ecology of waterborne pathogens, environmental health and justice, and sustainability. He has participated in training and programs devoted to supporting diversity in STEM.

Ania Majewska is an Assistant Professor at the University of Georgia. She is an ecologist by training who engages in educational research. Her interests in culturally responsive pedagogy were sparked by her postdoctoral mentor, Dr. Ethell Vereen. Ania is passionate about creating inclusive learning environments.

APPENDIX A

Table S1. Participant responses to question, “What does culturally responsive teaching mean to you?”

Response
Being conscious about what student's experiences might have and not making assumptions
Not assuming we all have the same experience, priorities, obligations, traditions
Having windows and mirrors: so students see themselves and others in our classes
I don't teach, but culturally responsive means inclusivity. It means creating a safe space for everyone to express themselves and be who they are comfortably.
It means teaching in a way that respects students' individuality and is aware there are cultural differences and different priorities.
Adjusting how you teach based on your students' cultural identity
Using diverse language and examples that span a variety of backgrounds and life experiences
Being open and adaptable to changing my teaching approach based on student background
Teaching that takes into consideration who your students are, and how they might learn best.
Approaches that are respectful and which are representative of the diverse backgrounds of our students

Table S2. List of published culturally responsive (or relevant) teaching activities and practices that can be implemented in undergraduate biology laboratory courses and CUREs.

Activities for students
● Complete “Exploring Your Culture” assessment to think about their lived experiences ● Conduct oral history or ethnographic interviews of their families on a topic related to the CURE research and devise experiment based on the information ● Reflect on the broader economic, social, and political contexts of the CURE research problem ● Apply concepts from the course to their community and personal life ● Develop research questions that have personal meaning (within cultural identity), or aid students’ communities ● Write about an historical figure in the field: research someone meaningful who had contributed to the field in their country, to their cultural, or ethnic group ● Complete a case study that exemplifies social issues (e.g., socio-environmental) that stem from disregard for marginalized communities
Instructor practices
● Keeps transmission-style teaching (lectures and PowerPoint) to minimum ● Examines which groups are represented in lecture slides ● Uses and shares student language ● Provides instruction that is student centered in the context of their community ● Integrates nonwestern knowledge into the curricula ● Uses assessments that capture different ways of knowing and modalities (alternative assessments besides high stakes exams) ● Reframes student experiences as potential sources of evidence

- Encourages students to build a critical lens
- Pulls in community knowledge
- Provides examples of issues within local community
- Integrates globally oriented content
- Acknowledges cultural differences among groups
- Facilitates class discussions on social injustices relevant to the course content
- Shows different cultures in a positive light
- Discusses scientific contributions from individuals of different genders, races, sexual orientations, and other visible and nonvisible abilities
- Creates opportunities for students to share their histories and cultural heritage

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