

Implementing Ecopedagogy as an Experiential Approach to Decolonizing Science Education

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Abstract

Background: The field of environmental education (EE) aims to produce an environmentally literate citizenry that is not only aware of environmental problems but is motivated to work toward their solution. However, much of the U.S. EE curricular focus has been on understanding the biophysical environment with rural populations, with little discussion about the environmental problems created by the dominant Western cultural norms. **Purpose:** Freire’s ecopedagogical framework provides a framework for this discourse, yet there are few studies exploring how to put the theory to action. Experiential education’s principles of practice provide a platform to help environmental educators make this shift. **Methodology/Approach:** This mixed-methods participatory action research study includes observations, 71 document reviews, 29 interviews, and 15 surveys. **Findings/Conclusions:** This study presents two unique curricular interventions that aim to disrupt cultural patterns of environmental oppression through the use of ecopedagogy. **Implications:** This work expands on conclusions drawn in research by Smith and Segbers which recommended both transcultural pedagogy and a willingness to move beyond traditional models of curricula. Specifically, White environmental educators and researchers must rise to the challenge of adopting and innovating ecopedagogies that empower youth to explore solutions in their communities.

Keywords

critical theories, disciplinary frameworks, action research², methodology, urban settings, settings, minority/underrepresented groups, environmental education

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The field of environmental education (EE) has the aim of producing an environmentally literate citizenry that is not only aware of environmental problems, but motivated to work toward their solution (Stapp, 1969). Historically, EE has focused on this by way of the biophysical environment, particularly land and water issues in nonurban contexts. This approach is attractive to rural populations or those interested in rural natural resources; however, this leaves a gap for urban EE discussions about the environmental problems created by dominant Western cultural norms (Kenis & Mathijs, 2012; Payne, 2018). Intentionally integrating experiential education offers a way to engage students in responding to the intersectionality of culture, power, and the local environment into pedagogical practices (Khan, 2009; Pauw & Petegem, 2012; Stevenson et al., 2013). This intersectionality informs innovative pedagogical approaches discussed here as working toward decolonizing science education.

Scholars writing about urban education include a lack of cultural competency among White educators to be among the problems that shape students' experience of schools as sites of oppression rather than liberation (Emdin, 2010; Freire, 1970; Ladson-Billings, 1995). To develop environmentally literate citizens who will work to change the socially and environmentally destructive effects of human activity, people must be willing to enter into dialogue to understand and be empowered to work toward a solution. Urban environmental educators have much to offer the broader field as they have been working to empower marginalized populations in meaningful ways for decades (Anyon, 1980; Kayumova et al., 2019). While many of these critical pedagogical movements can be explored in the literature, there are few examples of curricular models that reflect working toward these goals at the secondary level. Experiential education can help to put theory to action through curriculum such as service learning, studying abroad, and student employment (Fede et al., 2018; Pipitone, 2018; Ricke, 2018), a particularly important effort for White educators partnering with urban educators who work regularly with marginalized students.

With this in mind, the present study examines two unique curricular interventions that aim to disrupt cultural patterns of environmental oppression through the use of ecopedagogy: an urban high school's three-credit Youth Participatory Eco-Justice Action Research (YPEAR) project and an all ages community science fair called Science Strikes Back (SSB). This exploratory research project focuses on students' responses to experiential components of those interventions. These take place in Milwaukee, Wisconsin, a city that is recognized as having the widest achievement gap between students by race in the country (Kremer, 2019).

Literature Review

Educational Equity and Urban Schools

Urban schools are working to incorporate pedagogical practices capable of remedying educational imbalances. According to the 2015 NAEP science assessment, statistically significant gaps in achievement are still present between students identified as Black and Hispanic and those identified as White (U.S. Department of Education, National

Center for Education Statistics, 2015). The National Science Foundation (NSF) has determined that, in addition to women and persons with disabilities, people who identify as Black, Hispanic, and American Indian/Alaska native are underrepresented in science and engineering fields (NSF, National Center for Science and Engineering Statistics, 2017). NSF data have shown wide gaps in enrollment in upper level science and math courses between high and low socioeconomic status (SES) high school students (National Science Board [NSB], 2016).

In addition, the state of Wisconsin, where this research occurred, has the highest disparity in graduation rates between students identified as Black and students identified as White, and the 10th highest disparity in graduation rates between students identified as Hispanic and those identified as White (U.S. Department of Education, National Center for Education Statistics, 2016). Nationwide, schools that serve largely Black and Hispanic student populations are less likely to offer higher-level science courses (U.S. Department of Education, Office for Civil Rights, 2016).

Milwaukee County has a greater percentage of Black and Hispanic residents than the rest of Wisconsin (Curtis & Lessem, 2014) and Milwaukee schools are attended by a racially diverse student population. While Milwaukee Public Schools' 4-year graduation rate rose from 58.2% in 2015 to 67.2% in 2018, there is still a significant gap between the Wisconsin state graduation rate of 90.3% (Wisconsin Information System for Education Data Dashboard, 2019).

Educational disparities and environmental problems are connected as matters of ecojustice and ecopedagogy. A lack of student engagement is one component of this problem. Furthermore, the historic trends in environmental education which are not situated as urban pedagogies, but rather are decontextualized environmental education, are yet another component of the problem (Hougham et al., 2017). Together, a disconnection between context and engagement bring about the need to better understand ecopedagogical innovations that are decolonizing and affirming of youth voice. What needs to be known is how to prepare Milwaukee and other urban teachers to better engage students in environmental education. This research will explore students' responses to experiential components of two hands-on curricular intervention with the hopes that these may provide ways to overcome race-based barriers to educational equity, particularly in science education.

Ecopedagogy as a Solution to Environmental Problems

Rooted in Central and South America, Paulo Freire's ideas spread globally after his 1970 publication of *Pedagogy of the Oppressed*. One of the most celebrated critical educators, Freire introduced ecopedagogy as a more humanistic approach to environmental education. While examples of ecopedagogy implementation are available worldwide, research on its implementation in U.S. schools remains limited. Freire's (1970) suggestion to shift from a banking education to a problem-posing education supports the potential effectiveness of experiential education in this context. The literature supporting this study is summarized below.

Ecopedagogy, as a form of critical theory, is grounded in normative concepts such as planetary (i.e., identifying as an earthling), biophilia (i.e., love of all life), and sustainability. Gadotti (2011), a colleague of Freire, states that ecopedagogy gives

... a chance for education to renew its old systems, based on competitive principles and values. Introducing a culture of sustainability and peace into school communities is essential so that these communities can be more cooperative and less competitive. (p. 22)

Beyond traditional environmental education, ecopedagogy embraces aspects of critical pedagogy and constructivism, making it both relevant to urban populations and transformative for students seeking to make change.

To address the issues of climate change, citizens, policymakers, and leaders must recognize how specific institutionalized practices contribute to large-scale environmental degradation and irreversible climate change. One of Freire's (1970) last great contributions provides a framework for this discourse, as he added the Earth to his list of oppressed. In doing so, he helped frame that simply accepting we humans are the cause of climate change would be uncomfortable, but would not necessarily be enough to begin to support the oppressed Earth. Freire (1970) explains, "Discovering [oneself] to be an oppressor may cause considerable anguish, but it does not necessarily lead to solidarity with the oppressed" (p. 49). While normally we apply the idea of oppression to human populations, Freire suggested educators dedicated to liberation shift to an ecopedagogical praxis to include the Earth.

In 2018, *The Journal of Environmental Education* published a special issue dedicated to Ecopedagogy as/in "scapes": This issue highlighted empirical research conducted by seven authors with a focus on *scapes*, what they define as an "ontologically oriented 'first' manner to the 'natural' and Nature as a primordial sourcing of beings and things, their ecologies and scales, the Scapes and their scopings 'affording' the epistemologies of ecopedagogy aim to provide another point of departure from 'civilized,' enculturated, domesticated, schooled/disciplined pedagogies" (p. 78). Topics included deimperializing foodScapes (Ma Rhea, 2018) and a feminist posthumanist ecopedagogy in/for/with animalScapes (Lloro-Bidart, 2018). While the issue represented a global perspective and included one study conducted in the United States, much of the focus was on high-level theoretical shifts rather than specific practices undertaken in ordinary, everyday contexts like secondary schools.

Indeed, while ecopedagogy is gaining in popularity as a philosophy on a global level, little is documented about how it is being put into practice, especially with K12 students. In his conversation with Myles Horton (Freire & Horton, 1990), Freire explains that while it is important to have a better understanding of the theory behind education as a researcher, he also knows that, "without practice there's no knowledge; at least it's difficult to know without practice" (p. 98). To embody praxis, educators must move between research and action, exploring how curricular interventions that aim to disrupt cultural patterns of environmental oppression through the use of ecopedagogy impact student learning.

Methods

The exploratory research presented here is grounded in a worldview that embraces the notion that there are multiple realities and/or truths. Particularly, this work is an extension of a critical pedagogy of place, and seeks to further decolonize environmental education practices examined here in both urban and science education contexts (Grunewald, 2003). Through exploratory case study design, the theoretical framework used by this project was Freire's ecopedagogy. Grounded in critical paradigms, the researchers' concerns with power relationships within social structures of formal educational settings, as well as a high reliance on praxis and the utilization of participatory action research inform the design of the cases discussed here as well as the pedagogical contexts for the students before and after these cases (Sandoval, 2000; Smith, 2012).

Site and Participants

Both of the cases in this study take place in an innovative independent public charter high school, Escuela Verde (EV), authorized by the City of Milwaukee and operated by TransCenter for Youth, Inc. Founded in 2012, EV is a project-based school grounded in constructivist ideologies with a curriculum focused on sustainability and social justice.

Currently, 80% of the 100 students at EV identify as Latinx, 7% as White, 6% as Black, and 5% identify as American Indian. In addition, 87% of the students attending Escuela Verde are economically disadvantaged, 28% are identified as students with disabilities and 27% of the students have limited English proficiency or are English language learners. These demographics reflect participants who are traditionally underrepresented in scientific studies as well as marginalized populations in the United States.

The curriculum paradigm at Escuela Verde has ideologies that are both constructivist and social reconstructivist, with teacher-researchers and community partners who adhere to an ecopedagogical praxis for teaching and learning. Applying an ecopedagogical praxis, EV teachers and students dedicate professional development and curricular time to examine systematically their own oppressor-oppressed roles as members of a particular unsustainable modern community/culture.

Both the YPEAR project and SSB serve communities in Milwaukee, Wisconsin. This location was chosen for two reasons: first, Milwaukee's geography is such that water, and water quality, play a huge role in the city from both a municipal and ecological standpoint. It is a densely populated, urban center that borders Lake Michigan and is situated at the confluence of the Kinnickinnic, Milwaukee, and Menomonee rivers. There are diverse lakeshore and riparian ecosystems in close proximity to heavy industrial and residential development. Second, by focusing outreach efforts in Milwaukee, the project can help address racial and economic disparities in science course enrollment, graduation rates, and access to quality science programming. In addition, the project selected schools that serve large populations of students from low SES backgrounds.

Considering this, the research process was enacted in ways sensitive to the cultural values and protocols of research participants and the climate of the school. Several guidelines described by Creswell and summarized by Glesne (2011) were followed. First, prolonged engagement and persistent observation for a year was spent to develop trust, learn the culture, and provide time to rethink my preconceptions and first impressions of the students. Next, crystallization, or the use of multiple data collection methods, multiple sources, multiple investigations, and/or multiple theoretical perspectives through the various sources listed above was used.

The participants in this YPEAR case study represented students and staff who were excited and actively engaged with their projects as well as those who were simply going through the motions to graduate or as a job expectation. Seventy-one YPEAR projects completed between 2017 and 2019 were reviewed for this study. Student and alumni interviews and senior/staff discussions were the primary data sources. Ten seniors and 10 staff were split into five small groups of four for the discussions, seven senior mid-year interviews and seven alumni exit interviews were transcribed verbatim. To add depth to the research, a records review of student documents including research papers and reflection journals was used to supplement these findings. Instruments used to collect these data included the researcher as observer, interview questions, and documents.

The primary goal of this research was to explore how EV's senior thesis YPEAR project represents a curricular model that implements ecopedagogy in praxis. Rather than focusing on the sum effect, these data represent the progression through which students move through the curriculum. In an attempt to gain saturation of information, 93 sources of data were included in this study including: seven alumni interviews, seven senior mid-year interviews, five senior and staff discussions, and 74 documents. These sources included a total of 29 participants: 12 seniors, seven alumni, and 10 staff.

After reviewing the curriculum documents and the transcribed student mid-year interviews, alumni exit interviews, and student and staff discussions, the data were coded into categories. In an attempt to keep the data as true to the voice of the students and staff as possible, an emphasis was placed on extensive initial codes. Using NVivo, 54 initial codes were created, and then sorted into subcodes, codes, and themes. Specifically, a total of 127 quotations were coded into 24 subcodes and 37 codes.

In the 2018 SSB, 10 community judges contributed, 38 teams registered and participated, and 240 community members attended the event in support. The teams were organized in six categories: The "Science—sustainable communities" category encouraged projects that identify or addressed environmental issues that affect local communities. The "Technology—use the right tool" category encouraged projects that used technology tools to collect data about students' scientific questions. The "Engineering—solutions-based design" category prompted student teams to improve their community through creative design. The "Art—science is beautiful" category encouraged students to apply scientific principles or uncover scientific themes in traditionally "non-scientific" topics, like art. The "Math—driven by data" category was for projects that displayed and interpreted data. The "Weird Science" category was for

nontraditional projects that found unique angles or interesting elements that related to scientific inquiry.

Teachers as researchers of methodologies also have unique bias. Having a close relationship with the participants can lead to false interpretations. While SSB was a one-night event with community members, several steps were taken with the YPEAR case to achieve trustworthiness. First, participants were asked to member check the information gathered for this research. This was done by providing opportunities for students and staff to read their transcripts to make sure their ideas were accurately represented. Although there is an innate power dynamic between the participants and researcher, some researchers feel this bias is justified because research also supports the idea that students will be more open and honest when working with a researcher they have built a relationship with (Herr & Anderson, 2005).

This exploratory study examines how students respond to the experimental components of YPEAR projects (Case 1) and how they are extending these changes to the community through a community science fair (Case 2), Science Strikes Back (SSB). Case 1 represents a deep, longitudinal student-centered ecopedagogical example at EV, while Case 2 represents a broad community ecopedagogical example with some of the same students at EV. The research reported here is part of a larger exploratory case study on how YPEAR impacts the development of students' environmental literacy that was approved by UW-Milwaukee's protocol under IRB application #14-420.

The Case Studies

Case 1: Youth Participatory Ecojustice Action Research (YPEAR) Curriculum

The Escuela Verde staff adheres to an ecopedagogical praxis for teaching and learning, with a vision to cultivate a community that is participatory, just, sustainable, and peaceful. The curriculum is based around this vision, and the school requires a three-credit YPEAR senior thesis project for graduation.

The case used for the present study, YPEAR is unique to this site. In an attempt to put ecopedagogical theory into practice, the school created the YPEAR project designed to be integrated into the Senior Thesis graduation requirement. In addition to content-related standards, the objective of the senior thesis project is to provide authentic experiences for students to realize and embrace their humanness by allowing learning to be relevant to their lives (Zocher, 2015).

Results

By design, the YPEAR project is a curricular intervention that allows students to decide what topic they would like to focus on. Of the 71 projects from 2017 to 2019 reviewed, 39% had an environmental theme. Furthermore, this percentage increased from 31% in 2017–2018 to 43% in 2018–2019.

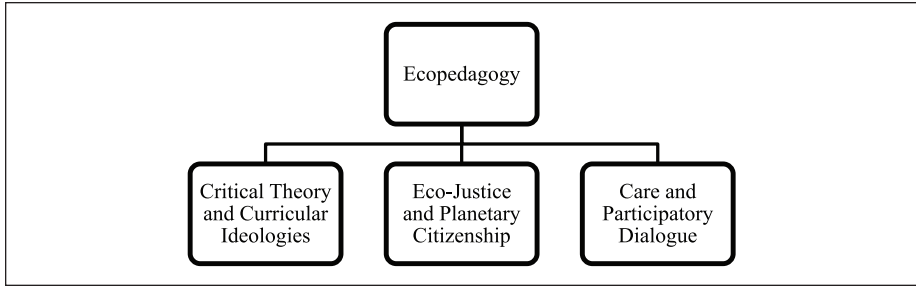


Figure 1. Ecopedagogy themes.

After critical reflection on the initial codes and larger blocks of texts during a larger study on students’ reactions to the YPEAR projects, 10 themes were discovered. Three distinct themes related to ecopedagogy emerged through critical analysis of senior interviews, alumni exit interviews, and senior and staff discussions: Critical theory and curricular ideologies, ecojustice and planetary citizenship, and care and participatory dialogue (see Figure 1).

Multiple themes overlapped to operationalize ecopedagogy. These themes converged to substantiate layers of theoretical grounding with staff, students developing a sense of planetary citizenship and a shift in transmission of knowledge through participatory dialogue affect the development of urban high school students’ environmental literacy.

Multiple codes including social justice, confidence to enter into the dominant discourse, and taking action to create positive change overlapped to develop a rich theme of critical theory and curricular ideologies. Critical theory is one of the key principles associated with embracing an ecopedagogical praxis for teaching and learning and Victoria is one of the students who shared the presence of these three prevalent codes.

Victoria was a Latinx senior whose senior thesis YPEAR project was, “In what ways does creating an art and craft space in the school affect student stress levels?” When asked about her senior thesis project, Victoria replied, “My senior thesis is basically art therapy and how participating with art can actually decrease stress in students . . . and in the adults, too!” She brought us the idea that it was important to participate *with* art, and pointed out that this practice benefited the whole community, “even the adults.” Freire’s (1970) critical pedagogy, and later ecopedagogy, supports a shift to a social reconstruction ideology as a means to facilitate the construction of a new and more just society that offers maximum satisfaction to all its members.

Her belief that her project helped the adults as well as the students demonstrated how both the adults and students worked together to reflect on their school conditions, imagine them better, and then took collective action to create that positive change. Although not a huge societal change, this opportunity provided practice for Victoria, and the adults, to shift the way they typically thought about the school system and to work toward critical consciousness of their relationships to one another. This, in turn, helped Victoria disrupt cultural patterns of oppression, demonstrated by her increased

knowledge of healthy emotional and physical choices, her improved skills in defending simplicity, care, and peacefulness, and her overall disposition of happiness, but did not related to the environment at all.

The second theme of ecojustice and planetary citizenship was distilled through multiple codes including care for Earth, sustainability, and empathy, another integral part of ecopedagogy. Learning to value and have dignified interactions and meaningful dialogue is critical to the next phase of planetary civilization and Mika, an American Indian female senior with a passion for gardening and cooking, exemplified this theme.

Mika's senior thesis YPEAR project was, "In what way does providing opportunities for teens to learn about food, the environment, and community impact the belief that they can create a healthy commons?" She worked on aspects of it for 2 years. During her mid-year senior reflection interview, when she was asked, "Tell me about your senior thesis project," she responded,

My senior thesis deals with, like, youth healthy choices and it's kind of about like how your actions affect you and how they affect the Earth because everything is like all tied together.

Mika focused on how peoples' actions affected them, in addition to how they "affect the Earth" to emphasis that everything is "tied together." For her, this meant that she was thinking beyond her own needs, and that her project was trying to teach her peers to do the same. When asked, "Why are you doing this project?" Mika substantiated the theme of ecojustice and planetary citizenship by explaining that the she was worked with the lunch program to

look at different ways students can reduce food waste, GMOs or other organisms like that, all different kinds of things but always in the same subject of food for personal betterment and bettering the Earth, too.

Mika felt that helping students take action related to food was important for "personal betterment" as well as "bettering the Earth, too." This is related to the code of care for the Earth where Mika felt the Earth needed to be healed. This affected the development of environmental literacy skills in the students she worked with by providing them with practice evaluating potential solutions to environmental issues such as waste, GMOs, and chemical pollution.

The last theme of care and participatory dialogue encompassed multiple codes including trust, relationships, and humor, which substantiates that carefully engaging in participatory dialogue affects the development of urban high school students' environmental literacy. Care and participatory dialogue are also associated with ecopedagogy as it is based on the idea that two parties learn to authentically care for each other.

Case 2: Science Strikes Back, a Community Science Fair

"Science Strikes Back" (SSB) is an annual community science fair held by Escuela Verde, a public charter school in Milwaukee, Wisconsin, in collaboration with Upham

Woods Outdoor Learning Center. Building these science fair projects is supported through coaching and mentoring, inherently experiential methods for mobilizing ecopedagogy action with youth. Furthermore, the origins of SSB lay in pedagogies that—unlike a traditional science fair—emphasize convening community as participants, venue, and solution makers with students and with schools. SSB is designed to increase public participation in environmental stewardship and conservation. Specifically, this project increases community engagement with water quality issues to promote the conservation of clean drinking water and aquatic ecosystems, as well as recreational, economic, and subsistence activities. SSB fosters collaboration between informal science learning (ISL) organizations, formal educational institutions, and community partners to engage students and teachers in environmental education and stewardship.

The activities supported by SSB engage students in inquiry-driven, experiment-based investigations of water in their immediate surroundings, in turn promoting critical thought about water quality issues that affect their communities. ISL settings like Upham Woods Outdoor Learning Center, Wehr Nature Center, and the Urban Ecology Center offer the project alternative resources and curriculum flexibility while formal educational settings like Escuela Verde provide the long-term student–educator relationships that allow for sustained programming and adequate evaluation. Community partners provide content mentorship and professional development opportunities for teachers.

Although their intentions are notable, the singular nature of science fairs tends to compromise their long-term impact. The SSB approach expands the reach and impact of a traditional science fair by building a network of students, educators, community members, and content specialists that engages in year-round science outreach. This environmental education network collaboratively prepares students for the SSB community science fair, but in doing so it also engages in activities whose impacts last beyond the day of the science fair itself. This approach creates longer lasting connections between environmental organizations and educators, connecting students more deeply to environmental stewardship in their communities. In addition, the involvement of community members and content specialists in the project introduces students to careers and real-life applications of the science content they are learning.

SSB capitalizes on the technological and pedagogical benefits of the Digital Observation Technology Skills (DOTS) approach at Upham Woods to facilitate water quality outreach in Milwaukee. The DOTS approach is an ISL enhancement that provides handheld, digital tools (DOTS kits) to education practitioners for use in lessons driven by student inquiry and data collection. DOTS allows students to collect data using handheld digital technology and analyze that data using an online portal (Hougham et al., 2018). Research suggests that incorporating new technology into environmental education can enhance student engagement in outdoor sciences (Greenwood & Hougham, 2015), as noted in Section 2.2.10 in the 2015 NEEAC report to the EPA. National agencies are beginning to recommend that educators integrate technology into environmental science learning (The National Environmental Education Advisory Council [NEEAC], 2015). The program is constructed to

encourage students to be active participants in the scientific process and its flexible design ensures it can be readily applied to many environmental subjects, including water quality.

Results. The results of this project model include the way community participated in the event as well as the student impact itself. In 2018, 39 entries were submitted to SSB, 11 of which were projects focused on environmental issues (28%). In 2019, 34 entries were submitted to SSB, 16 of which were projects focused on environmental issues (47%). This directly reflects student engagement in experiential science education through self-selected topic areas about environmental issues.

Fifteen of the 42 participants in the 2018 edition of SSB provided reflection on the event as well as responded to a post-event survey. A descriptive summary of their responses is shown in Table 1, and responses to open-ended questions are reported below.

Youth (between 10 and 15 years old) reported

- “I like presenting my project in front of people”
- “I had fun and I learned so much and I really enjoyed looking at all the different projects”

Adult (older than 25) reported

- “It was a great way to see many ages presenting as experts”
- “It was so amazing to see people of all ages learning and teaching together!”
- “Excellent event and impressive presentations”

Discussion

In this study, two cases were presented that demonstrate that experiential education can be implemented as a part of ecopedagogy in an urban secondary context. The senior thesis YPEAR project along with staff adhering to an ecopedagogical praxis sought to help students acknowledge that our current cultural norms are not in concert with the natural world. In doing so, they were to actively engage in working for a more just, peaceful, and sustainable planetary community to work toward environmental justice. As such, the YPEAR project’s curricular model focused on empowering students through experiential education and demonstrated ecopedagogy in action.

Components of SSB draw from many recognized forms of experiential education in place-based pedagogies to better engage students in environmental education. Place-based education has been shown to allow students to forge meaningful connections between science, technology, engineering, and mathematics (STEM) content and their experiences in their daily lives, develop their acute observation skills, and increase their capacity to care about the environment around them (Greenwood & Hougham, 2015; Land & Zimmerman, 2015; Liu et al., 2009). SSB provides learners with technologically advanced tools to explore their immediate environment and

Table 1. SSB Pre- and Post-Event Survey Combined Youth and Adult Responses.

Survey response (I agree that I . . .)	Before SSB (%)	n	After SSB (%)	n
Feel like I could use science to positively impact my community	73	12	91	15
Understand how science, technology, and engineering can solve problems	73	15	81	11
Learned something new at Science Strikes Back			100	15
Learned from people who were different ages (older/younger) than me			93	15

Note. SSB = science strikes back.

collect data on the phenomena they observe; studies show that using technology to engage youth can foster a desire to become better observers of the natural world (Hougham et al., 2018). Students’ learning experiences are largely driven by their own inquiry processes, which SSB educators and facilitators can enhance through observation activities and instruction on the scientific method.

Through all of its integrated components, SSB seeks to increase participation in environmental education and environmental stewardship by students, teachers, and their communities. In its third year now, the project seeks to produce the next generation of active, informed citizens by empowering them to identify and solve environmental problems faced by their own communities. SSB serves as a catalyst for science-based problem solving that engages not only students but their communities and family members as well. To fulfill this promise, SSB engages in year-round development with teachers and organizations, producing an environmental education network that serves the Milwaukee communities that stand to benefit most from such programming.

This exploratory study presented students’ reactions to the experiential components of two curricular interventions that aimed to disrupt cultural patterns of environmental oppression through the use of ecopedagogy. Both cases involved teachers who empowered urban youth to work toward solutions to environmental problems that they identify, which is in concert with experiential education’s principles of practice. Furthermore, none of this would be possible without both educators and researchers intentionally acknowledging and addressing systems of oppression. Ecopedagogy in this instance is developed as an experiential approach to decolonizing science education.

While this study offers an initial look at how students can be engaged in an ecopedagogy unit, it provides little information as to how this engagement relates to future environmental commitments, let alone the more global problem of oppression. For example, what sort of environmental commitments did participants make after these curricular interventions? Future studies that would connect these themes to the wider aims of ecojustice would be beneficial. This research studied how the experiential



components of two curricular programs supported the designers' goals of promoting ecopedagogy targeting critical understandings of human/nature relationships and the analysis of the data is limited to student experiences of and reactions to those experiential components. Unfortunately, data have not been collected or analyzed to link the reactions to the ecopedagogic aims specifically. Nor is it clear what the data say about any relations of oppression. Research exploring how urban educators have shifted their practice to embrace ecopedagogy would help inform professional trainings for others to implement this shift.

Educators must be courageous enough to shift from objective content as a focus to relationship building, and this shift has the biggest implication for teachers in urban settings. Particularly true for White secondary teachers whose pre- and in-service training typically focuses on content-related pedagogy, it is important to understand how much of it will be ineffective if issues of race and power to build relationships with students are not addressed first.

Conclusion

This work expands on conclusions drawn in research by H. A. Smith and Segbers (2018) which recommended both transcultural pedagogy and a willingness to move beyond traditional models of curricula. Specifically, White educators and researchers working in urban classrooms in the United States must be sensitive to issues of power and privilege that are manifest throughout traditional curriculum and educational research. Shifting the focus of environmental education to help guide students to use their knowledge, skills, and dispositions also helps them become actively engaged citizens working to dismantle dominant discourses to address issues they continue to be passionate about. Environmental educators must rise to the challenge of adopting and innovating ecopedagogies that localize changes for environmental justice and empower youth to critically examine power in their community.

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