

Atunements to Socioecological Histories of Places in Learning and Decision-Making in Complex Socioecological Systems

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Abstract: Socio-ecological histories of places are political, contested, and intimately linked with ways of knowing and being in the world. Supporting students in perspective taking and reasoning through contested histories of places are equity practices that allow for multiple and diverse stories to be told, honored, and incorporated in science learning. In this paper, we describe an approach to teaching about socio ecological systems from the Learning in Places project using a framework called *Socioecological Histories of Places*. We first describe the framework and its design within the Learning in Places project. We then analyze one teacher's implementation of this approach and discuss implications for understanding issues of power, historicity, and ethical decision-making in field-based science learning and teaching.

Introduction

Socio-ecological histories of places are political, contested, and intimately linked with ways of knowing and being in the world. Supporting students in perspective taking and reasoning through contested histories of places are equity practices that allow for multiple and diverse stories to be told, honored, and incorporated in science learning (cf. McGrath & Jebb, 2015). Oftentimes, science education in the U.S. has positioned humans as separate from the natural world, or in ways that are ahistorical, which render the intersections of social and ecological systems invisible and thus ensures that students do not have access to powered and historical analyses of these intersections (Authors). Further, our failure to incorporate these histories reduces learners' opportunities to understand the complexities of social and ecological systems central to 21st century challenges.

The work we describe in this paper describes Learning in Places (LiP), a four-year, participatory design research study funded by the National Science Foundation. Learning in Places seeks to co-design (with classroom educators, families, and community-based organizations) learning engagements that support young science learners in Kindergarten to 3rd grade with equitable, culturally-based, socioecological systems learning and sustainable, ethical decision-making using field-based science education in outdoor places (e.g., gardens, parks, neighborhoods). The pedagogical model incorporates students' observations and wonderings, family cultural and community practices, critical historicity of place, and ethical deliberation and decision-making in the form of "should we" questions. The project intentionally designs porous learning environments, where learning happens across time and place, in classrooms, homes, neighborhoods, and community settings. To provide an exemplar of how and why exploring socioecological histories of places is critical to learning and teaching about complex socioecological systems, we analyze one teacher's implementation of this approach and discuss implications for understanding issues of power, historicity, and ethical decision-making in field-based science learning and teaching. **Research questions that guided this analysis are: (a) How does this educator use elements of the framework in their science-related planning, instruction, and reflections on their practice?, and (b) What challenges did this educator grapple with when attempting to embody and actualize the ideas and practices in the socioecological histories of places framework?**

Theoretical framing

We draw heavily from work in social design experiments (Gutiérrez & Jurow, 2016) and participatory design research (Bang & Vossoughi, 2016) to conceptualize our approach to co-designing field-based science learning environments toward just, equitable, and culturally thriving communities. Social design experiments work toward social transformation "by creating a significant reorganization of systems of activity in which participants becom[e] designers of their own futures" (Gutiérrez & Jurow, 2016, p. 566). Similarly, participatory design research requires a fundamental examination and critique of structural sources of inequity, and collective dreaming of alternative, more just forms of partnering (authors). In the Learning in Places project, we intentionally engaged in co-design with district leaders, leaders of community-based organizations, teachers, and families to support the development of co-designers as *historical actors* (Gutiérrez & Jurow, 2016), or "designers of their

own futures” (p. 567). This involves not only a sense of one’s own identity in broader cultural and systemic contexts, but also a historicized understanding of how certain practices--in particular, practices that perpetuate inequity--came to be and are sustained over time. We use this as a lens through which to examine the episode presented below.

Design

In the Learning in Places project, we have designed a set of *educator frameworks* that make visible core dimensions of practice for just and equitable field-based science education. We focus on one of those frameworks, called *Socioecological Histories of Places* (Learning in Places Collaborative, 2021). When scientists study complex systems phenomena in places, they need to understand those places across different scales of time and space. For example, when engaging in restoration, scientists need to first understand the history of a place and the various historical decisions that have been made to shape the land and waters of a place. They need to think across timescales—from geologic time to nation-state time to global time to the future—to understand how natural processes intersect with human decisions and the effects those might have on the future health of a place for all of its inhabitants (cf. Santos-Martin et al, 2019).

The socio-ecological histories of places framework involves thinking across six time scales. These provide a framework for supporting learner sense-making within and across time and place. A key reason to engage learners in this thinking is that it will support them in understanding how things may have changed slowly or rapidly, and how decisions lead to ethical, just and sustainable futures and possibilities. Learners should also reason across multiple time scales to understand the impacts of slow or rapid change in any one of these scales and how this affected/affects another. For example, learners can wonder about how rising temperatures (compared across geologic, nation-state, and global histories, for example) have impacted and are impacting plant, animal, and soil time.

Figure 1: Histories of Places visual graphic



Methods and analysis

For this analysis, data sources included video and audio-taped recordings from a classroom implementation involving the use of the Histories of Places framework with this focal participating teacher. Data sources also included affiliated documents (e.g., student work samples, transcript of a teacher post project interview). Video and audio recordings were transcribed and then coded in Dedoose. Codes included the six timescales in the Histories of Places framework (e.g., plant, animal, and soil time, Indigenous People’s time), as well as elements of language use (e.g., past, present, or future tense).

Initial findings

As an exemplar of how these ideas were implemented, we present an episode from one second-grade teacher and co-designer, Ms. Poppy (all names used in this text are pseudonyms), and her subsequent reflection based on her post-interview. To get ready for this lesson, Ms. Poppy had created a timeline out of pieces of paper that spread across the length of the whiteboard, with a picture of Creekside Elementary (their school) at one point on a horizontal line that ran the length of the papers. To begin the lesson, Ms. Poppy engaged her class in a reflection

using the question “What and who was here before me?”. Ms. Poppy asked students to go to their desks and draw their ideas, and when they returned to the front of the room, Ms. Poppy put their drawings on the timeline. Ms. Poppy then facilitated a whole class discussion during which students shared their ideas. At the beginning of the discussion, students shared that dinosaurs, bugs, trees, and grassy fields were all in the place now occupied by Creekside Elementary and its surrounding neighborhood. Then one student, Simon, shares the following idea:

Like our great, great, great, great grandfathers, like, had developed guns and then we took like canoes and rode over here. Then we're like, "We have guns. You only have bow and arrows. We will shoot you if you don't come and give us some of this land." Since the Native Americans were nice, they gave the land to us. But then we were kind of not so nice to the people who were, the Native Americans who were nice and we like kept saying "We will shoot you with our guns unless you give us more land." And they were scared and then they kept giving us more and more land and they had smaller and smaller land until this was all ours. Then they only had like a small bit of land for them.

In this example, we see Simon engaging with Indigenous people's time, nation-state time, as well as global time, as he made visible the deeply powered relationship between Indigenous peoples and European settlers. In his response, the complexity of his thinking spanned across temporal and spatial scales to connect past events and present positionings of both himself and others with a shared ancestry to the settlers. He uses the term “we” to refer to settlers, and “they” to refer to Indigenous peoples. This positioning shows a shared assumption of identity of Simon with the rest of the class, and the subtle ways that whiteness is present as implicit identities amongst students. We also see Simon attending to differences in orientations to nature-culture relations, particularly the relationship to land.

In addition, we see power and historicity emerging in Simon's comment as well. Settler colonialism, which is premised on removal of Indigenous peoples from their lands, often through violent means, is acknowledged by Simon. He is making explicit how the immoral ethical decisions made by non-Indigenous settlers were displays of power imbalances, exacerbated by differential access to and use of tools and weaponry. Not only was this powered relationship something that led to the forced removal Indigenous peoples from their lands, but Simon also uses the terms “we” and “us” when referring to the settlers, recognizing his shared ancestry and implicitly acknowledging that this history is connected to the present day. Finally, Simon is surfacing the different orientations to land between the Indigenous original inhabitants of the land and the settlers. This orientation, and the relation between the two groups of people, reflect different values - what we hold to be right and ethical - as we see in the “nice vs. not so nice” sentiment.

As the class continues to delve into ideas of Indigenous presence in the region occupied by Creekside Elementary, the following episode emerges:

Ms. Poppy: Do you think they go when Native Americans were-
Class: No.

Ms. Poppy: Oh sorry, I apologize. I just said "Native Americans were." We have plenty of people in this area who are Native Americans whose ancestors have been here for a really long time. So I meant to say, "When," or "Before Europeans came and started living here, do you think they were long before that, the dinosaurs?"

At the end of this episode, Ms. Poppy engages in self-correction by recognizing that she referenced Native Americans in the past tense, a move that invisibilizes Indigenous presence and futurity. We argue that this form of humility is an important step in dismantling power hierarchies between educators and learners, and between educators and communities. This is a recognition of the limitations of the educator's own knowledge and understanding, and indicative of the challenges of engaging across multiple timescales that are often left invisible in science education. This is also a model of making repairs in micro-moments of instruction, repairs that remediate epistemic violence against children when we make their histories invisible in classroom

interaction.

In Ms. Poppy's post-interview, she reflects on this episode and what it taught her. She says:

I think a lot about the history of places conversation that we had, and how just like really subtle language, but that ends up being really, really powerful language, like talking about Native people in the past, rather than the present, like these little things. And again, so much of this comes from watching tape and reading scripts. And I think that we get, when we're in the moment, we're responding to things. And we're not always like thinking it through every single piece of language. And then when you get to go back and look through it, you're like, okay, this is what I need to think about for next time, or this is how I need to word that differently. So I think those, you know, the history of places is really big for that power. And...historicity? And then I think equity. I mean, I really do feel that I needed a lot to grow as a teacher with my need for like, control of behavior, on walks was something that was so big for me to like, need to have that control.

We see a gradual attunement to the importance of language choice during instruction, and the connection between language and power. Ms. Poppy also reflects on the need to have time to "watch tape and read scripts" as a way to reflect carefully on her language and learn how to continually improve her teaching practice. In this way, Ms. Poppy is emerging as a *historical actor*, in deepening her reflections on how her own practices perpetuate invisibilization of Indigenous peoples, as well as how her actions reflect powered dynamics that carry across time and place.

Conclusion & implications

Shifting the dynamics of power and historicity in moment-to-moment interaction in learning environments is central to actually creating educational equity and forms of education that can contribute to just, sustainable and culturally thriving communities. However, as of yet we have a paucity of work that has traced the learning pathways of educators who are learning to shift their paradigms and to see and enact more just learning environments. This is particularly true as it relates to Indigenous peoples and histories. There is a dearth of empirically based classroom study of these learning dynamics. Further, there is nearly no literature about the role of Indigenous peoples in the scientific study of place. This study marks an important new dimension of how place and field-based science education can and should start to take up the complicated and layers social histories of places as central to learning.

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