Critical Online Service-Learning Pedagogy: Justice in Science Education

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In the year 2020 the world changed dramatically. We went from busy lives spent largely away from home to spending most of our time at home while daily facing deepening national crises. With the violent, needless death of George Floyd, the simmering tensions around race in America boiled over, sending thousands into the streets to protest racial injustices. The world of science education has largely avoided discussing racism in our classes, but we can no longer ignore it. The events of the spring and summer have highlighted our need to integrate conversations and reflections on justice into science education. In this work we argue that service learning can build this understanding from both theory and experience. Utilizing a critical online service-learning framework, we have developed a service-learning course that incorporates dialogic communication, cross-contextual reflections, and positioning oneself as an ally. This perspective allows science and the community to prioritize relationships, humanity, and reflect on our roles as professionals, utilizing the online interacting space. This course, taught at the beginning of the pandemic, focuses on critical online service learning for those studying public health. We discuss the challenges we faced moving critical service-learning pedagogy online, and the compounding issues brought on by the pandemic itself.

INTRODUCTION

The events of 2020 were unprecedented in so many ways. The COVID-19 pandemic, requisite stay-at-home orders, and worldwide protests for racial justice and the end of police brutality highlighted, among other things, the fact that our society has not met the needs of community, equity of online access for education, or commitment to racial justice. One may ask, how does all of this relate to scientific education? Science education, and the science, technology, engineering, and math disciplines (STEM) in general, have long been considered an objective endeavor and therefore “racially neutral,” maintaining that diversity is necessary but the discussion of race is not (1). However, by not actively working for equity in STEM, we maintain inequity as the status quo. Our current circumstances have shown that we are unprepared both to educate online and to educate with racial equity in mind. For science education to meet the current challenges, we must face the role that racism plays in our everyday lives, including in the scientific classroom, lab, and in the field. First, we, as scientists and educators, must address the fact that the fundamental questions we ask are often not objective. Consider the now-infamous study of syphilis, the public health service-funded experiments spanning from 1932 to 1972 in Macon County Alabama. The Tuskegee study, in which African American men with syphilis were subjected to experimentation without their consent and also without being informed of or given available treatment, ended only after public outrage (2, 3). This is just one egregious example of discrimination, however seemingly innocuous, but seriously damaging, racist biases still proliferate; these damages have had long-lasting effects and have eroded faith in science (2). For example, the erroneous use of “race” as a medical risk factor, when “racism” is a much more accurate fit, continues to fill textbooks that educate the next generation of scientists (4, 5).

A proven method of connecting with the community and exploring issues of diversity, racism, and social justice in education is through service learning (6–9). Defined as a structured learning experience that combines community
service with preparation and reflection, service learning brings connection with our communities and social issues into the classroom (10, 11). This type of experience has not often been part of science education (12). However, the twin pandemics of illness and racial injustice have clearly exacerbated communication, diversity, and justice problems in teaching science. Therefore, scientific education must adapt by contextualizing and reflecting on how these problems affect our lives. This can be achieved through the incorporation of service learning.

In this paper, we will explore a critical online service-learning framework and offer a course example that used the framework. The example course, taught at the beginning of the pandemic, is part of a philosophy-based public health science doctorate program and designed as a practicum course with a maximum enrollment of 20. The course had students work in groups with local Baltimore community–based organizations to develop evaluation tools. We will discuss the challenges we faced moving critical service-learning pedagogy online, and the compounding issues brought on by the pandemic itself. While in this work we describe a stand-alone COSL course, the tools we have developed to bring critical service learning (CSL) to life online can be incorporated into the architecture of a number of different courses. These tools prioritize the pillars of the COSL framework: action, authentic communication, and a focus on justice.

**SERVICE-LEARNING FRAMEWORK**

Traditionally, service learning has been an in-person experience held in the community to yield the connection with, and reflection on, that community. However, our current socially distanced world necessitates the use of online platforms for service learning, adding an additional layer of complexity to the development of these connections with our communities that allow us to address social issues and advance the public good (13).

Combining traditional service-learning pedagogy (14, 15) with online teaching platforms, online service learning (OSL) has been a higher education pedagogy for nearly 2 decades (16). Soon after its inception, four categories of OSL became apparent, three of which were some hybrid form of online and in-person learning (17). The fourth category, which is the focus of this paper, are completely online service-learning courses, termed extreme e-service learning (XE-SL). XE-SL courses have largely been business and technical classes that enact online service learning as a “consulting” or “client-based” practice, in which students are assigned a task or problem and they work independently or in small groups to arrive at a solution (18–21). XE-SL works to connect “real world,” complex issues through a contractual project completion model (17, 22). This approach does not provide the learning architecture necessary to develop deep connections and true collaboration because it relies on outcomes rather than a collaborative learning process (8, 23, 24). This results in a siloed effect where the project is disconnected from the context of the problem and fails to focus on the complexities of real world issues, like racism, in relation to science education.

Instead of the contractual model of XE-SL, we propose the use of a new model for online service learning which implements Mitchell’s (25) critical service-learning framework in online courses. While OSL has been a part of the educational milieu for decades (16), the overall effectiveness of an online format has often-noted limitations (18, 22, 26). Much of the argument against OSL points out the transactional nature of previous designs (26). However, COSL proposes online structures to implement the three core elements of the CSL framework: social change, authentic relationships, and the redistribution of power (Fig. 1) (R. T. Derreth, unpublished data). These CSL structures offer a shift away from hierarchical and charity models of community engagement and toward equitable collaboration that prioritizes community goals and expertise (25, 27–29).

The COSL framework we present translates the CSL core elements into an online setting through dialogic communication, cross-contextual reflections, and positioning oneself as an ally (Fig. 1). The first COSL structure, dialogic communication, seeks to replace the conventional online approach of a course as a repository of texts and information. Instead, COSL frames the online course not as a space, but as a meeting place where participants both listen to and share perspectives on issues in the course. Second, because online students may be spread across the globe, we can embrace cross-contextual reflection as a way to include many perspectives and contexts facilitating deep reflection on how the problems explored in the course manifest and proliferate in different, yet related, ways across various contexts. This kind of insight allows for innovative and collaborative responses to the community project. Cross-contextual reflection has the added benefit of developing more authentic relationships, as participants learn from and about others’ lived experiences. Finally, COSL positions participants as allies in contrast to the conventional consultants (19). In other words, students and faculty take positions of allyship by approaching a community project out of equal collaboration rather than as preconceived experts ready to solve the community’s problem. Erroreously, we often decontextualize STEM courses, but it is necessary to develop the skills to reflect on and relate our understanding of STEM concepts to the world around us. The COSL framework and the addition of new coursework in service learning is essential to the scientific educational process, empowering science educators and scientists to position themselves as allies and participate in social change and anti-racism.

**COURSE DESIGN**

We have laid out the problem, scientific education does not engage in social issues, and proposed a conceptual
framework to begin addressing this problem. Here, we offer a course description as an example of what it might look like for science education to engage with issues of justice through COSL. The curriculum of this course relies on instruction for designing and implementing evaluation tools and working with community-based organizations (CBOs). The goal of our course is to provide the CBO with an evaluation tool that meets their current needs and is also adaptable for the future. This way the CBO can implement a collection tool that contributes to improving ongoing services to their local communities. This process connects tools often used in science, evaluation, with community context, allowing students to explore how this tool will impact the CBO and community. By collaborating with the CBO in the development of the evaluation tool, students both obtain context about the community and begin to reposition themselves as allies (Appendix 1).

Encouraging dialogic communication, the course has three forms of ongoing interaction (Appendix 1). Lectures explain the theories and science of evaluation in public health. We also recorded “conversations,” as podcast-style recordings, between the co-instructors, to provide practiced-based examples and reflections. These conversations introduced broader discussions on evaluation science, community work, and justice (Appendix 2). One such conversation focuses on the biased nature of standardized tests like the SAT, which favors privileged populations in many ways (30). For example, the wealthy are more likely to have spare time and money to take preparative coursework, yielding better scores. By sharing our views, the conversations stand as a way to “humanize” the work, developing authentic relationships and allowing the students to engage with us in later discussion posts. Third, we have project checkpoints that prioritize putting into practice the theory of collaboration and evaluation development (Appendix 3). These three communication modes are intended to draw together the three main parts of service learning: academic knowledge (lectures), reflective discussion (conversations), and community collaboration (checkpoints). Additionally, we designed our course site to be highly interactive. We recorded weekly welcome videos to introduce the assignments for the week, adding personal touches to help breakdown conventional teacher/student barriers. We posted video conversations with our community partners so that students could learn about the organizations and the work they do in Baltimore. On the course site, each week has its own home page, which organizes weekly goals, assignments, and activities due (Appendices 3 and 5). We also integrated Baltimore as a kind of “participant” in the course. We used video, pictures, lectures, and conversations between instructors and with Baltimore residents to give students as much of a sense of place in Baltimore as possible.

To show the explicit connect we made between issues of social injustice and science education, we highlight one nonstandard assignment: the cross-contextual reflection (Appendix 4). Our approach to community-based evaluation
was to highlight the importance of historical and contextual factors in understanding and addressing any community issue (31). We created this reflection to focus students’ attention on the context that was shaping the CBOs’ goals and expectations. The assignment had students reflect on the contextual factors at work in Baltimore in comparison to their experiences at their home locations (which were largely outside of Baltimore). The comparative analysis was a way of drawing Baltimore in relation with their own experiences, since learning development theory (32) notes that cognitive development is aided by affective and social development. In other words, students could understand more about Baltimore if they could put it in relation to a place they know intimately. The use of reflection, like the cross-contextual assignment which encourages student connections, facilitates the transition from a transactional interaction online to a transformational one. The stereotypic, prejudicial representation of Baltimore versus students’ views after completing the cross-contextual assignment highlighted how particularly effective this reflection assignment was.

Finally, we designed this course with very few synchronous sessions. Only meetings with CBOs and informal instructor chats happen in real time. This allows each student to come to the course site as a meeting place and check-in on what has happened. While this can sound sterile, our course design incorporating the podcast-like informal conversations and weekly videos brings in a more personal touch. We have found from student reflections, surveys, and informal feedback that through this course students have developed a connection with both the city of Baltimore and its people (see Appendix 6). This is an essential step in transforming the interaction from consultants to allies. In addition, many of the podcast-like informal conversations, as well as the formal lectures reinforce the need to meet the wants and needs of the CBO in this work as contributors not consultants.

**IMPLEMENTATION**

Offering our course in Spring 2020 for the first time, we were fortunate that it was built to be online from the beginning. Knowing that we would have the challenges that come from being online, we built in new and innovative measures to increase the feeling of connection between the three parties involved in the course: the instructors, the students, and the participating CBOs. While there are many pandemic-related factors we could not have anticipated, we relied even more deeply on these innovations that allowed space for us to adjust to the needs of the students.

We found that the lectures fulfilled their typical role in providing fundamental knowledge to students. However, students shared that the podcast-style recordings and weekly welcome videos made the most difference to them, allowing them to feel connected to us as faculty members and the CBOs. The bulk of our work during the term could be categorized between asynchronous communication, synchronous communication, and responding to assignments. Asynchronous communication relied on emails to students and community partners and discussion board responses to reflective questions. Synchronous communication was largely through video conferencing. We met with students for status reports on the course; this was particularly valuable during the pandemic and global lockdowns. At these meetings, we discussed well-being and mental health alongside the coursework and what needed adjustment so that students could maintain health while still meeting CBO expectations. This requires developing a connection with the students beyond the work involved in the course, and this proved vital in the unprecedented times with which we were faced. We also attended video conferences between community partners and students, prompting with questions or comments to support the progress of the call when necessary. For the most part, we found that the checkpoints set up within the architecture of the course itself helped to keep students on track with assignments. Additionally, we worked to give substantive feedback on student assignments, responding to reflections and project-related assignments to build relationships with students while also guiding their progress toward learning objectives.

The core of the class was the community projects students and CBOs collaborated on. Faced with the global pandemic, finding community collaborators who were still able to participate in the course was especially challenging. In “normal” times the availability of our community partners can be sparse. Their time is often spread thin. But during the lockdowns many CBOs had to suspend their services entirely. Thankfully two of the SOURCE community partners, GEDCO and Elev8 were available and still in need of collaborators. Additionally, we found that the online nature of our course was helpful in facilitating interactions that could not have happened in person due to the pandemic.

These projects were our enactment of the democratization of the scientific process. Students were broken into two groups of five students each. The checkpoints described above entailed: an action plan that assigned group roles (e.g., group liaison, lead editor), a project timeline of deliverables and group meetings, a draft of the evaluation tool, a cross-contextual reflection, and the final draft and presentation of the evaluation tool. Throughout this process, students were expected to communicate synchronously and asynchronously with their community partners to maintain group cohesion and ensure they remained on task. The overarching construction of the project had our CBO partners guiding students in their scientific inquiry, ensuring that CBO questions and goals remained at the center of students’ scientific design. The result of this course had the two student groups design a survey tool with each of the CBOs along with an implementation and revision plan to ensure the sustainability and feasibility of the tool long-term. Both instructors and community partners gave feedback to ensure the survey tools were appropriate.
The work the students did with the CBOs served many functions, not the least of which was providing the CBO with a long-term, usable tool. We found that students took great care in understanding the community needs, especially during a time of uncertainty and anger, so that they could contribute to necessary work. Making explicit space for reflecting on our world and our place in it as scientists alongside prioritizing active collaboration brought to the course a shared meaning and urgency. Implementing this course for the first time during a pandemic brought unique challenges. Thankfully, the pedagogy and course design we enacted afforded us the space to process and discuss the impact of a viral pandemic and worldwide protests on our work as professionals. The racial and economic divide of Baltimore city, often referred to as the “white L” and the “black butterfly,” lays the inequities we explore in this course in stark contrast (33). While we covered the inequities of education in our prepared material, we also discussed the fact that COVID-19 cases exploded in the poor and black neighborhoods while white, wealthy ones were less affected (34). By exploring these conversations in depth, we hope that a viewpoint of racial justice can be incorporated into more scientific tools utilized within all areas of research. As instructors and scientists, we see the agonizing need within our community to confront long-lived prejudices and hope that this course, and the implementation of COSL theory in scientific education programs, can help bring scientists to the forefront of activism and a strong anti-racist stance.

As we reflect on this course, student evaluations show that the reflection activities changed student perspectives about Baltimore. Additionally, in the same survey, students shared that they felt a stronger connection with faculty than in previous online courses, suggesting the development of authentic relationships. Further, a subset of students requested to continue working with their community partners beyond the course, suggesting a deepened commitment to work with Baltimore communities (see Appendix 6 for a subset of student comments). We hope to continue to evolve this course and add more about the city of Baltimore to give the students deeper connections to the city through further conversations with Baltimoreans and videos showing the depth of culture that exists here. Beyond Baltimore, we hope that this course can act as a template for other areas of both the United States and the world so that the online space can help bring us all closer together in working for more equitable scientific practices.

CONCLUSIONS

The work of teaching engaging science education is never finished. The idea of bringing COSL into the core of scientific education may have, in years past, seemed idealistic but unnecessary. The present circumstances we are faced with show how wrong that assumption was. We, as scientists and educators must acknowledge the role science has played in the current state of the world. The goal of science is to advance our knowledge and understanding as a method of advancing public good. In order to conduct scientific investigation in alignment with the needs of the community we must acknowledge the effects of racism in scientific practice. We know that systemic racism is present in current scientific education, from the paucity of people of color in the rank of full professor (35–37), to the number of minority students who leave STEM programs (38). We must redouble our efforts, on all fronts, to address these fundamental problems, first by acknowledging their existence and then by changing our approaches and practices.

The goal of this course, and service-learning courses in general, works, in one way, to do just that—by enacting the critical service-learning objectives of social change, authentic relationships, and the redistribution of power that work to further the cause of justice. The course presented here is unique in that we have brought these goals to the online platform. Unlike those that have come before, this critical OSL is not transactional, but transformational. It aims to bring the community (goals and expertise) into scientific inquiry as collaborators. Our hope is that this collaboration leads to more open access to science and the reframing of scientific questions to be radically anti-racist. With the COSL pedagogy as a framework, we intend this work as a call for the re-formation (and reformation) of science as knowledge inquiry with and from those who have been shut out.

The rise of the pandemic, regional lockdowns, and global protests for justice have only made the need for pedagogies like critical online service-learning in scientific education clearer. These recent months have affirmed our belief that we need to change the way we think about all education, including science education. Justice requires action from all of us, and the scientific community is no exception. One of the elemental ways to advance this understanding in our students is to teach them how to participate and reflect on their place as scientists and citizens in an evolving world. If we are educating our next scientific leaders, we must make sure they consider acts of anti-racism as essential to their acts as scientists. The COSL methods outlined here represent one step toward that goal.

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