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Indigenous Water Pedagogies: Cultivating Relations Through the Reading of Water

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Indigenous Water Pedagogies: Cultivating Relations Through the Reading of Water

Cover Page Footnote

Chi-miigwech to the ISTEAM co-designers, families, community members, lands and waters that inspired this work. Funded by NSF grants DRL 1713368 and DRL 1712796 as well as US Department of Education, Institute of Education Sciences, Multidisciplinary Program in Education Sciences, Grant Award # R305B200037.

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As Indigenous peoples, living in right, respectful relations with the natural world has always been a vital responsibility. The well-being of human communities is intimately connected with the well-being of more-than-human (MTH) communities comprising plants, animals, insects, water, and other natural beings. Indigenous peoples have had a deep understanding of the interdependence between all forms of life for countless generations and have always worked to live in reciprocal relationships with the rest of the natural world (Cajete, 2000; Kimmerer, 2013). Such an orientation to the natural world is needed now, perhaps more than ever, as human communities must figure out how to adapt and build thriving futures in the midst of changing lands and waters. The relations—whether reciprocal, extractive, or some other way of relating with the world—that we make with the natural world will have a profound impact on the well-being of future generations, both human and MTH.

The authors of this paper are all Indigenous. We each see the work we do, reflected in this paper, as part of our collective responsibilities and contributions to our communities. Forrest is a member of the Fond du Lac Band of Ojibwe and of German descent. He is a graduate student and grew up in Minnesota, but has been living in or near Chicago for the last 10 years. Megan is of Ojibwe and Italian descent. She is a mother, auntie, daughter, sister, and cousin, amongst other relations. She is the principal investigator of the project this work was conducted in and has been an educator and scholar for going on three decades. Anna is a Waganakasing Odawa descendent. In addition to her roles in family and community, she spends much of her time researching and working alongside children, teachers, and teacher candidates. Nikki is a citizen of the Shoshone-Bannock Tribes and is also of Paiute and Irish descent. She is a mother of two with another on the way, an auntie to many, a daughter and granddaughter. She is a PhD candidate and researcher for the Indigenous STEAM (sciences, technologies, engineering, arts, and mathematics) project, and is heading into a faculty position. Felicia is Menominee and Santo Domingo Pueblo. She grew up in Chicago and has worked with the Native American community of Chicago for 20 years. She is the program coordinator for the project and worked for seven years as a math and science middle school teacher. Jeanette is a citizen of the Turtle Mountain Band of Chippewa Indians North Dakota. She was born in Tacoma, Washington and raised in Olympia and has lived near the Salish Sea for all but three years of her life. She is retired but continues to teach part-time at the University of Washington Honors Program on topics related to Indigenous philosophy. She continues her life as a sibling, mom, Kookom (grandmother), as well as cousin and auntie to many.

This work is intended to elevate a focus on human-water relations in part because we believe human relationships to water are particularly important to building thriving futures. Water is the basis of all life. And many of the most pressing issues of this era are water-related (Pokhrel et al., 2021; WHO & UNICEF, 2021; Vousdoukas et al., 2020). From droughts to floods, to water access and contamination, our collective futures are largely dependent on human communities (re)making ethical relations with water. Ethical relations require upholding all life's need to have access to clean water, as well as to recognize water's inherent value and sovereignty to exist in its own right.

Indigenous peoples, knowledges, values, and ways of being could play an important role in fostering ethical relations between humans and water. A core part for many Indigenous knowledges is an understanding that water is a relative with personhood and should be afforded dignity and respect

(Yazzie & Baldy, 2018; Wilson & Inkster, 2018). Simply put, water's existence is not for the sake of humans. Consider the series of ethical commitments that follow from understanding water as a relative rather than an exploitable resource. For example, many Indigenous peoples have advocated for legal personhood and the rights of MTHs, such as rivers, and some have put these rights into policy through their tribal government (Yurok Tribal Council, 2019) or negotiations with settler nation-states (New Zealand Parliament, 2017). Such stances fundamentally shape our ways of living and gesture toward a different kind of future where we live in reciprocal relations with water. For these reasons, the task of building socio-ecologically just and sustainable futures goes hand in hand with the regeneration of Indigenous ways of knowing and being.

The socio-ecological challenges of this era are fundamentally issues of learning. Building thriving futures will require humans to *learn* to live in healthy, respectful relations with water and the rest of the natural world. Education, as an institution of learning, is essential to this endeavor. Learning to live in healthy, respectful relations with water will require systems of education that cultivate a caring relational ethic and complex thinking about the natural world. Such education would support children and families in coming to understand themselves as a part of, rather than apart from, the natural world (Bang et al., 2007; Medin & Bang, 2014). Fundamentally, we argue that we need education that ruptures the false divide between humans and nature and supports an understanding of the natural world as a web of interdependent relationships that we are all a part of. Indigenous values, ways of knowing and being do just this, as they are rooted in an understanding of relationality amongst all things (Cajete, 2000; Kimmerer, 2013). In the same way, Indigenous pedagogies are chiefly concerned with nurturing that sense of interconnectedness and supporting learners to learn to live in reciprocity with all their relations, including humans and MTHs (Deloria & Wildcat, 2001; Simpson, 2014; Bang et al., 2014). These types of pedagogies are imperative if we are to develop systems of education that advance thriving futures for lands, waters, humans, and MTHs.

In this article, we offer a model of Indigenous water pedagogies using a case study of three vignettes from an Indigenous STEAM (ISTEAM) summer program. We review three vignettes as a case study to highlight the different aspects of Indigenous water pedagogies that cultivate ethical relations with water toward just and sustainable futures.

INDIGENOUS WATER PEDAGOGIES

As scholars and educators, we take up nature-culture relations, defined as the socially constructed relationships between humans and the rest of the natural world (Bang & Marin, 2015). Nature-culture relations—which include relations with water—are an important pivot point for improving systems of education toward more thriving futures. They shape the what, where, why, and how of learning environments at a fundamental level. Consider the human-nature relationship being implicitly taught in most schools. Most, if not all, educational activity takes place indoors while the outside is primarily reserved for recreation like recess and playtime. This structure of schooling hinges on the assumption that intellectual activity only takes place inside. Core to this assumption is the idea that humans are both distinct from and superior to the rest of the natural world (Bang et al., 2014).

Now, consider how schooling typically structures children's learning about water. Dominant approaches to water education rarely give children the opportunity to physically interact with water, much less water existing in a natural habitat (like an ocean, stream, or rain puddles). Further, these learning experiences typically take place indoors, isolated from the natural world. For example, in early childhood education, one common approach to water-based learning involves sensory tables that are intended to develop children's sensorimotor skills and introduce them to scientific concepts, like the buoyancy of different objects, through exploration and play (Gross, 2012). While these activities allow

for physical interaction with water, they position water solely as a resource for child development and leave little if any room for engaging with water as a relative, or ethical considerations of how humans can support water's well-being (Nxumalo & Villanueva, 2019).

These shortcomings continue through primary and secondary schooling, where water education is primarily concerned with abstracted understandings of phenomena like the molecular composition of water or the hydrologic cycle. For example, the Next Generation Science Standards (a national framework for science education that focuses on engagement in science practices toward developing scientific literacy) 2-ESS2-2 asks learners to develop a model that represents the shapes and kinds of land and bodies of water in an area. While understanding these properties of water are important and necessary, we worry that dominant models of water education attend only to these technical aspects, and fail to engage with humans' relations and ethical responsibilities to water or to the political context of water in history and the present (Davis & Schaeffer, 2019; Nxumalo & Villanueva, 2019; Bang et al., 2012). Building systems of education that cultivate right relations with water will require greater attention to the nature-culture relations that are inherent in the broad structure of schooling, as well as the pedagogical details of how one teaches about and with water.

Toward these ends, we call specifically for greater attention to and development of Indigenous water pedagogies. Despite being the basis of all life, water is under-articulated when it comes to land-based, place-based, and field-based science education. We have come to see that framing education solely around land, without enough emphasis on water, fails to disrupt colonial paradigms that position land as the basis for property and territorial claims. Such paradigms conflict with those of many Indigenous peoples, for whom water is central not only to territorial struggles but to defining who we are as a people (Daigle, 2018; Wilson & Inkster, 2018). We argue that this disfigured understanding—which privileges land as property and ignores the vitality of water—lies at the root of why water is overlooked when it comes to outdoor learning environments. Although land is central for Indigenous peoples, prioritizing relations with land over relations with water is irreconcilable with Indigenous lifeways, in which water plays an equally vital role. Further, focusing on one over the other upholds the notion that land and water are separate and diametrically opposed rather than always in relation to and dependent on one another.

We share our efforts to develop Indigenous pedagogies that teach about land and water as fundamentally connected rather than as separate entities. While we understand land- and water-based education as inseparable, due to the overt focus on land we find it necessary to specifically discuss what it means to teach about and with water. This article discusses Indigenous water pedagogies as a method for teaching about water in a way that is grounded in Indigenous lifeways and restores right relations with water. We focus specifically on two dimensions of Indigenous water pedagogies: 1) relations with water and 2) reading water. These dimensions were developed in the context of a community-based design research project in collaboration with children, families, and community educators (Bang et al., 2016). We also build with other communities and scholars who have been working toward water pedagogies that are lifegiving, relational, and lean into the political and ethical dimensions of water education (e.g., Nxumalo & Villanueva, 2019; Nxumalo, 2021; Pacini-Ketchabaw & Clark, 2016; Davis & Schaeffer, 2019; Marin & Bang, 2018; Bang et al., 2012).

Relations with Water

Teaching about relations with water involves recognition that water, humans, and MTHs are intimately linked in a web where the well-being of one is dependent on the well-being of another. The second dimension, reading water, involves careful observations and noticing of water as it exists in the natural world. While it's worth recognizing relations with water and reading water as distinct aspects of Indigenous water pedagogies, we also understand these dimensions as mutually constituting one another. That is, making relations with water involves learning to read water and vice versa.

We suggest that making relations should be the starting point for any learning experience with water and depict this in the following vignettes. Dominant models of science education tend to focus on the physical properties of water and its utility to humans, leaving little room for, or even actively discouraging, deeper questions around what it means to be in relation with water (Davis & Schaeffer, 2019; Nxumalo & Villanueva, 2019; Bang et al., 2012). Centering relations with water opens up space for ethical deliberation and “should we?” questions that facilitate reflection on how we ought to live in the world if we are to contribute to the collective thriving of human and MTH communities (Tzou et al., 2021; Ferkany & Whyte, 2012). Importantly, teaching for relations with water should extend beyond human-centrism and include water’s relations with all beings. Situating humans as but one small part in a broader web of relations disrupts the notion that humans are superior to the rest of the natural world and the claim that extractive relationships with water are justified (Cajete, 2000). Lastly, we have found the recognition of MTH personhood to be an important part of land- and water-based education that supports ethical environmental decision-making (McDaid Barry, et al., in press).

Reading Water

The second dimension of Indigenous water pedagogies that we raise is reading water. We use the term reading water deliberately because we understand it as an important form of literacy. That is, reading water involves learning to take in and derive meaning from complex phenomena. Like learning to read text, learning to read water deeply changes how one understands the world. Marin & Bang (2018) show how learning to read lands and waters is an important practice for scientific inquiry. It involves paying close attention to water as it exists in the world, noticing details like changes in an ocean’s tide or plants that grow along a riverbank. Importantly, reading water involves recognizing how water exists and shapes life in places that are not immediately obvious. For example, differences in plant growth between the bottom of a hill and the top, or between shaded and unshaded areas are largely shaped by the presence and movement of water. Learning to understand water as always present—whether it’s a river, in clouds, in the ground, or in our bodies—recognizes the central role of water in supporting life on this planet and disrupts the colonial prioritization of land. Recognizing the vitality of water in all facets of life also supports humans to take greater care and live in ethical relations with water.

Together, these two dimensions of Indigenous pedagogies work to cultivate learning toward thriving futures for humans and MTHs (including water). Making relations with water through the reading of water involves making sense of details to build theories and explanations about the natural world in a way that is guided by our ethical responsibilities.

INDIGENOUS STEAM

ISTEAM is a multi-site community-based design research project that seeks to build thriving communities, composed of human and MTH life, through the regeneration of Indigenous systems of education. Rather than teaching *about* Indigenous culture, ISTEAM supports learning *through* Indigenous culture, creating the conditions under which Indigenous values and ways of knowing and being in the world can thrive (Deloria & Wildcat, 2001; Simpson, 2014).

ISTEAM creates the conditions for Indigenous thriving through two core principles. First, ISTEAM is fundamentally land- and water-based. It’s built on the premise that place matters for what and how we learn. In practice, this means that the entirety of ISTEAM takes place outdoors and involves learning about local ecosystems. Whether it’s going on nature walks to learn about plant medicines, checking for macroinvertebrates to gauge the health of a river, or listening to a story about Grandmother Cedar while sitting underneath a giant cedar tree, ISTEAM deliberately engages lands and waters as teachers for us to learn from. We not only engage lands and waters as teachers during ISTEAM but as co-designers when we plan for ISTEAM. We call this process “place-design” because we go out to where ISTEAM will

take place and plan activity around the learning opportunities the place affords. This represents an important shift from learning about lands and waters to learning *with and from* lands and waters.

The second way that ISTEAM creates conditions for Indigenous thriving is through family and community engagement. One of the main goals of ISTEAM is self-determination for Indigenous families and communities to decide the how, what, and why of learning. We do this through a process of community-based co-design where we engage families, Elders, and community members as designers and educators for the ISTEAM program (Bang et al., 2016). We have regular community co-design gatherings where we collectively imagine the kind of education that our children need to thrive and work to co-create learning environments that are grounded in Indigenous thought and lifeways. There's a wide range of participation in the co-design process. Some community members attend co-design meetings and help guide the program from a broader perspective. Others dig into the details, take lead in planning specific activities, and work as teachers at ISTEAM. It was through this work with community co-designers that we came to develop the conceptualization of Indigenous water pedagogies that we present here. That is, relations with water and reading water were the two main facets that community educators attended to in their interaction with children, families, and water. Lastly, as a community-based design research project, ISTEAM blurs and often outright rejects the dichotomy between researcher and participant. The authors of this article, all of whom are from Indigenous communities, not only engage in ISTEAM as researchers, but as community members, relatives, educators, and families with children, grandchildren, nieces, and nephews who participate in ISTEAM.

We use three examples of water pedagogies from two ISTEAM sites, the Pacific Northwest and the Great Lakes, to show different dimensions of water pedagogies involving river, ocean, and rain water.

CARE FOR THE CHICAGO RIVER

This first clip takes place in Chicago during a learning engagement with the Chicago River and involves gaining knowledge of histories and imagining possible futures. Students learned about the removal of a dam downstream, new regulations for water quality, and restoration efforts, all examples of humans remembering to respect the river again. This clip is from the beginning of an activity where students were asked to draw the “before” part of a “before and after” picture to support careful observation of the river ecosystem and to imagine changes that the ecosystem would be undergoing. We share this clip and the segments highlighted here because of the way that participants model an ethic of care for water.



1. Megan (Turn 1¹): *For me, the dam removal is really exciting and the changes and people deciding that this river deserves to be clean both for us, and all of our relatives that live here, means that human people are learning to respect these rivers again too. Okay so, you guys get to witness this and you get to decide are you going to honor that relationship with the river or not. And part of the way that we can do that is by looking really carefully and noticing what's happening and every year hopefully you will come back to our summer program. And in a few years, you could come back to this place and you'll be able to see what's different here, and I know you all were just noticing some things. So, human people have a really important relationship with this river. What else, why else? Who else benefits from having clean rivers?*

Megan, the facilitator, framed the removal of the dam in terms of human people remembering to respect the river again. By centering relations with the river, Megan grounded the discourse firmly within Indigenous ethical commitments to water. Specifically, Megan attributed personhood to the river by mentioning that the river “deserves to be clean” and positioning the river as worthy of respect in its own right, in alignment with Indigenous ways of knowing and being with water (Yazzie & Baldy, 2018; Wilson & Inkster, 2018). This provided an ethical anchor for the activity so that students’ learning was taking place in the context of Indigenous values and relations with water. Further, this ethical anchor created the relational conditions so that students were not just learning to observe the river, but considering how they might make decisions that would benefit the river ecosystem. This focus on environmental decision-making was made prominent as Megan linked the decision to remove the dam to the everyday decisions that students make in order to “honor that relationship with the river.” Lastly, in saying that “part of the way that we can [honor our relationship with the river] is by looking really carefully and noticing what’s happening,” Megan framed careful noticing and observations about the river as an act of relationality. In this way, scientific observation and knowledge about the river were inherently tied to making relations with the river.

At the end of Turn 1, Megan asked the group to consider “who else benefits from having clean rivers.” This shifted discourse to a conversation around different MTH beings who are also part of the river ecosystem and depend on clean water. In the following Turn, Megan discussed how the decisions that humans make go on to impact these other beings.

Megan (Turn 20): *So, when human people aren't respectful, we don't just hurt ourselves, we hurt all of our other relations too. So part of why we are here is so that we can actually notice and really remember that if we make better decisions, we can actually make decisions that are good for everybody.*

By shifting the conversation to the relations that MTH beings have with water, Megan makes an important pedagogical move that decenters humans from socio-ecological reasoning. While it is important to teach for human relations with other natural beings, focusing solely on human relations often leads to slippages where humans are positioned as central and superior to the rest of the natural world (Taylor, 2017). For example, Megan could have modeled care for the river by focusing on how *humans* rely on water to survive. However, by recognizing the ways that other beings depend on the river, the group was able to attend to the river’s relations beyond themselves.

In this clip, the scientific observation of water was tied to ethical relations and decision-making with water, highlighting relations as the most vital component of Indigenous water pedagogies. The group’s thinking was then extended beyond human relations with water to be accountable to the well-being of

1 The “Turns” indicate the speech Turns of participants. Turn 1 indicates that Megan was the first to speak. Later, Turn 20 indicates that there were 19 previous Turns taken. Turns skip in this article we could not include the entire transcript for the sake of space.

the entire ecosystem. Importantly, this engagement took place on the riverbank, and the ensuing activity involved direct observations of and interactions with the river. The act of physically being with water is central, as it creates a relational co-presence with water that generates new terms within which thinking and learning take place (Marin & Bang, 2018; Vossoughi et al., 2020). We argue that a similar discussion in a classroom would not have carried the same ethical and relational weight. Pedagogical practices and moments like these contextualize and frame encounters with water to support the cultivation of ethical relations and decision-making that foster thriving socio-ecological futures.

READING THE PUGET SOUND

The next vignette takes place in Seattle and involves making relations with, as well as learning to read, the Puget Sound in the Pacific Northwest. As the group of students walked to the beach for a series of learning engagements involving ocean currents and tidal pools, one of the camp Elders, Jeanette, stopped them at a hill overlooking the beach.



Jeanette (Turn 5): *So if you look out, the water is kind of—especially there's that one line there, right? That's detritus floating so why would it only float in a line? And that has to do with currents.*

After asking the students what they were noticing, Jeanette pointed out where the current was visible in the water. These attentional directives supported the group's reading of water. As the group jointly attended to their view of the Puget Sound—a complex visual field—Jeanette highlighted components of the field, such as lines in the water, to make the ocean currents visible to everyone else. Jeanette then drew the group's attention to the haze.

Jeanette (Turn 9): *I want you to look at the air. So that's the Olympic Mountains and that's Kitsap Peninsula and up north you can see the cliffs of Whidbey Island. What do you notice about the air?*

Child 3 (Turn 10): *It's different over there.*

Jeanette (Turn 11): *Yup?*

Child 3 (Turn 12): *It's foggier.*

Jeanette (Turn 13): *Foggier. Yeah, we call that haze. And so if you look that way, you can't tell quite so much but it used to be kind of brown. And the brown haze is probably pollution. But on hot days in Puget Sound, Puget Sound evaporates. The water evaporates and you're gonna be talking about this with Noelani, about salinity. So when all the water goes up in the air, it gets really hazy and what's*

left is water in the Puget Sound that gets a little more concentrated. And that means that it has more salt than other things in it.

In Turn 10, Jeanette invites the group to “look at the air.” Observing air might be an unfamiliar practice for some, but Jeanette’s prompt brings attention to something that is incredibly important to understand when reading water, which is the relationship between water and air. Jeanette also situated the air and water of Puget Sound in relation to nearby landmarks such as the Olympic Mountains, Kitsap Peninsula, and Whidbey Island. These directives helped scaffold the groups’ observations of water *in relation* to air and land. In these ways, Jeanette modeled how water should not be read in isolation, but always in relation to other parts of the natural world. This is not only key to Indigenous knowledge systems that recognize the world as composed of interdependent relationships, but to complex thinking that focuses on interactions within and between systems (Medin & Bang, 2014; Cajete, 2000).

In Turns 11 to 13, one of the students responded to Jeanette’s prompt by noticing how the air is “foggier.” Jeanette identified the fogginess as haze that has evaporated off the water (Turn 13). She connected the haze that they observed with the salinity of the water and pollution, phenomena that the group would be learning about later that day. Through these moments of observation and explanation, Jeanette was able to prepare the group for additional learning about these phenomena, demonstrating how, for ISTEAM, learning content is always connected to place. This vignette shows how the reading of water gives life to scientific concepts like evaporation and salinity by situating them in firsthand observations of the natural world. Transitioning from Jeanette reading waters with children to exploring the beach at low tide, Megan (Turns 14 to 23) shifted toward ethical ways of being with water.

Megan (Turn 14): *What is the one rule when we're down on the beach? Riley?*

Child 5 (Turn 15): *No picking up rocks bigger than our heads.*

...

Megan (Turn 18): *Got it. Did everyone hear that? No picking up rocks bigger than our heads! And if we move a rock, what do we do afterwards?*

Child (Turn 19): *Put it back!*

Megan (Turn 20): *And how do we put it back?*

Child 5 (Turn 21): *With our hands.*

Megan (Turn 23): *With respect. 'Cause why? 'Cause we wanna put 'em back 'cause that's somebody's house, right? And we don't wanna hurt them.*

Specifically, she reminded students not to pick up rocks bigger than their heads (Turn 18), and to place rocks down respectfully (Turn 23). Here, Megan set expectations for how to make observations in a way that is respectful to MTH relatives at the beach. In Turn 23, she explained that these rules were in place because the students would be walking through other peoples’ (e.g., mussels, crabs, starfish, and more) homes and they should do so with respect. Megan recognized the MTH beings who live at the beach as people, and in doing so demonstrated how the reading of lands and waters is consistently linked to environmental decision-making. In other words, scientific observations are fundamentally connected to questions of how to live in ethical relations with water and water relatives.

Jeanette provided further scaffolding for students’ observations while at the beach.

Jeanette (Turn 24): *And also look at the top of the water way out and when you're down there for two hours, every few minutes I want you to look out there and see how it changes and see what you notice.*

Jeanette asked the group to remember to “look at the top of the water way out” as they were also reading the tidal pools at the beach. This prompt helped scaffold yet another important observational practice.

Not only was Jeanette advising the group to keep paying attention to the water and how it might change. This pedagogical move also worked to facilitate perspectival shifts in scale. That is, Jeanette was implicitly encouraging the group to go back and forth from zooming in to the life that exists in the tidal pools to zooming out to observe broad changes in the current and the tides. The ability to shift spatial and temporal scales that Jeanette was scaffolding is key to both reading water and making sense of complex phenomena (Pugh et al., 2019; Wilensky & Resnick, 1999).

This clip beautifully encapsulates what it means to read water. The facilitators provided various attentional scaffolds to support students' reading of water in relation to air and to land. This allowed the group to connect their observations to concepts like salinity and evaporation. Further, scientific inquiry was intrinsically linked to ethical questions of how to support the well-being of water and water relatives. We argue for the urgency of outdoor learning experiences that create opportunities for this kind of place-based sensemaking. Constructing more ethical human-water relations toward thriving futures will require systems of education that grow children's ability to read and make sense of water as it exists in the natural world, and in a way that fosters complex thinking and an attunement to ethical decision-making.

“WATER IS BLESSING OUR EXPERIENCE”

This next vignette takes place in Chicago and involves interactions with rain. When talking about ISTEAM, a question often comes up: “How do you run outdoor learning environments when it's not nice out?” While innocuous enough, this question is rooted in assumptions that constrain the ways that humans relate to the natural world. Specifically, it enforces an orientation in which humans are apart from nature by implying we should only go outside when it's “nice out.” Further, the value-laden phrase “nice out”—typically meaning warm and sunny—implies a hierarchy of desirable and undesirable weather. Such a stance glosses over the fact that diverse weather patterns (e.g., wind, rain, snow, storms) are necessary for healthy ecosystems. Lastly, avoiding rain wouldn't be conducive to an educational program that seeks to build relations with all aspects of nature, including water.

This vignette shows how outdoor learning environments create opportunities for people to enact values in how they orient themselves to the weather. This interaction takes place during the same activity as the first vignette, where students were asked to draw their observations of the river. As it starts to rain, one of the students, Brian, exclaims:

Brian: (Turn 1): *Oh no, my paper got wet!*

Lawrence (Turn 2): *Yeah, it is gonna get wet. It's okay. Water is blessing our experience right now.*

Brian's interaction with the rain (Turn 1) was rooted in an assumption that rain was undesirable and interfering with human activity. However, one of the facilitators, Lawrence, took the opportunity to reframe how Brian was orienting to the rain (Turn 2). This pedagogical move by Lawrence reoriented toward Indigenous ways of relating with water by repositioning rain as a blessing rather than something to be annoyed by.

This vignette demonstrates how we navigate different values and construct human-water relations in real-time during an activity. These are ripe pedagogical moments where students and educators build with one another to construct new, more ethical relations in the present moment (Marin & Bang et al., 2018; Vossoughi et al., 2020). In this vignette, Lawrence's reframing steered away from dominant ways of positioning rain as a nuisance and asserted Indigenous values and ways of knowing and being with water. Learning to recognize and reframe thinking in these micro-moments is an important pedagogical practice that can lead to alternative emergent understandings and constructions of human-water relations at grander scales.

CULTIVATING ETHICAL HUMAN-WATER RELATIONS

In this article, we have emphasized the necessity of attending to human-water relations in order to adapt to changing lands and waters and build towards collective thriving for human and MTH communities. Dominant systems of education are largely rooted in paradigms that position humans as separate from and superior to the natural world and position water as an exploitable resource for human use. This points to a need for systems of education that are rooted in respect and reciprocity, where concepts like the molecular composition and phase changes of water are situated within firsthand observations, relations, and ethical commitments to place. We put forth a model for Indigenous water pedagogies to cultivate learning toward more ethical human-water relations. Indigenous water pedagogies involve 1) making relations with water and 2) learning to read water. Together these two dimensions support ethical decision-making and complex thinking about and with water. After reviewing the clip involving haze in the Puget Sound, it has become apparent to us that air, which consists of water, is another aspect of place-based education that is under-articulated, even more so than water. A future direction is consideration of relations involving air in land- and water-based (and air-based?) learning environments.

Cultivating more ethical relations with water involves shifts across multiple scales, from the broader structuring of learning environments (Where does the learning take place? What's being taught? Who teaches it, and why?) to the finer pedagogical details that involve the "how" of learning. We provided a brief overview of an Indigenous STEAM program to offer one example of how learning environments can be structured toward more thriving futures for humans and MTH communities. The vignettes offer examples of pedagogical moments that (re)frame thinking and construct human-water relations in real-time. By working across multiple spatial and temporal scales, we hope to build futures where human communities are able to live in reciprocal relations with water and the rest of the natural world

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Anna Lees (descendant of Little Traverse Bay Bands of Odawa Indians) began her career as an early childhood classroom teacher in rural northern Michigan. Now, an associate professor of early childhood education at Western Washington University, she partners with schools and communities in teacher preparation. Anna is committed to developing and sustaining reciprocal relationships with Indigenous communities to engage community leaders as co-teacher educators, opening spaces for Indigenous values and ways of knowing and being in early childhood settings and teacher education. She is currently engaged in research around a land education professional development model led by tribal nations and a relationship-based site-embedded professional development model with tribal early learning programs.



Nikki McDaid (Shoshone-Bannock) is a parent, partner, and doctoral candidate in the Learning Sciences at Northwestern University. Her research interests are broadly focused on informal and formal learning environments at the intersection of land-based education and Indigenous resurgence. She is a former middle school and high school teacher and currently teaches in Dr. Megan Bang's Indigenous STEAM program. She earned her MA in Teaching from Pacific University and her BS in Sociology from Northeastern University.



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