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Richard Sawyer
Washington State University, rsawyer@wsu.edu

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Preservice Teachers Learning to Teach in an Anti-Racist/Climate-Justice Program: Challenges and Promises

Abstract

The global climate crisis represents the most urgent problem facing the planet, impacting social, cultural, political, economic, and environmental dimensions of life. Alarming, it has impacted communities of color in disproportionate ways (Goddell, 2023; Pellow, 2013). The climate crisis, along with the intertwined context of racism, places a profound responsibility on social justice teacher educators to prioritize addressing these issues in teacher preparation. The intent of the following two case studies is to explore the impact of a project based teacher preparation program focused on cultural and environmental justice on the pedagogical knowledge and practice of teaching interns at the beginning in the first semester of their program.

Keywords

Climate Change Education, School University Partnership, Adaptive Expertise, Curriculum, Teacher Preparation, Project Based Teaching and Learning

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Introduction

As the world burns, many teacher preparation programs have stayed frozen in an objective Western mindset characterized by an epistemology of certainty, linear progress, and normative outcomes. Subject matter competencies, status quo standards, and decontextualized individualized learning supplant lived relational knowledge—of each other and our planet. To combat climate change, not only is a new mindset about the planet necessary, but that mindset needs to complement a new way of being: instead of considering the planet a warehouse for consumption, we need to respect it as a fragile ecosystem of life.

As a longtime teacher educator who coordinates a small secondary teacher preparation program with a dedicated group of flexible, social justice educators on the West Coast of the United States, I've recently stepped outside my comfort zone to reconceptualize and restructure the Graduate Teacher Program¹ (GTP) around problem-based approaches to climate disaster and anti-racist education. This article presents findings related to that restructuring. Specifically, it examines the impact of a project based teacher preparation program focused on cultural and environmental justice on the practice and thinking of teacher candidates (preservice teachers). It also examines their perceptions about the obstacles they faced to their teaching for and thinking about this topic. Through two case studies, it examines the following three research questions: how did the preservice teachers change their *practice* in a project based program focused on cultural/climate-justice over their first semester of the program? How did they change their *thinking* in a project based program focused on cultural/climate-justice over their first semester of the program? And third, what challenges to their changing practice and thinking did they face?

The Partnership and Embedded Clinical Program

Adapting an existing preparation program with an emphasis on anti-racism education as part of a larger program change, with other faculty members I redesigned part of the program to prepare preservice teachers to teach for climate-justice (Le, 2021; Turner, 2015) and anti-racism (Pellow, 2014) (e.g., examining not only the heightened risk and impact of climate change on people of color but also strategies of resistance). As part of the change, the Graduate Teaching Program (GTP) formed a partnership with a neighboring combined-middle/high school emphasizing project based learning (PBL), embedding the program into the school and the authentic practice of its teachers engaged with their students in project based learning.

The goals in planning and establishing the partnership were first to close the endemic “two-worlds pitfall” between college-based theory and school-based practice (Feiman-Nemser & Buchmann, 1985) in the program. Second, we sought to scaffold the teaching candidates’ inquiry and practice, knowledge, and skills, providing them with a complex lens with which to conceptualize and co-construct anti-racist education for climate-justice, impacting both their practice and their thinking about practice.

The curriculum of the middle/high school itself emphasized project based learning (Larmer, et al, 2015). PBL is a form of practice in which preservice teachers develop curriculum around a contextualized teaching question or phenomenon situated within a learning project. As part of the GTP, two courses (a curriculum course and a technology course focused on project based learning for social-justice and climate-justice) were taught at this school. (I taught the curriculum course and the technology course was taught by a teacher/media specialist at the

¹ All names are pseudonyms.

school.) GTP preservice teachers who took these two courses also conducted observations at the school on the day the two night classes were offered.

In the GTP, we introduced pedagogical knowledge about the crisis, for example, Rita Turner's *Teaching for EcoJustice* (2015). However, until recently, we focused on teaching pedagogy, exposing the preservice teachers to little scientific or factual information about the crisis (which we now identify as a program weakness) at the start of their program.

We've found that the preservice teachers enter our program with a single disciplinary focus with which they hope to build their teaching frameworks. English teachers want to excel in their chosen and much-loved discipline, as do the history, math, and science candidates. However, the complexity of climate change is multidisciplinary—that is, it exceeds the constructed disciplinary categories. We established our program intentionally to be consistent with approaches to interdisciplinary and multidisciplinary design (Jacobs, 1989) as well as theories of adult self-regulated learning (Spruce & Bol, 2015), which stresses personal awareness of patterns of learning as a means of directing and regulating one's continued learning.

In addition, the program emphasizes preservice teachers' development of critical consciousness and self-study. Our goal of critical self-study is for preservice teachers to surface and understand their socialization process to patterns of power—without their further maintaining, justifying, and reifying practices and attitudes that perpetuate oppression. example, in my own classes, I have integrated dialogic forms of self-study—for example duoethnography (Sawyer & Norris, 2016) or collaborative photo-voice (Gubrium & Harper, 2013; Miller et al, 2019), as a means for preservice teachers to gain the critical distance necessary to begin a reconceptualization of views leading to a change in their action and thinking about action (this activity falls in the third semester of the program, not the first). As part of this process I ask students to unpack their root metaphors about specific phenomenon. Although they all are obviously opposed to climate destruction, they often believe that progress is about further control of the environment rather than opening their thinking to new approaches, such as Indigenous views of developing a healthy relationship to it, for example.

Also, in class in the first semester we discuss environmental ethics (Palmer, et al., 2014). Environmental ethics examines contradictions and tensions with both anthropocentric and non-anthropocentric value claims related to, for example, best environmental consequences, the respect of more individual and social principles and rights, and the respect of environmental virtues (p. 419).

A very brief review of key program assignments and activities in the first semester might be helpful and operationalizing the practice of the program. In the technology course, preservice teachers use technology as a tool with their middle/high school students in order to design and implement eco-justice project based learning. As a template for the projects, the preservice teachers followed the Gold Standard PBL Seven Essential Project Design Elements—framed by the perspective of their middle-and-high school students (Larmer, et al, 2015):

<ul style="list-style-type: none"> • a challenging problem or question, • sustained inquiry, • authenticity, 	<ul style="list-style-type: none"> • student voice and choice, • reflection, • critique and revision, and, • a public product.
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The second graduate level course taught at the combined middle/high school is an introductory to teaching course. Not a methods course, it's more of a framing course combining

philosophy, social justice pedagogy (Freire, 1982, and Greene, 1978), curricular co-construction (e.g., examining the tensions between the planned and the lived curriculum (Aoki, 1993), multidisciplinary and interdisciplinary curriculum (Jacobs, 1989), the value of teacher collaboration, and the relationship between climate change and culture and racism (Pellow, 2014). The two courses work together and their syllabi and assignments overlap and reinforce each other.

In these courses, partnership leaders seek to scaffold a sense of hope, agency, and pedagogical knowledge and skill in the preservice teachers as a generative context for their work with middle and high school students.

Theoretical Framework for the Study: The Social-Cultural Dimensions of Learning to Teach for Climate-Justice

Three interconnected theoretical frameworks guided this study. We drew from 1) Sanchez's social focus framework (2023); 2) Bransford et al.'s adaptive expertise (Bransford et al., 2005); and 3) Beach's (2023) framework for addressing seven challenges to preparing teachers to teach about the climate crisis.

A Critical Social Focus Lens

Sanchez's (2023) tripartite social focus framework contextualizes environmental justice as social phenomenon related to critical consciousness, consequential concern, and critical liberatory presencing. Critical consciousness is grounded in a Freirean stance of conscientization (1982), of becoming aware of one's relationship to larger systems in the world that maintain or dismantle oppression. Engaging in critical consciousness, preservice teachers try to conceptualize and then reconceptualize their relationship to normative discourses of power which create and channel attitudes directly or indirectly accelerating the climate crisis. Critiques of these normative discourses move recursively from the critique of self, to that of others, to that of society and structures of power.

In contrast to the first more individual dimension of Sanchez's framework, the second dynamic, consequential concern, focuses on the social context of climate justice education. It asks candidates to consider their relationship to cultural and collective wellbeing. Applied to climate change, how one conceptualizes nature, wellbeing, different cultures, and relational collectivity contributes to a vision for action. In this regard, it is imperative for students to begin to work together collaboratively, not competitively, collectively, not individually.

As part of the social context, interns explicitly studied the personal, cultural, political, and historical dimensions of racism throughout the GTP. In the first semester of the program in different courses (not just the two partnership courses), for example, interns read articles about culturally sustaining pedagogy (e.g., Paris & Alim, 2017; Paris, 2012), body-soul rooted pedagogies (Soca-Provincio et al., 2020), Indigenous pedagogies (e.g. Louie, 2020), and critical whiteness pedagogy (Tanner, 2020). In the first semester students also engage in a critical self study focused on having them surface and explore aspects of cultural hegemony within white identity. To help students make connections between climate change and race, we drew on anti-racist environmental justice (Pellow, 2014).

Finally, the third dimension, critical liberatory presencing, asks students to extend their ecological imagination and use empathy and compassion to go beyond themselves in considering

different future possibilities. A vision for collective engagement and the social imaginary acts as a guide as we seek a new way of being in the world (Sawyer, et al., 2022; Zumwalt, 1989). This dimension focuses on restorative justice, rightful representation, and self-determined representation. But it's important to note that although it involves the concept of futurity, a lived ontology—being and becoming with others (and plants and animals) in the moment—is central.

Finally, and more in the background, in order to examine the candidates' conceptions about their practice more generally, we utilized the work of Bransford et al. (2005) on adaptive expertise. Teachers who are adaptive experts “are prepared for effective lifelong learning that allows them continuously to add to their knowledge and skills” (Bransford et al., 2005, p. 2). Teachers' views of diverse student learning are central to their process of developing adaptive expertise as they begin to challenge their own specific ways of learning and understanding. Personal and professional dimensions of teachers' work interact to facilitate a change in beliefs, values and practice (Corno, 2008; Randi & Corno, 2005). Furthermore, one's adaptation to a change of some sort (in task, demands, and environment) distinguishes adaptive expertise from routine expertise. Environment both facilitates and indicates adaptive expertise (Sawyer, et al., 2022).

Challenges to Preparing Teachers to Teach about the Climate Crisis

Beach (2023) identified a number of challenges teachers who attempt to teach for eco-justice face. Interconnected, each of these challenges holds both internal dimensions (e.g., personal stance and positionality) and external dimensions (e.g., larger structures that maintain or disrupt ways of working with children):

- providing valid knowledge and beliefs about climate change,
- acquiring positive attitudes and self-efficacy about teaching climate change,
- providing multidisciplinary curriculum teacher preparation,
- addressing environmental justice issues, and
- adopting systems thinking for addressing climate change.

One roadblock to preservice teachers addressing the climate crisis in their class is their lack of knowledge about it. In fact, a recent study found that a focus on climate change in college biology textbooks (Ansari & Landin, 2022) and sociology textbooks (Liu & Szasz, 2019) has actually *declined*, “possibly due to publishers' concerns related to teaching about climate change in universities located in certain states” (Beach, 2023, p. 4). Although students in science and sociology may be losing content about the climate crisis, other students receive none: students in the humanities on the secondary level and many students in general on the elementary level often receive no content and consequently don't identify as teachers in environmental studies (Beach, 2023).

Given a lack of knowledge about the climate crisis, preservice teachers often have not had the opportunity to engage in successful teaching about the crisis—and thus ideally to experience firsthand a sense of self-efficacy about teaching to address climate change. The importance of such experience can not be overstated; research has shown that for adult learners to challenge and change engrained beliefs and values, they often need to directly confront such beliefs through experiential activities accompanied by critical awareness (Lombardi & Sinatra, 2013). Preservice teachers' sense of hope and self-efficacy in their teaching skills about the crisis scaffolds their subsequent confidence and action.

As Beach (2023) states, preservice teachers

benefit from acquiring knowledge of the economic and political forces shaping consumption associated with policies on energy use (Jorgenson et al., 2019; Stapert, 2018), as well as reading about examples of female scientists who are actively engaged in addressing CC (Johnson & Wilkinson, 2020). An analysis of elementary PTs learning about climate change in a methods course found that they were particularly motivated to teach climate change based on socio-scientific connections to coping with issues and ethical dimensions related to climate change effects on students' lives (Hestness et al., 2011, p. 6). (Beach, 2023, p. 6)

Clearly, a relevant curriculum that students actively connect to the unique dilemmas and complexities each experience during the climate crisis is necessary. Such a curriculum needs to be contextualized within the complex (multidisciplinary) space of “real” life.

An important point is that climate change doesn't impact all communities and countries equally. For example, homeless people in cities with extremely high summer temperatures are much more likely to perish from environmental causes (Davis-Young, 2022; Gabbe, et al, 2023). Referencing the People's Agreement of Cochabamba (2010), Beach (2023) states, “while richer countries generate far more emissions than poorer countries, developing countries are experiencing more adverse effects” (p. 7). As we discuss below, explicitly examining the social-cultural context of climate change is necessary both to understand the human impact of climate change as well as to take meaningful steps to address it.

Furthermore, Beach states that a systems approach to the examination of climate change is necessary to understanding and generating solutions to the crisis. A systems approach goes beyond the analysis (and blaming) of individual actions to highlight the larger systems (e.g., laws, economics, trade-patterns, urban design, and education) regulating, justifying, and maintaining climate destruction. Grounded in social justice concerns, a systems approach reveals systemic causes of climate change that impacts human and posthuman life on Earth.

A Case Portrait Methodology

As mentioned, we examined three research questions in the study: how did the preservice teachers change their practice in a project based program focused on cultural/climate-justice over their first semester of the program? How did they change their thinking in a project based program focused on cultural/climate-justice over their first semester of the program? And third, what challenges to their changing practice and thinking did they face?

To examine these questions, we conducted pre/post surveys and interviews with the participants and examined their teaching portfolios which included written commentaries. In addition, for the first research question we observed the candidates working with middle/high school students. Finally, and more as background data, we analyzed my and another instructor's concurrent notes, planning documents, and memos on the collaboration. The three questions were intended to work together, moving from more concrete to more abstract levels of understanding.

My data coding followed a three-step process, taking the form of a series of thematic compressions of the data (Saldana, 2013). In these three steps, the data moved from edited initial interview, to a secondary coding table, to a primary coding table. Before codes were assigned to

the meaning units, the data were read thoroughly a number of times to ensure familiarity. A secondary code (or codes) were then assigned to each meaning unit. These codes used key words from the initial quotation, in essence “low inference snippets” (Huberman, 1993) or InVivo coding (Saldana, 2013), basing the code on the language within the quotation being coded. The goal was to examine the “data through a series of cumulative coding cycles that ultimately lead to the development of a theory—a theory ‘grounded’ or rooted in the original data themselves” (Saldana, 2013, p. 51). Following this more inductive coding method, I then, referencing Yin’s (1984) suggestion that a theoretical orientation can guide the analysis (1989), used a more deductive approach and examined the data framed by the research question, the social focus framework (Sanchez, 2023) and adaptive expertise framework (Bransford, et al., 2005). I grounded much of the analysis into the literature in order to counter my own possible bias toward the data, providing categories (e.g., critical consciousness) to guide the analysis through a more trustworthy, external lens (Maxwell, 1992).

The third step in the data analysis process was the assignment of the primary codes. The primary codes were developed by grouping together and then organizing into patterns and themes the secondary codes (Saldana, 2013). The name of an emergent overarching theme would then become a primary theme. Finally, the data were examined again to identify additional and possibly stronger examples of such themes and patterns as well as to search for irregularities and contradictory cases (Huberman, 1993; Merriam, 1988).

It should be noted that this research was conducted during the Covid-19 pandemic, and mid-way through the semester the candidates had to shift from teaching face-to-face to an on-line format. Although I don’t consider this forced transition a research limitation, it did add pressure to the preservice teachers’ challenges to develop and implement their new units.

Kevin and Lisa: Beginners’ Introduction to Project Based Learning, Eco-Justice, and A Pandemic

In the following case portraits I examined Kevin’s and Lisa’s--two beginning preservice teachers--teaching practice, thinking about that practice, and encountered obstacles. Although I examined the research questions separately, given that many of their responses are based on their self-perceptions and reflection on their practice, the discussions about practice and thinking about practice occasionally intertwine. Also, it should be noted that we were examining these teachers in their very first semester of their teacher preparation program: they were beginners, not veteran teachers.

Kevin: An Aspiring History Teacher

Before entering his teacher preparation program, Kevin was a gifted student both in history classes and of the discipline of history. In AP history in high school he was mentored by a teacher whom he came to see as a strong role model for him. This teacher encouraged him to give a series of lectures in the class to his classmates, inspiring him to become a teacher.

In his first semester in the GTP, the initial unit plan that Kevin and his collaborators designed in the month preceding the Covid-19 lockdown was consistent with his initial views of the importance of empathy in teaching and learning. Initially, he had wanted his middle school students to do a project-based unit related to a community garden. Their curriculum as planned was fairly tightly scaffolded and directed by him and his two co-teachers (preservice teachers in

his cohort). This project was his first attempt as a teacher to design a project based unit. Kevin's thinking about this community garden project shows his initial confusion and hesitation about project based learning, as well as his growing excitement when he began to realize its potential to engage student learning. He described how the process evolved:

When we first started talking about the garden project I was overwhelmed with the idea. It was so different from how I typically conceptualized teaching and learning that it took me a while to actually understand the process of taking part in project-based learning. When I got a handle on it, I was excited to bring a bunch of ideas for what a garden project would be. I was very set on the idea that students would create something physical to show their parents and the rest of the school, and I believe the rest of the cohort had a similar idea. Although not yet agreeing on the specifics after quite a few instances of in-class and out-of-class planning on Facebook, in small meetings before class, and in a few emails, we narrowed down our ideas and had a few general plans. However, we were not nearly ready enough after a fairly intense planning session, we finally came up with a concrete plan, and allocated tasks to everyone in the group. I felt very satisfied with this process. That is to say, I like that we struggled with all of our ideas as a group, put in a lot of effort, that burst into a force of cooperation that left everyone happy with our progress. I liked what I learned about project based learning, and it's made me seriously consider using similar long-term projects as the base for future classes.

Kevin's thoughts about the initial planning process related to the garden project reveal insights about his early conceptualization-process as a teacher. Perhaps central to the above thought is that he sought to build the unit around student engagement, "I was very set on the idea that students would create something physical to show their parents and the rest of the school...." Also, he is able to conceptualize the process fairly well, including initial difficulties followed by a "struggle...that burst into a force of cooperation...." He describes a generative "cooperation," one leading to new thoughts. Instead of beginning an early process of establishing a more narcissistic routine (arguing for, defending, and then implementing his plans), he is not only open to new ideas but says how happy he was with them. He shows a general positive impression of project based learning: there is imagination, flexibility, reflection, knowledge of self-regulation, and—perhaps most importantly—joy-- to his description.

However, Kevin's sense of satisfaction with their design was replaced by the change in teaching-and-learning with the onset of the Covid-19 crisis. At the midpoint in the semester the school district moved all their in-person classes to an online remote platform. After the lockdown, Kevin appeared galvanized to work with the students in relation to the crisis. During the crisis he stated,

the Covid-19 crisis creates several challenges that students (and adults) have to overcome: avoiding xenophobia and bigotry that crises often engender, being able to pick apart valuable scientific data from the endless noise of the media, [and] being able to work together to solve local state and national problems. I believe that all of my educational goals line up very well with the immediate goals of solving the crisis.

Kevin stated at that point that his goals as a teacher were to help students to think critically, become good members of a broader community, and to develop a sense of empathy and cooperation. At this point his educational goals have become broader and much more in line with social justice, community enrichment, and systemic issues.

The context of planning curriculum in relation to a pandemic added a new context of collaboration and creativity. For example, in his portfolio, Kevin shared email exchanges between himself and his two collaborators, documenting their collaboration. The following exchange shows the generative nature of their collaboration: One of them states,

looking at Rob's [the technology instructor] emphasis on community for this course, I do think something like role-playing community members and their roles in preventing the spread of/curing Covid-19 would be super interesting.

Kevin added,

I've been reading pretty extensively about the differences between various responses by social organizations to the coronavirus. I believe a very useful civics lesson could be done by giving students various artifacts (i.e., snippets of news articles and government reports, short news broadcast, etc.) and asking them to draw various conclusions from the information presented to them.

A collaborator mentions,

I think they could then contribute to a Google doc where they share their various ideas of how their responses differ and how [...] they as individuals and as part of a local community could help the situation. If you have any general or specific ideas of how you two could fit your content areas into this I would be very interested.

This exchange highlights the substantive and meaningful nature of their collaboration. Collaborating, they were able to replace conceptualizations of more conventional ways of teaching history with an emphasis on history as part of a multidisciplinary curriculum focused on community wellness, systemic approaches to pandemics, and students “shar[ing] their various ideas [...] as individuals and as part of a local community [to] help the situation.”

The unit that Kevin subsequently designed with the students resonated with these goals, becoming mutually synergistic. The focus of their new unit was student wellness in a pandemic. Their goal was to have students create community and self-agency within a pandemic by creating their own fitness goals. Part of the unit would involve researching different ways that people cope with pandemics--for example the Spanish flu of 1918--in the past. Then he structured the unit to have students “create and submit one piece of art, original writing, video, or music to be published on the class’s website. These pieces will tell our collective story of the Covid-19 experience.”

Part of the goal in this process was to have students “walk the viewers through their engineering process.” The project included intergenerational bonding as students were to “record a video or audio interview with an adult family member or family friend about their experience

during the Covid-19 pandemic. The goal is to create firsthand historical accounts of this time in history of which students and their families are part."

The design process went more smoothly and quickly the second time—and it supported a huge leap that Kevin and his collaborators made in their thinking about learning, that the learner comes first:

Through the design process, we came up with a large number of ideas, many of which we discarded because of their lack of authenticity to what students were experiencing. We ultimately decided on having students create their own SMART [specific, measurable, achievable, relevant, and time-bound] design goals out of an interest of putting responsibility into their hands. Instead of us assigning to them a specific rigid set of goals, while not even being able to talk to them beforehand to know what they wanted, we thought it was best to give them a lesson that could act as a template they could use on their own.

Throughout the design process, Kevin and his group never explicitly focused on race. However, as mentioned, they did emphasize how their students could examine and contribute to the social-emotional wellbeing of their community. A clear goal for the group was students' development of empathy for others, including those who lived in poverty. Although not directly promoting diversity, Kevin was at least aware of this shortcoming and reflected in his portfolio about his difficulties in teaching for diversity and culture. This omission in his work probably points more to program than to personal flaws. It also shows the impact of the partnership school's culture and curriculum, which emphasized social justice and community involvement, but not students' racial assets. Giving these limitations, it is perhaps not surprising that Kevin did not at this time apply anti-racist concepts to his practice.

Changes in Kevin's Thinking about Teaching

As he entered his program, Kevin highlighted empathy as being the most important skill to teach as a history teacher. Also at that time he experienced some anxiety and fear about possibly not being compassionate or caring enough in the classroom and sufficiently nurturing to his students, again, central goals for him as a teacher. However, in these goals, there may have been a primary concern more about self than about (at this point hypothetical) students.

When he entered the program he had little knowledge about eco-justice curriculum. On his survey he gave himself the lowest scores possible about such knowledge. But, at the same time, he showed that he did have some knowledge about project based learning. His definition about project-based learning at the beginning was complex and layered:

Project based learning is about bringing students together for a long-term project, based on getting students to engage in a wide variety of processes and ways of doing project solving. Typically, multiple students will be working together to solve the problems the project presents them.

Here he emphasized student collaboration as well as problem solving. Separating "processes" from "ways of doing," he highlighted both conceptualization as well as action. He also

mentioned that the focus of the curriculum is emergent, based on the students and their problem-focus within the project.

In the same pre-survey he also discussed his discipline of history. He mentioned that it helps students to understand how society and the human brain functions. This definition contrasts slightly with his view of PBL in which he emphasized specific skills and skill building: in history and social studies he emphasized the value to students of more abstract and broader concepts related, for example, to society.

How and what Kevin thought about his practice changed considerably over the course of the semester. The following discussion references Anastasia Sanchez's (2023) social focus framework.

In the two GTP classes taught at the middle school as part of the partnership, preservice interns engaged in structures that scaffolded their thinking. The courses were designed to facilitate their collaboration as well as thinking about that collaboration. A goal was for the nature of this collaboration to become visible to them as they constructed their growth portfolios over the course of the semester, a central assignment in the class, which directed their thinking as well as metacognition about their practice. As shown in the previous section, Kevin thought about how and why he collaborated, how he increased his knowledge of history, and how history contributed to his multidisciplinary unit. Also, importantly, he became aware of the role and value of community to student learning.

However, Kevin did not become critical—both in terms of societal dynamics of power or of his own positionality and relative privilege. This lack is understandable in that there was not an emphasis on critical consciousness in the first semester of the program (the emphasis on critical consciousness appeared later in the program). He did however begin to think about structural issues in more systemic ways (e.g., the xenophobia concern and bigotry during the Covid-19 crisis), but his thinking did not explicitly consider power relations or more critical issues.

In terms of consequential concern, Kevin deepened already existing concerns of relational and collective well-being. At the beginning of the program he cared about student empathy, but more as a personal fear of a future deficiency in this area. However, by the end of the semester he began to consider empathy, compassion, and wellness through the eyes and experiences of his students. And in his practice he began to focus on the personal and social-emotional aspects of the pandemic, but, again, he didn't place them into a more critical perspective.

Furthermore, he developed a greater sense of justice in relation to cultural significance. He and his collaborators' unit emphasized community engagement and well-being. There was not a deficit but rather an asset-based approach to community. However, although he became more concerned about community concerns and connections to the curriculum, he rarely explicitly considered culture as a part of community. And he never mentioned race as an identity marker or as a context for justice in relation to climate change. With the emphasis on the pandemic, however, he did scaffold students' more expansive views of identity, culture, and community in relation to the environment and climate change.

And his discussion of project-based learning tended to be fairly value free and politically neutral, maintaining a more surface-level connection to social justice and equity (although he did mention social justice elsewhere). When he considered culture or social justice, he didn't give specific examples but rather emphasized more generically the importance of real world applications and authenticity.

His growing awareness of teaching for eco-justice was also somewhat mixed: while his concern about the ecology of the pandemic (and previous pandemics) included that of nature, it didn't directly include climate justice. In his reflection he didn't highlight climate change or eco-justice as a context of analysis. However, his concern with the ecology of nature and wellness very possibly laid the groundwork for a growing emphasis in his practice on eco-justice.

Finally, in terms of critical liberatory presencing, in his unit he emphasized student voice and student self-representation. Having his students solicit community members' stories related to the pandemic furthermore provided the community with a degree of self-representation. This emphasis on facilitating student-and-community self-representation emerged over the course of the semester and contrasted with his initial dominant concerns of himself as the teacher. While there may not have been an explicit social justice component to his viewing student representation, it was present implicitly.

Viewing his development through a lens of adaptive expertise broadens the interpretation of his change. He and his collaborators broke with their first approach to design—building teaching routines around themselves as the constructors of curriculum. Instead of reinforcing the initial lesson routines, they recentered the design process around students as active learners. He stated, “Designing our section of the coronavirus unit to be authentic and learner driven was a major challenge.” However, this was a challenge to which he and his collaborators rose.

In his initial teaching journey—during which he isolated at home—Kevin encountered and met a number of challenges to the growth of his practice. As a frame to discuss the challenges Kevin encountered and the strengths he built on in his journey to teach for climate justice, Beach's (2023) framework of challenges in becoming a climate justice teacher is helpful. First, Kevin always saw himself more as a history teacher than as a multidisciplinary climate change teacher. Part of the issue here was that his expertise in, knowledge of, and even love of his field was paramount to him. He simply didn't have the same knowledge background and level of self-identification to climate justice that he had to the discipline of history. In contrast to these challenges, there was however a shift in his thinking and by engaging in a successful unit with his students related to the pandemic, he began to develop exceptionally positive attitudes and a sense of self-efficacy about project based teaching and students as co-constructors. As he put it, he and his collaborators had a “burst of creativity” in working together to design their units and he came—perhaps almost reluctantly given his self-effacing nature—to see himself as a successful teacher of a PBL unit on environmental and health change. It would be a stretch to say that he considered himself a successful teacher of PBL and environmental change, since his view of himself as a history teacher still dominated his construction of his teaching identity, but he did begin to develop a robust view of himself as someone who successfully facilitated with his students as co-constructors a grounded, emergent, wellness education PBL unit, framed by the Covid-19 crisis.

Engaging his unit during the pandemic, Kevin also began to develop a broader, more systemic way of thinking. For example, he mentioned that one activity was having his students research successful coping strategies of people and communities in past pandemics, such as the 1918 Spanish Flu. It seems likely that his development of systems thinking was contingent on context—directed by the Covid-19 crisis—and therefore perhaps temporary. Perhaps underscoring the contingent and more fragile nature of a systems stance, he very possibly didn't develop an awareness of this knowledge, so it never became overtly conscious or metacognitive to him.

This lack of more explicit metacognitive knowledge may underscore a weakness in the program more than in Kevin. For Kevin to have developed such counterintuitive self-awareness he would have required considerable scaffolding—both directly in his teacher preparation coursework and in supportive structures such as the framing of their growth portfolio, which did not focus on this dimension.

Lisa: An Aspiring Science Teacher

Learning science had always been intuitive and easy for Lisa. A gifted science student with aspirations of becoming a science teacher, she entered the same cohort as Kevin in her teacher preparation program.

As a preservice teacher in the GTP, Lisa was still in the process of planning her initial unit on sustainable gardening with her other collaborator when the pandemic hit and the school switched to remote learning, causing her and her students to isolate at home. She didn't talk too much about the initial unit, which was a sustainable gardening project, which they abandoned in the planning stage. However, when the school moved to online instruction, she, like Kevin, had to change her initial plans and over the course of a weekend prepare a new unit plan.

She and her collaborator, also a preservice science teacher, found that the pandemic amplified many of the important issues and emerging goals they had for education. For example, after the pandemic she sought to practice "culturally sustaining pedagogy and having curriculum reflect the rich backgrounds of students." She stated, "Imagine how much more engaging lessons would be if units focused on real social issues and were rooted in the lives / reality of students they intended to reach."

Adding a critical perspective, she saw curriculum to be "fundamentally based around the critique of systems in place and why it is important to question these systems." She framed the unit and, importantly, her thinking with the following thought and question: "as educators we need to rethink the purpose of schooling in our country. Is it to reinforce Eurocentric standards and prepare kids for their predetermined place in this capitalistic society, or is it to begin social justice reforms and create a more empathetic, curious world?"

Her unit focused on students designing personal protective equipment, PPE, for their wellness and the wellness of society during the pandemic. As she put it there was a cultural component to the question and students' projects would be different based on their lived experiences.

As she stated, students took their projects in many different directions:

from face masks that replicate a person's actual face, to [activities that lessen] dementia in Alzheimer's patients, to hand sanitizer bracelets and disinfecting phone cases, [the] students became engineers during a pandemic.

By design, she sought for the unit plan to support students' well-being and social emotional learning during the pandemic, within a community context:

The unit was divided into four sections. It began with students developing a better sense of their community, specifically the health of the community around them. Students would investigate who had access to health. And they would determine what indicators of

health are and what individuals can do to be healthy. The investigation of power dynamics comes into play here.

For the second part of the unit, Lisa had her students engage in a photo voice project in response to the question, "how is our community healthy and or unhealthy?" As she stated, each week she had her students share their photos together to collaboratively build contextual knowledge of

causes and assets within the community in terms of health. The second section then becomes more abstract and has students focus on the interrelatedness of social and ecological crises. Students will learn the definition of eco-justice and begin to analyze its connection to environmental racism.

In the third section of the unit she asked students to apply their learning about environmental injustice to global dynamics more generally:

These would include climate change and emphasize ecological vocabulary such as the carbon cycle, carrying capacity, and greenhouse gases. Finally the unit would conclude with a project based assessment, conducted by the students. The students would analyze intersections between impacts of the environment and specific demographics of different groups, mapping these according to neighborhoods and specific demographics. This is a larger evaluative piece tying it together and reinforcing the unequal impact of climate change and eco-injustice in relation to dynamics of power.

A few months later as she was completing her student teaching, she designed a different unit with a clearer focus on social justice. The title of this unit was *Ecology through Eco-Justice*. As she stated,

Eco-justice education is an emerging framework [...] that seeks to [...] provide students the opportunity to critically analyze the power dynamics that contribute to systemic inequities like environmental racism. [...] When contextualize with community-based learning, the framework engages students to identify issues within their local communities, analyze the cause of these issues in larger systems, and develop a healthy sense of self in their immediate ecosystems. If effectively utilized together, community-based learning and eco-justice education challenge students to engage with scientific concepts in a relevant, emotional, and critical way.

Although she did not directly engage in anti-racist teaching in the first semester of the program, by the end of her program, as evidenced by her *Ecology through Eco-Justice* unit, she did. In that unit, race was a demographic context for students investigating which neighborhoods in their region had access to the best health care.

Changes in Lisa's Thinking about Teaching

At the start of her program, Lisa's beliefs centered on student wellbeing. She emphasized the importance of supporting students emotionally, believing that teaching for empathy and

critical/creative thinking were more important than for more decontextualized academic achievement. She also believed in always treating students with dignity and respect, with a central goal of hers helping students to become "better people." In some ways this concern put pressure on her, and she worried about how successful she would be with students who were homeless or in difficult situations.

Her past academic success may have left her with more knowledge of gifted students than beginning students in science, and her initial stance (when she entered the program) as a project based eco-justice teacher appeared relatively superficial. On her pre-survey, she gave herself exceptionally low marks about knowledge of planning the curriculum for project-based learning as well as for science more generally and eco-justice more specifically. Although she looked forward to learning about multidisciplinary design and team teaching, she mentioned having no knowledge or experience of it.

At the beginning of her program she emphasized students' individualistic ways of thinking about project-based learning, which she thought might help students with hands-on applications of the assigned materials. For example, when asked to give a detailed example of project-based learning, she stated, "Learning about an ecosystem and constructing an example of your own with given materials." In fact, she considered the emphasis on materials in project-based learning as one of the benefits of it, stating, "students must have a deeper understanding of the material in order to do a project on it, so, I expect that they would learn better in some instances."

When asked about the challenges associated with project-based learning in the classroom, she referenced herself as a teacher more than the students. She thought that "the challenges would be finding materials and time to plan lessons. Also, classroom management could be an issue."

Finally, at the beginning of her program she had little knowledge of and experience with teacher collaboration and team teaching. On a positive note, however, she stated that perhaps her biggest strength about herself at that time was her capacity to direct and regulate her own lifelong learning.

As with Kevin, how and what Lisa thought about her practice changed considerably over the course of the semester. Unlike Kevin, though, she moved in a more critical direction. Again, the following discussion references Anastasia Sanchez's (2023) social focus framework.

Lisa shifted the importance of specific elements within the social focus framework during her program. Initially, when she entered the program she emphasized more individual student dynamics, such as their critical thinking and creativity within a science context. However, at the end of her first semester, after completing the PPE unit, she stated,

[In the unit] I feel we missed out on including an important social justice element. After our cohort's discussion on interdisciplinary design viewed through a PPE lens, I realized how powerful it would have been to include resources focusing on the large disparities we see among certain demographics within Covid-19. By providing articles and working to highlight the systems which cause these differences, students would have taken this lesson to the next level; they could have become advocates for social justice.

While an explicit and systemic social justice focus may not have been in the unit, she still framed her unit by social justice on an individual level, if not on a more structural level. For example, she thought that it was important that teachers

give their students a voice within their classroom. We can still be leaders without giving direct or traditional instruction at all times. Leadership isn't about telling students what to do; it's providing them a platform and allowing them a way to their own path to education. Without including PBL, or any form of non-traditional instruction, our students miss out on authentic opportunities that allow for essential problem solving and critical thinking.

In terms of critical consciousness, her emerging self-critique focused not only on what she had already done, but how she would like to change in the future—thus becoming more reflexive. Her future teaching goals became more about collective and societal liberation, a change reflected in her end-of-program unit, *Equality through Eco-Justice*.

Her growth in critical liberatory presencing was noteworthy. Throughout the semester and especially with the move into a more isolated teaching platform using Zoom during the lockdown, she increasingly emphasized student voice and self-determination. For example, at the end of the semester she reflected on the specific things she had students do related to voice and determination:

We planned for student choice and voice by allowing them to creatively choose how to solve the problems associated with PPE and required them to draw on their own funds of knowledge. We scaffolded student reflection into the lesson by including thought-provoking questions throughout their organization worksheet.

Lisa scaffolded student voice by having them construct public service announcements (PSAs):

Later on, the project developed further as students worked on their ... PSAs. It was amazing to be able to guide students by providing one-on-one feedback and see their voices/perspectives shine through their PSAs.

Finally, in terms of developing adaptive expertise over the course of the semester, Lisa, like Kevin, encountered a shifting context that required major adaptation. In her case, she embraced the change as well as the challenges that came with that change. For example, discussing her planning process she stated,

The first obstacle to tackle was developing a challenging question to focus our e-learning ... lesson...that utilized PBL and connected students to their community. We already added the necessary PBL knowledge to our metaphorical toolkit; we just needed to tweak it to fit the new definition of public education: distance learning. Not only did we have the issue of planning an asynchronous lesson for online instruction, we had to do so amidst the traumatic events affecting our students in unknown ways. With an equability mindset, we decided to focus our mini-unit on creative problem-solving, which encourages use of students' funds of knowledge and promotes critical thinking.

In the above quote she shows that how she actually articulated the challenges she faced: “the issue of planning the asynchronous lesson for online instruction” and “the traumatic events

affecting our students in unknown ways.” To address these challenges, she built on student voice and creativity—being present to her students as active and critical co-curriculum makers. Yes, the changing context in many ways forced her to become adaptive; however, her flexibility and readiness in doing speak to the scaffolding potential of PBL as a means for engaging students in eco-justice problem solving (as well as to her flexibility and intelligence). Although the eco-justice piece may have remained implicit in the PPE unit (but not her subsequent final unit), giving students voice to respond to an environmental pandemic is arguably about eco-justice.

Challenges and Supports for Kevin and Lisa

Beach (2023) listed a number of obstacles that pre-service teachers face in preparing to address climate justice. These obstacles include pre-service teachers' lack of academic and applied knowledge and experience related to climate change, lack of existing positive attitudes and sense of self-efficacy in relation to teaching for climate justice, and lack of systems thinking. Both Lisa and Kevin entered their programs facing these obstacles, although Lisa, who was preparing to be a science teacher, did have limited disciplinary knowledge about climate justice.

In both cases, however, there were explicit supports in their program (and within themselves) helping them to address these challenges. Although the supports were similar for both—since they were in the same cohort—their profiles and trajectories in relation to climate justice within their program were different. First, they both started with belief structures that scaffolded their learning about teaching for climate justice. Emphasizing the importance of student critical thinking in relation to the improvement of societal structures that cause disparities and inequities, Lisa's curriculum focused on critical issues in relation to student voice and efficacy. And while she only worked with another science teacher, their work was multidisciplinary. And Kevin's curriculum, emphasizing students' social emotional learning, voice, and agency, focused on students building community and wellness. Their beliefs provided a synergistic context for them to learn about engaging in teaching for climate justice. They also both benefited from collaboration with their peers and the explicit structures of reflection within their program, for example as found in their portfolio. And, they both also specifically learned about multidisciplinary curriculum and how systems (and systems thinking) may either facilitate or disrupt oppressive structures.

Also, it should be noted that project-based learning itself gave them important tools with which to have their students actively address the evolution of issues related to the Covid-19 crisis. And though both had to change their emphasis from a climate-justice garden project to more Covid-19 specific projects, this context still related to climate justice given the environmental and naturalistic nature of the pandemic. And, in Lisa's case, her motivation to design a unit around climate justice returned at the end of the program with her final *Ecology through Ecojustice* unit. Kevin's final unit at the end of his program, on the other hand—focused on hypothetical or alternative history and not explicitly about climate justice—did represent his own personal agency and voice in designing curriculum.

Discussion

Although in this study I've attempted to examine questions about changes in Kevin and Lisa's practice as separate from changes in their thinking about practice, in many ways these questions were intertwined and mutually supportive. The use of an adaptive expertise lens suggests their

range of flexibility and adaptability in their practice. Initially, they knew little about project based learning and less about teaching for eco-justice. Over the course of the semester, however, they engaged a number of elements related to practice and thinking about practice that arguably developed into a cycle (or perhaps emerging cycle) of ongoing improvement of practice for eco-justice. Key pieces in this cycle included successful work with students, growing knowledge of multidisciplinary content (more related to pandemics than the specific topic of eco-justice), a richer and more sophisticated vocabulary for reflection and thinking about practice, and a generative collaboration with their teaching partners (which included their students). Leaving their comfort zone and, in a supportive environment, preparing (successful) units on eco-justice, they developed knowledge, practice, and self-efficacy around this topic. Gaining in authentic experience, they added a foundational piece that paved the way to additional teaching confidence and knowledge.

Their initial beliefs about student learning also scaffolded their work as they strove to make the curriculum supportive of students' wellness and critical thinking. Working with their middle school students on units that built cooperation and community, their initial beliefs were amplified by the pandemic. This complex dynamic, in which the interns mixed theory and practice, highlights how Kevin and Lisa expanded their adaptive expertise within a cyclical framework that facilitates additional development.

More specific details about the change in their thinking is revealed by Sanchez's social focus framework (2023). In a way, the framework shows the boundaries that they did and did not cross. In terms of critical consciousness, they both reflected deeply on their teaching. In the unit plan that Lisa submitted at the end of the program (two semesters following the initial semester and initial unit plan), she directly critiqued herself in relation to power, using race as an analytical context for equity in how communities received benefits. Kevin, however, did not reach this point in his thinking, but did consider equity more generally. Related to consequential concern, the framework's second dimension, they both developed sophisticated thinking about community well-being, empathy, and compassion. It's interesting to note that they both shifted from initial concerns about themselves to those of their students. A critical element focused on the racial context of power and justice was missing from both of their units initially in the first semester and from Kevin's even in the last semester. And finally, related to the third part of the framework, critical liberatory presencing, they both developed units that empowered students expand their and their communities' voices to investigate and explore solutions to societal issues. In her second unit plan Lisa added a critical piece asking students to examine social issues (health benefits) in relation to race. Kevin felt uncomfortable examining and discussing race and was unable to add this deeper critical piece.

The use of this social focus framework highlights the importance for students to examine climate justice with a deeper social and historical systemic frame, which includes race. It is possible, although the findings don't go so far as to support this possibility as an assertion, that this deeper critical focus actually plays a developmental role for pre-service teachers who are learning about and developing their practice.

However, a sole interpretive focus on individualistic elements (e.g., students' motivation, scaffolding values and beliefs) limits the findings of the challenges and supports Kevin and Lisa faced. Highlighting the structural challenges and supports they faced reveals a number of specific changes to the program that may have better supported these two teachers. For example, both would have benefited at the beginning of the program from explicit knowledge of and experience with Sanchez's social focus framework. This awareness may have provided both of them with a

stronger framework within which to develop metacognitive knowledge and self-regulation in relation to learning to teach for climate justice. Specifically for both of them, although they did develop as reflective practitioners, neither examined their own critical positionality in relation to structures of power and climate justice. And while they both implicitly taught for liberation and provided their students with voice and agency, neither was explicitly or metacognitively aware of the importance of teaching students to have self-determination and learning to value their own story.

A second program consideration relates to the preservice teachers' developing skills and knowledge base related to their becoming teachers within their chosen disciplines. Questions that arise include how does an initial (early program) emphasis on multidisciplinary knowledge become a foundation for preservice teachers' work within their own disciplines? Would it be helpful for developing preservice teachers to first work within single disciplinary groups on a climate justice before working with their peers from other disciplines? The data suggest that there is a complex relationship between their aspirations, goals, and developmental dynamics as neophyte, preservice teachers within their own disciplines (again, English, history, science, and mathematics) and their engaging in multidisciplinary work.

It was suggested by the data that their still developing knowledge-and skill-set about teaching generally about their own subject-matter and more specifically for climate justice within their own disciplines--as an initial foundation—was a strong detriment to them not explicitly focusing on this topic in their units. Given the complex relationship between single disciplinary and multidisciplinary knowledge--with multidisciplinary knowledge possibly growing from single disciplinary knowledge--the first step in facilitating their knowledge about teaching for climate justice would then be having the preservice teachers acquire such knowledge in relation to their own disciplines. Part of the strength of the improvement of education class is its range of preservice teachers from multiple disciplines, which helps facilitate interdisciplinary planning and collaboration. However, at first it would be helpful to have these students learn to apply teaching for climate justice to their own discipline.

Also, both interns' lack of thinking about and application of anti-racist pedagogies to their projects suggest the need for additional program changes. While the interns were exposed to different meanings of anti-racist pedagogies within different contexts via course readings, this aspect of the course curriculum was in many ways decontextualized, both in terms of how it was taught and practiced: although the interns had opportunities to discuss anti-racist pedagogy in their classes, they were not guided to weave their new understandings into their emerging practice, embedded and framed as it was by school policies and practices which emphasized social justice more than race. Furthermore, the unexpected Covid-19 crisis presented, almost overnight, educators with new tensions and challenges, such as facilitating a sense of community and collective wellbeing in their students who each sat isolated in front of a monitor and camera.

Of course, it's important to recognize that preservice teachers face accountability mechanisms related to state standards and curriculum frameworks. They are placed in schools which receive a publicized yearly report card giving the aggregated test scores of their students. Thus, it is necessary to consider an important question: can teachers do this complex work given the standards and curriculum frameworks they encounter? Although standards often have the effect of narrowing classroom curriculum (Farenga, et al., 2015), we found that teachers were able to create a semiotic relationship between the standards and the curriculum. That is, the standards supported a climate justice curriculum and a climate justice curriculum humanized the standards. Currently in the state of Washington and at our university, curricular frameworks for

preservice teachers include the inTASC standards, the CCDEI (cultural competency, diversity, equity, and inclusion) standards, the social emotional learning standards, and the Since Time Immemorial framework—an indigenous framework for schools. What I found with this study was that pre-service teachers were able to use their climate justice curriculum to add coherence and meaning to the standards. They were able to bring the standards alive in authentic, real world ways that had leverage and purpose. And they were able to give a human face to the standards, engaging in activities that relieved anxiety, built a sense of collective purpose, and infused their curriculum with a sense of joy, meaning, and purpose—both for themselves and their secondary students.

Conclusion

Designing a program to facilitate preservice teachers' growth in thinking and practice related to the intersections between culture and eco-justice is clearly complex. There is a need for programs to scaffold self-regulated learning that centers teaching for climate justice. To counter preservice teachers' subsuming this goal into a more conventional teacher identity—perhaps one reinforced by more conservative teaching environments and schools—those of us who work in teacher education need to invite our students who are preparing to become teachers to co-construct our programs with us as we thread theory and practice for climate justice through them. Together we need to forge a common language that meaningfully centers teaching for climate justice in our programs and in our teaching identities. Many people—including teenagers—are engaging in the difficult work of trying to find solutions for the climate crisis: we need to push forward in finding a new voice in teacher education with them.

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