Experiences Indigenizing School Mathematics Through Place-Based Education

Stavros Georgios Stavrou and M. Shaun Murphy

University of Saskatchewan

Authors' Note

Stavros Georgios Stavrou https://orcid.org/0000-0001-9622-6116

M. Shaun Murphy https://orcid.org/0000-0002-1905-8806

Correspondence concerning this article should be addressed to Stavros Stavrou at stavros.stavrou@usask.ca

Abstract

This article describes the experiences of two Cree elementary school teachers who taught school mathematics through place-based education (PBE) in a Treaty 6 First Nations community in the Canadian prairie province of Saskatchewan. Using narrative inquiry, we discuss the teachers' understandings of Indigenizing school mathematics in relation to their Cree identities and PBE, their difficulties and successes in addressing curricular outcomes, and their recommendations for other teachers wishing to take up a similar practice. As described in this article, this research expands upon our existing work in which we sought to provide more nuance and substance around the meaning and practice of Cree Indigenizing school mathematics in the specific context of Treaty 6 Saskatchewan.

Keywords: Cree Indigenization, place-based education, school mathematics, teacher education

Experiences Indigenizing School Mathematics Through Place-Based Education

Author Self-Situating Prologue

We acknowledge that we live and work on Treaty 6 territory and the homeland of the Métis peoples. The First Nations and federal government signed Treaties 2, 4, 5, 6, 8, and 10 between 1871 and 1906 in the political region now known as Saskatchewan. Nêhiyawak (Plains Cree), Nahkawininiwak (Saulteaux), Nakota (Assiniboine), Dakota and Lakota (Sioux), and Denesuline (Dene/Chipewyan) are the original inhabitants and stewards of this land.

Γεια σας, με λένε Σταύρο. My name (first author) is Stavros, which comes from the Greek word σταυρός, meaning cross. My father emigrated from Cyprus to Prince Albert on Treaty 6 in 1987, where he met my mother. I was born and raised there. I have a White settler identity with Greek-Cypriot heritage on my father's side and French and Ukrainian heritage on my mother's side. I am a cis, gay, able-bodied, and neurotypical man. I am a lecturer and researcher in mathematics and teacher education at the University of Saskatchewan.

My name (second author) is Shaun Murphy, and I am White with settler ancestry. I am a professor in Educational Foundations, where Stavros completed his PhD work. I served as his research supervisor, and I am a collaborator in this research.

Our social locations are partially informed by the work of nêhiyaw and nahkawininiwak scholar Margaret Kovach (2021), who taught us that relational work involves purposeful introductions which function as a prelude in narrative writing and "signal to the careful reader that woven throughout the varied forms of our writing—analytical, reflective, expository—there will be story, our story, for story is who we are" (p. 2).

Chelsea Vowel (2020), a Métis woman with otipêyimisiw-iyiniw ancestry, reminds us that positionality locates us within a constellation of kinship, "linked through familial, cultural, and political relations through a shared history and through territory" (p. 4). Necessarily, we acknowledge the Indigenous-settler relationships with PK and Kiwi—the educator participants shared shortly—as they are complicated by historical and ongoing settler-colonial genocide. As we—Stavros, Shaun, PK, and Kiwi— hold space for the strained political, social, familial, and economic histories that shape contemporary relationships, we work towards positive futures.

Chelsea Vowel (2016) described the complicated function of names and terms—such as White, non-Native, non-Aboriginal, non-Indigenous, European, settler, and so on—in describing our relationships, past and present, thereby reminding us of the significance of challenging pan-Indigenous and White-settler binary constructions that obscure sociopolitical histories and power dynamics. With Vowel's descriptions in mind, we will use the names and terms chosen by scholars throughout this article so that we are consistent and true to their self-identifications and published work. In cases where terminology is not made explicit, we follow Maggie Kovach (2021), who used *Aboriginal* to draw attention to Canada's colonial constitution and *Indigenous* as the First Peoples of a place and their cultures.

This article describes the experiences of two Cree elementary school teachers who taught school mathematics through place-based education (PBE) in a Treaty 6 First Nations community in the Canadian prairie province of Saskatchewan. Using narrative inquiry, we discuss their understandings of PBE and its connection to Indigenization and school mathematics in relation to their Cree identities. We share their difficulties and successes addressing curricular outcomes and their recommendations for other teachers wishing to take up a similar practice.

In the following section, we provide a review of the literature surrounding Indigenization, PBE, and school mathematics for the purpose of articulating the interactions of these phenomena in a broader context before we attend to the specific considerations of this article. Our research is guided by the methodological commitments of narrative inquiry, which we will describe after the review of literature.

Note that we will sometimes shift from our first-person collective voice (we) to third-person voice when describing specific interactions between Stavros and the Cree teachers.

Indigenization, Place-Based Education, and School Mathematics

Practitioners (such as policymakers, educators, and researchers) have shared the necessity and potential of Indigenizing educational spaces (such as K-12 classrooms and post-secondary teaching environments), curriculum, and pedagogy (Gaudry & Lorenz, 2018). Indigenization is a broad concept that encompasses multiple processes, contexts, intentions, and educational mandates (Stavrou, 2020).

Some of the dynamic conceptualizations and processes of Indigenization include: reinforcing Treaty rights, land stewardship, and mobilizing the Truth and Reconciliation Commission's *Calls to Action* (Korteweg & Russell, 2012; Truth and Reconciliation Commission, 2015); foregrounding tribal epistemologies, ontologies, and axiologies (Kovach 2010a, 2010b, 2021); working towards a necessary reconciliation that rectifies the traumatic and destructive legacy of residential schools, ongoing foster care, the 60s scoop, and continued land theft (Razack, 2002; Regan, 2010); decolonizing Eurocentric ideologies that subjugate Indigenous knowledge systems through cognitive and cultural imperialism (Battiste, 1986, 2011, 2013; Battiste & Henderson, 2009; Wildcat, 2001); challenging Indigenous racism and intersecting forms of oppression (Kumashiro, 2000; Schick, 2000; St. Denis, 2004, 2007, 2011); integrating land and place-based education (Miller & Twum, 2017); revitalizing and legitimizing Indigenous values, perspectives, languages, cultures, and worldviews (Brake, 2019; Deer, 2013; Snively, 1990); transforming curriculum and pedagogy through cross-cultural teaching and two-eyed seeing (Aikenhead, 2006; Goulet & Goulet, 2014); and understanding the need for social justice through sharing the diverse experiences of Indigenous voices (Brandes & Kelly, 2004).

The preceding list of conceptualizations and processes is meant to provide a general overview of the plurality of ways in which Indigenization is taken up. In the following subsection, we make explicit our understandings of these in the context of the directives of our institution (University of Saskatchewan). We use the word *Indigenization* to refer to the overall phenomenon, and we use *Indigenizing* to refer to a specific contextual process. This aligns with the most common convention in the literature.

Indigenization at the University of Saskatchewan

Kirkness and Barnhardt (1991) explained that some Indigenization directives from institutions are shaped by their perceived accountabilities for interrupting colonial and racist systems that exclude and disadvantage Indigenous and Aboriginal identities. In the context of our own teaching and research, we were guided by the University of Saskatchewan's (University of Saskatchewan, n.d.) conceptualization of Indigenization mandates, which are a collaborative effort between local elders and the University of Saskatchewan administration and faculty members (both Indigenous and non-Indigenous). These mandates include strengthening inclusive communities and partnerships that respect and understand the value and importance of Indigenous knowledges and practices

(e.g., histories, teachings, languages, traditions, ceremonies, protocols, creative expressions, etc.) belonging to the diverse peoples of Saskatchewan and beyond; engaging in critical reflection on the systemic effects of colonialism on Indigenous and non-Indigenous peoples, including Treaty relationships and Métis and Inuit land rights; operationalizing the *Calls to Action* of the Truth and Reconciliation Commission (2015) and to enact a transformative reconciliation of University of Saskatchewan's commitment to inclusion and authentic voice and engagement of First Nations, Inuit and Métis peoples in Saskatchewan and beyond; and promoting and supporting Indigenous visions and aspirations for self-determination through transformative education for Indigenous well-being, growth, and prosperity.

With regard to enacting this work of reconciliation, we agree with our current president, Peter Stoicheff, that it is our moral imperative to do so. We attend to the words of Donald (2009), who stated:

> Ethical relationality is an ecological understanding of human relationality that does not deny difference but rather seeks to more deeply understand how our different histories and experiences position us in relation to each other. This form of relationality is ethical because it does not overlook or render invisible the particular historical, cultural, and social contexts from which a standpoint arises. Rather, it puts these considerations at the forefront of engagements across frontiers of difference. (p. 6)

These words help us attend to ethical relationality that is rooted in community, across time, and among people. To make sense of the current state of Indigenous/non-Indigenous relations, we must interrogate how our past trajectories shaped our present and will shape our shared future. To us, the spirit and intent of reconciliation mean we must consider the enmeshment of current and past relationships—including the more-than-human beings amongst us—to truly understand our reliance on each other within the broader context of our past, present, and future existence.

Place-Based Education and School Mathematics

Place-based education (PBE) links students' experiences to formal education through connections and partnerships between schools and communities in ways that support local environmental, social, economic, and ecological wellbeing (Gruenewald, 2003a; McInerney et al., 2011; Sobel, 2004). By focusing on community needs and interests, the experiential nature of PBE resonates with students and facilitates a sense of land stewardship, land ethics, and rural revitalization (Smith & Sobel, 2010; Sobel, 1996; Theobald, 1997). Place-based educators foster *place consciousness* through problem-based learning that involve students in questioning their community's social and ecological history and its connection to broader global concerns. (Gruenewald, 2003b; Gruenewald & Smith, 2008).

Indigenization aligns with PBE through a critical pedagogy of place that aims to "(a) identify, recover, and create material spaces and places that teach us how to live well in our total environments (reinhabitation); and (b) identify and change ways of thinking that injure and exploit other people and places (decolonization)" (Gruenewald, 2003b, p. 9). Donald (2009) proposed Indigenous Métissage—a place-based approach to curriculum based on ecological and relational understandings of the world—as a way to describe connections between place, identity, and sovereignty, as well as to reconsider colonial divides that continue to plague Aboriginal-Canadian relations. By foregrounding our social location in the context of physical landscapes through discourses of colonialism, Donald (2009) argued that "Aboriginal peoples can still honour places made meaningful by earlier generations [and that] landed citizenship also requires an

acknowledgement that such places have changed as a result of colonization" (p. 20). By considering how to reverse and mitigate colonialism while teaching us to reconstruct our environments, Donald's work aligns with Gruenewald's (2003b) framework of critical pedagogy.

Chambers (2008) shared her work in Blackfoot territory in terms of a curriculum of place, in which children's hands-on learning activities—alongside masters of the crafts—are those required to nourish place and identity. She explained that this "knowledge enables people to find their way in that place where they dwell and this knowledge and these skills endow them with identity" (p. 120).

In regard to school mathematics, teaching and learning in a cultural context is relational work. Considering Chambers, the masters of crafts include mathematics practitioners, elders, and knowledge keepers with aims to nourish and affirm identity by connecting mathematical skills to languages, ways of being, and ways of knowing. For example, Donald et al. (2011) found mathematical knowledge to be in relationships alongside Blackfoot peoples in Eagle Flight First Nation. Blackfoot concepts of *aoksisawaato'p* (visiting/renewal of relations), *aokakiosiit* (be wisely aware), and *aatsimaak'ssin* (responsibility to balance giving/taking reciprocity) guided their culturally relational work. Through his study, he found that Indigenous ways of knowing and being are anchored in their specific context.

In related work, Doolittle explained the challenges in thinking about his Mohawk identity as a mathematics educator and wondered, more generally, if Indigenous peoples' understandings of their specific worldviews would be displaced by mathematics education (Doolittle & Glanfield, 2007). In this context, we believe that Chambers's (2008) framework might alleviate this issue if Mohawk peoples worked alongside mathematics practitioners to create a shared space that affirmed children's identities while constructing mathematical content knowledge informed by place, experience, and community.

Masters of their craft, Sterenberg et al. (2010) also considered ways that place, community, culture, and languages shape peoples' understandings of mathematics education. In the context of Blackfoot and Cree, these authors explained that learning mathematics from place means teaching from the particular culture and language of the host territory, and that people's perspectives are revealed through understandings of culture and place. This exemplifies the side-by-side learning of skills that shape identity.

In regard to Indigenizing school mathematics in Saskatchewan, our own work as educators and researchers has focused on conducting narrative inquiries into the ways that familial, experiential, linguistic, and cultural contexts of Cree elementary school teachers shaped their classroom teaching (Stavrou, 2020). For example, we described *Cree mathematizing* as a process of reconsidering Euro-Western school mathematics from the perspectives of Cree teachers in an urban Saskatchewan school (Stavrou & Murphy, 2019). This mathematizing process, which involved translations of mathematical terms between English, Cree, and *Creelish* (a Cree-English blend) in the context of their local communities and experiences, partially represented facets of their identities. This exemplified Chambers's (2008) framework of how masters of craft co-construct spaces of hands-on and experiential learning with youth.

In subsequent research, we noticed that Cree teachers demonstrated promising practices of Indigenizing school mathematics via ways of being guided by *miyō-pimōhtēwin* (walking in a good way) and principles that balance *kohtawān* (our spiritual being) and make curriculum into a relational space (Stavrou & Murphy, 2021). It was through their Cree language—shaped by their

social, spatial, and familial contexts—that gave rise to teaching in a way that "foregrounded self-awareness, doing things properly, learning new ways, being thankful, being humble, leaving problems behind you, helping yourself, and keeping trying" (Stavrou & Murphy, 2021, p. 22). Furthermore, Stavrou (2021) examined Indigenizing school mathematics assessments through miyō-pimōhtēwin, and kamskénow, which was found to be a holistic way of looking at the life lessons, ethics, and discovery-oriented learning of children. This significantly organizes the life of a student to be at the heart of their mathematics education in ways that attend to their well-being.

In the narrative inquiries described above, the Cree teachers resided in urban settings, with some born in an urban setting while others were born in reserve communities. In the research described in this paper, we share the experiences of two elementary school teachers who used Cree-based approaches in teaching mathematics through PBE in a Saskatchewan reserve. Novel to this study is that the Cree cultural contexts are often outdoors in a reserve community located hours away from the nearest urban school. Through the methodological use of narrative inquiry, we discuss the teachers' understandings of Cree Indigenization and PBE in relation to school mathematics, their difficulties and successes addressing curricular outcomes when using these Cree-based approaches, and their recommendations for other teachers wishing to take up similar practices.

Narrative Inquiry

We are transparent about using narrative inquiry, a Western methodology, as we are non-Indigenous (White) scholars researching alongside Cree teachers. Although one might wonder why an Indigenous research methodology is not used, we attend to this matter by proposing that narrative inquiry is compatible with Indigenous forms of research by locating narrative inquiry in Indigenous research. To this end, it is important to first distinguish Indigenous research from an Indigenous research methodology. Kovach (2018) aptly differentiated between these, stating that *Indigenous research* is a broad term in which Indigenous matters are studied and does not necessarily include directly researching with Indigenous peoples, nor does it require using Indigenous methodologies given by Indigenous researchers. She explained that Indigenous research can be found in many disciplinary contexts, such as "education, social work, law, sociology, health, and environmental studies" (p. 215), and includes "community-based, ethnographic, grounded theory, phenomenology, narrative inquiry, decolonizing, and Indigenous methodologies" (p. 215). That is to say, Indigenous research is interdisciplinary and is open to study through *Indigenous methodologies* (which are founded on Indigenous knowledge systems), as well as Western methodologies such as narrative inquiry. While we understand there are other methodological approaches—such as Storywork (Smith, 2019) and Métissage (Burke & Robinson, 2019)—that would reveal their own unique and nuanced richness to the interpretation and representation of our research stories, we chose narrative inquiry.

In work by Cardinal et al. (2019), the authors wrote that although they were "guided by Indigenous scholars such as Bruno (2010), Cardinal (2010, 2011, 2014), Lessard (2010, 2014), Swanson (2013, 2019), and in particular Mary (Young, 2003), we felt the resonance and possibilities of Indigenous knowledge and narrative inquiry" (p. 127). In this way, we also understand how our inquiry is shaped in relation to Indigenous research. Battiste and Henderson (2000) explained that stories are enfolding lessons that transmit experiences, honour spiritual forces, and focus on processes of knowing. The experiences of Kiwi and PK—our teacher participants— helped us focus on the processes of knowing in this inquiry.

Experience, as described by Dewey (1938), is foundational to narrative inquiry. Narrative inquiry posits that people understand their experience narratively and relate it narratively to each other, in this case to the researcher. This aligns with Clandinin and Connelly's (2000) initial phases of the narrative inquiry cycle of living and then telling. Our job as researchers resides in the retelling, which may engender possibilities for reliving. Clark (2016) wrote:

> It is in the stories we tell about ourselves, the stories that people tell about us, in the stories we act by, and the stories we tell in our actions. Story becomes the warp and weft of all experience – it weaves its way through every moment. Stories are central to understanding the nuances of human interactions in any context. (p. 48)

When considering Clark's words, it helps to consider earlier work by Connelly and Clandinin (2006), who wrote:

> People shape their daily lives by stories of who they and others are and as they interpret their past in terms of these stories. Story, in the current idiom, is a portal through which a person enters the world and by which their experience of the world is interpreted and made personally meaningful. (p. 375)

This way of thinking about story reveals the complexity of experience as a narrated act. Our lives are composed of stories that, as Clark (2016) wrote, "become the warp and weft" (p. 48). In this way, story (experience) is the fabric of our lives and central to understanding human interactions in context, which, in the case of this paper, is teaching mathematics. The narratives that we explore are those of the teachers, but these stories happen in relation to the children/youth they teach, the mandated curriculum guides, and *place.*

In the research conducted with Cree participants Kiwi and PK, the first author (Stavros) sought a narrative telling of their experiences contextualizing school mathematics with attention to place. Clandinin and Connelly (2000) referred to the dimension of place as that "which attends to the specific concrete physical and topological boundaries of inquiry landscapes" (p. 51). According to these authors, place is an important aspect of the three narrative commonplaces—sociality, temporality, and place—that bound an inquiry. As will be apparent in this paper, the teachers' stories occur in specific places of their reserve communities, throughout periods of time, and are mediated between relationships.

Connected to the importance of place in our research, Chambers (1999) theorized a topography of Canadian curriculum theory by challenging researchers to consider education from the place they live and work, described through their language, using place- and linguistic-specific interpretive tools. Moving from the general research to the specific context of our research, Cree worldviews shape an understanding of life, *iniee mamitoneneetumowin*. It is in the respectful honouring and supporting of relationships and the ethical relationality foregrounded in our personal and professional alliances (*weechiseechigemitowin*) that we embody *miyōpimōhtēwin* (walking in a good way). These words, which are Cree ways of being that shape relationships, came up throughout our research process.

Relational inquiry is constituted by the "stories, places, memories, relationships, and communities that are part of who we are in the world" (Quiles-Fernández et al., 2022, p. 154). Relational narrative inquiry captures, in part, who we are in the world. King (2003) offered, "the truth about stories is that that's all we are" (p. 153). We take this to mean that our experiences can be shared through stories, and, in the living of our stories, we shape the stories of others; when we

tell our stories, we are sharing ourselves. Further, Battiste and Henderson (2000) explained: "Stories are unfolding lessons. Not only do they transmit validated experiences; they also renew, awaken, and honour spiritual forces. Hence, almost every ancient story does not explain; instead, it focuses on processes of knowing" (p. 77). Kiwi and PK help us to understand the lessons they taught us through the inquiry regarding mathematics taught with attention to place in the context of their Cree culture and lands.

Our work as narrative inquirers involves coming alongside educators and students. We used purposive sampling (Cohen et al., 2000) to gain access to our participants for this research in order to learn from the experiences of teachers whose practices are guided by the dynamic conceptualization and operationalization of Indigenization and PBE in school mathematics. Stavros met the teacher participants, Kiwi and PK, through his professional development work with teachers and related research (Stavrou, 2020). Kiwi has been teaching on his reserve for nineteen years. PK is a colleague with Kiwi in the same community and has been teaching on his reserve for almost a decade. At the time of the interviews, PK was on leave from work to care for his mother, who broke her leg in a fall at home. Both Kiwi and PK teach a blend of elementary and middle years classes. PK has experience as a consultant for schools located in northern communities. His consulting role involves facilitating conversations around sharing resources.

Through a series of 10 group interview conversations between November 2020 and April 2021 (conducted through Zoom due to Covid parameters) of approximately one hour each, data in the form of audio-recorded field notes and written field notes were collected. The audio recordings were transcribed and discussed in subsequent conversations as prompts for further open-ended discussions. The initial topic of the interviews was about the teachers' understanding of PBE and Indigenization (in general and in regard to school mathematics). From this starting point, Kiwi and PK shared their difficulties and successes in addressing curricular outcomes as well as their recommendations for other educators. We unpacked these by co-composing interim texts (in the form of narrative threads) that wove together the plotlines of these findings. Field texts are identified by the month and year in which they occurred.

As Stavros interviewed Kiwi and PK, they shared stories of mathematics teaching (some around shared lesson plans) during group Zoom conversations. Evident in the transcripts was the relational aspect of narrative inquiry, in which the work was not transactional because all of us involved shared a part of ourselves. At a later point, Shaun came alongside Stavros to reflect with him on these group conversations with the teachers.

This research was not conducted with the intention to generalize the practice of these teachers but rather to provide a more nuanced understanding of the ways educators are taking up Indigenization and PBE in mathematics education in their Cree communities, through their language, ways of being, and ways of knowing. The ways in which educators and practitioners take up Indigenization and PBE are varied. It would be problematic to provide a monolithic understanding of these diverse processes and concepts since they are highly dependent on temporality, sociality, and place.

The sharing of these experiences during the interviews and co-composing of interim texts were always situated in a context of ethical relationality. In our research and writing, we have been attentive to the centering of experiences in the world as we inquired into the "social, cultural . . . institutional [historical, colonial, racial, economic, gendered and political] narratives within which individuals' experiences were constituted, shaped, expressed and enacted" (Clandinin & Rosiek,

2007, p. 42). This narrative thinking—across time, place, and attentive to the social interactions—opened the potential to experience the ongoing multi-dimensionality of experience (Huber et al., 2022). Ethics in narrative inquiry is situated in the relationships that occur with participants and is attentive to the narrative commonplaces of sociality, temporality, and place. Furthermore, it is the grounding of ourselves in living in relationally ethical ways that we acknowledge our commitments to all our relations (Cardinal et al., 2019).

This study's findings focusing on the teachers' experiences are broken down into the following three areas: understandings of Indigenization and PBE in relation to school mathematics, difficulties and successes addressing curricular outcomes, and recommendations for other teachers wishing to take up this practice. The first two findings are presented as sections, within which we separate the experiences of Kiwi and PK into subsections.

Understandings of Indigenization and PBE in Relation to School Mathematics

Experiences of Kiwi

In early conversations with Kiwi, he spoke about mathematics and its relationship to human experience, nature, and time:

> Humans have an internal clock. We have an instinct that guides us to the passage of time that comes from our interactions with nature. I had to take a calculus course in university and the only chapter I understood were the real-world problems about rates of change. I was really fascinated about how we measure the passage of time as a rate that's related to *things we do.* I wanted to share my interpretation of this to my students at a lower-level, without as much emphasis on x and y. No offence—'cuz I know how much you math people love all the letters and symbols. (Field text, March 2021)

Kiwi described how the overly symbolic nature of mathematics can make learning challenging, but he expressed being inspired by the applications. He wanted to share the applications with his students.

> I was really impressed by the way we could model things like travel and predict exactly when things would occur based on different rates, like kilometres per hour. This related to our canoe trip this summer. We were able to use formulas to model how long it would take us to arrive at different junctions depending on the rates we were traveling. We do a lot of measuring of distances using referents like paces or looking at the length of our shadows.

He said sitting in the classroom and writing is important but, at some point, we need to experience what we are thinking about. He likened it to taking a cooking class in which a person only reads recipes but never actually cooks anything. He questioned how a person could learn to cook or discuss ingredients without ever having cooked something.

> When you are outside without a clock, it can be difficult to know how much time has passed, but we can feel the passage using our shadows. The rates our shadows stretch and shrink is a way to measure time. You can connect all of these activities to something we need to teach in the classroom—the difference is we can experience it. We can feel it. (Field text, March 2021).

Kiwi underscored the need for mathematics to be experiential. The disconnection for students comes from abstracting these experiences to numerical descriptions that rely heavily on symbols. In other words, students can lose sight of how mathematics applies to their everyday lives if they

spend too much time on theoretical orientations of mathematics. This finding is consistent with our previous research in which classroom learning with our Cree teacher participants was disrupted by the mathematical notion of *generalization* (Stavrou & Murphy, 2020). In relation to this, Kiwi did not deny the necessity of these abstractions but rather sees an opportunity in the teaching of mathematics through outdoor experiential learning.

> One of my teachers focused on modeling real-world situations. I found that to be the most engaging and exciting. My students see that I'm excited and this is infectious. It worked for me and I hope it works for them. We start with a problem or activity and we model it. Experiencing what we're doing makes it easier to develop formulas after. (Field text, March 2021).

Kiwi believed PBE promotes effective teaching experiences, where students feel motivated to engage in more nuanced learning when it applies to their lives. This is also described in Miller and Twum (2017), whose study looked at teachers' responses to student learning in their outdoor education programs. Furthermore, Kiwi believed inquiry-based learning and real-world learning are synonymous. Since everyone experiences the world differently, Kiwi explained that his students' projects are diverse and reflect their individuality. He argued that traditional pencil and paper desk work limits students' abilities to express themselves in meaningful ways. This is important to students who feel bored when they are expected to sit in a classroom and solve the same predictable assignment questions as everyone else.

Kiwi's experiences relate to PBE in clear ways in that these real-life experiences are connected to ways of being on the land (as indicated in the canoe trip, for example). It is not a discussion about imagined real-life experiences but rather connected to the experience itself. Kiwi indicated that math can easily rely on abstraction, but he made it clear that abstractions make more sense when tied to experiences that are, in turn, tied to place. This way of seeing experiences and culture in education is consistent with work produced by Aikenhead (2006), who found that Eurocentric thinking compartmentalizes knowledge into subject matter strands that purport to be value- and culture-free through an emphasis on objectivity as being superior to the subjectivity of life and cultural experiences.

We conclude this subsection with Kiwi's comment that commitment to working through PBE and mathematics education is not easy work:

> We see different things when we teach math and you really notice it when we talk about what we're doing […] You learn to appreciate where people come from when you come together with a common goal, and you let your guard down […] You have to make a commitment. (Field text, February 2021).

Experiences of PK

PK described the ways in which mathematical acts are woven into our lives, but that the curriculum draws out descriptions through the curriculum strands of Numbers, Patterns and Relations, and Shapes and Space. PK shares:

> There are lots of ways to explain what we do every day. You are a math person, so correct me if I'm wrong, but I believe math is one of many ways to explain something. We go about our daily lives, figuring things out, trying to be efficient, trying to be accurate. I don't need to say I'm doing math because it isn't a specific thing that I turn on when I'm living

> my life, but I can appreciate that math people think it's cool to think about things through patterns, numbers, shapes, and so on. (Field text, February 2021)

To avoid treating mathematics as a decontextualized classroom endeavour, PK sees the advantage of connecting to other subject matter, such as biology and home economics, thus providing a more meaningful, rounded understanding of mathematics in our lives. Mathematics is a language for describing everyday events and PK said that we cannot go about our day without a reliance on mathematics for relating or understanding our experiences. Murphy (2009) wrote, "mathematics is a language necessary to describe experience" (p. 1); it would seem PK felt the same way:

> Everyone likes describing how math is used in gardening because it's so easy to see. Our school's annual project is making a big garden. I don't have to justify the value in being outdoors growing food, but I do feel like I need to explain when curriculum math is used. We had to put a wooden fence around the garden to keep animals away, and obviously making a rectangular perimeter was easiest. The students helped with measuring and we did the cutting. All the operations were used there – adding, subtracting, dividing, and multiplying. Then we had to buy bags of soil. That involves calculating approximately how many bags of dirt we'd need to cover the area of the garden. This relates area and volume. You also have to factor cost in there. Then we plant the seedlings we grew inside over the winter. Students use referents like arm span to make sure there's enough space between the plants. As the plants grow, we take different measurements, like height, and compare it to our Gardener's Almanac. We can compare how much our plants are growing this season compared to previous years. We can represent this data using charts and graphs. There's a lot we can do. Students like doing it because it makes sense to perform these tasks in the first place…and because everyone loves being outside, of course. (Field text, April 2021)

PK explained the ways outdoor activities can be described using mathematical terms involving measurements, shapes, and space. He makes a conscious choice to connect his students' daily lives to mathematical processes, as is consistent with different Cree teachers in our other related research (Stavrou, 2020; Stavrou & Murphy, 2019).

> The Indigenization aspect of my work seems strange to explain. The importance of learning to get food from the land to our table is universal, but I think that since you big-city-folk can get groceries at anytime, you might see what we do as Indigenization. In that sense, I guess me explaining how we use math in our outdoor activities is an Indigenized way of learning. To me, students in big cities sitting in their desks all day learning through a book should be named something. (Field text, March 2021)

To us, the idea of book learning in desks that he referred to is a Eurocentric learning style. It is interesting to us how he troubled the notion of what is considered by many educators to be one of the 'normal' standards of conventional learning. We believe that the teachers' enactment of some of the processes of Indigenizing school mathematics in PBE drew attention to the colonial nature of classroom learning.

Difficulties and Successes Addressing Curricular Outcomes

It is expected that teachers will encounter barriers in implementing PBE since these concepts and processes subvert the pedagogical status quo of classroom desk learning and rote memorization for high-stakes assessments. Some challenges to Indigenous cultural inclusion and relevance in education include perpetuating racist stereotypes and colonial notions of success in education

(Battiste, 2013; Deer, 2013; Stavrou & Miller, 2017); colorblind ideologies by teachers who refuse to acknowledge classroom diversity and racial oppression (Kumashiro, 2000; St. Denis, 2004, 2007); uncertainties in developing cross-cultural content (Aikenhead, 2006); and a lack of support by peers and administrators in affirming Indigenous educator representation (Doolittle, 2006; Goulet & Goulet, 2014).

Challenges implementing PBE include a lack of financial support and safety issues such as the cold weather of our Canadian prairies (Miller & Twum, 2017); resistance and hesitancies by teachers and school administrators (Smith 2002, 2007); de-schooling in the form of unlearning the conventional practices of schooling and embracing new methods (Clark, 2012; Illich, 1971); addressing curricular outcomes (Archibald, 2002; Powers, 2004; Skoutajan, 2012); meaningfully connecting experiential outdoor teacher education with the local community and natural environment (Twum, 2014; Zeichner, 2010); uncertainties in how to create and execute outdoor programs (Demarest, 2015; Hall, 2015); problematic notions about the ways place is conceptualized as a shared space (Eijck & Roth, 2010; Sobel, 1996, 2004); developing critical pedagogies and ecological consciousness (Gruenewald, 2003a, 2003b); challenging colonial practices that undermine Indigenous sovereignty and land stewardship (Battiste, 2002; Wilson & Battiste, 2011); and uncertainties in how to foreground Indigenous epistemologies and pedagogies in place-based education models (Kirkness, 1998)

In the following subsections, we share Kiwi's and PK's experiences addressing curricular outcomes. Their experiences represent our research findings and illustrate some of the challenges addressed in the literature above. For example, the teachers discussed ways their practice subverted traditional classroom learning methods, addressed safety concerns, and attended to curricular outcomes.

Experiences of Kiwi

Kiwi is cognizant of demonstrating his approach to meeting curricular outcomes to his administrator. He understands that he is accountable to his colleagues for the activities he does and is prepared to justify the ways the curriculum is integrated into the activities. For example, he is attentive to the ways place-based features—such as the location of rivers, animals, and plants—are integrated into existing curricula through measurements.

> It's important to keep a portfolio of everything you teach when you're outdoors. Administrators really want to know that you are meeting outcomes any time you leave the school. The other day, our principal asked one of my students what she learned. She talked for ten minutes straight about using a compass to locate the position of different landmarks animals use for migration. She talked about how we charted the growth rates of plants and trees at these landmarks and graphed our data to make it easier to visualize. The administrator then asked one of my colleague's students what he learned in school today, and he said 'Nothing.' Obviously, he didn't learn nothing—but it wasn't memorable or fun to be in his desk all day. (Field text, November 2020)

Portfolios and self-assessment documentation track the development of student learning. Being able to articulate connections to curricular outcomes and curriculum mapping is important for teachers who will be called upon to legitimize their pedagogical approach to administrators and parents. This is described as a challenge in, for example, Powers (2004), who used a model called the Place-Based Education Evaluation Collaborative to mitigate the constraint of a lack of time to devote to curricular change in the midst of current curricular pressures felt by educators.

Documenting the trajectory of programs might make it easier to request funding and resources. Kiwi explained wanting to move away from calling his pedagogical approach a *field trip*. To him, a field trip represents a tangential experience that is a treat rather than a normalized way to learn. Kiwi also exposed the need for de-schooling in the form of challenging the normalized notion that schooling only occurs in desks and classrooms, thereby supporting Illich's (1971) call for transformative pedagogies:

> A big challenge we face is the weather. It can be too dangerous when it gets [very] cold. We are currently applying for funding to get specialized outdoor gear so that we can continue our learning regardless of the temperature. It's expensive to purchase the appropriate clothing and we can't let the burden fall on our children's families. We know there are financial resources available, and I hope the community will see how important it is to remove this barrier. (Field text, November 2020)

Kiwi attended to the need for aligning curricular outcomes with outdoor activities by documenting the trajectory of his work. He integrated place-based features like rivers and plants into the curriculum and emphasized keeping portfolios for accountability. He challenged traditional schooling notions. He acknowledged that weather poses a significant challenge and attempted to remove financial barriers by seeking funding for specialized outdoor gear.

Experiences of PK

PK shared that he has invested a lot of time in building a convincing case for the benefits of PBE. He said there is a burden on educators to convince administrators, parents, and school boards of the success that outdoor inquiry-based learning has to offer. He said, "we talk about what works, what doesn't, what stays, and what goes". He described his work as a grassroots movement to make the curriculum work for his community's specific needs and explained that his job involves getting teachers to collaborate and share what they have.

> It's my job to keep a written track record of all the activities I do, with detailed explanations that justify how we are addressing curricular outcomes. I have folders and folders of reflections written by me, some colleagues, and my students. I'm constantly being asked 'How did you teach this math topic?' I pull out my students' journals and I show them what we did during our overnight trips to [Location]. We experienced biology, chemistry, physics, and math. We experienced Phys. Ed. My students make charts and graphs and use formulas to explain what we're exploring and seeing. Parents are excited to see their kids learning something they can actually explain at the kitchen table. (Field text, January 2021)

PK thinks of his work as being about skill development. In other words, he sees his practice as emphasizing the skills students need to thrive in their community, such as safe fishing and hunting practices, proper food handling and fire safety, and understanding how to care for local ecology. In our interview conversations, he explained that having empathy for the environment and world around us comes from locating ourselves in nature. He shared that developing a critical consciousness comes from experiential learning and stated, "we will protect our earth if we live and learn alongside nature".

Recommendations for Other Teachers

In this section, we provide our interpretation of Kiwi's and PK's recommendations. These are based on analysis of various field texts (interview conversations) that are not reproduced in this article but which we analyzed and then shared our findings with Kiwi and PK. They were invited

to clarify and modify those findings, which is part of co-composing interim texts and final research texts in a narrative inquiry (Connelly & Clandinin, 2006).

Through our interview conversations, Kiwi and PK demonstrated the ways PBE promotes community engagement. They noted how teachers and students connect with small businesses to get the supplies and resources needed for outdoor activities. In turn, the community saw concrete ways to support children's learning, such as donating supplies and offering expertise. When the community as a whole bought into what the teachers were doing, word spread to other communities and schools. This promoted collaboration between teachers and communities. Ideas were shared, and organizations saw what worked and what did not work without having to metaphorically reinvent the wheel along the way.

Kiwi and PK recommended that teachers reflect on how they have been socialized to think about the environment around their communities. They believe this helps develop an emotional connection to place that compels people to think of their land stewardship—specifically, the ethical imperative to protect shared land. They recommended that teachers see PBE as a motivator to move towards environmental collectivism through collaborative efforts of sustainability.

Kiwi and PK recommended that teachers reflect on the ways their practice fosters inquiry-based experiential education that is mindful of respect, reciprocity, and relationships with each other and the land. They encouraged teachers to develop activities that explore medicinal properties of local plants, skills needed to grow food, and tasks around minimizing our carbon footprint. For example, students applied statistical analysis to track changes in pollution levels in local bodies of water. Their students also used trigonometry to measure light refraction while fishing and to determine the height of tall trees without directly measuring.

The evidence supporting the benefits of PBE was affirmed by Kiwi and PK, who both recommended that colleges and universities provide structured programming for teacher candidates across all subject matters so that they can develop competencies and proficiencies in PBE. In addition, teacher educators modeling the integration of PBE and inquiry-based learning will reinforce the promising practices that arise from learning in natural environments (Archibald, 2002; Clark, 2012).

Closing Remarks

Kiwi's and PK's experiences highlight important first steps for mathematics teacher educators. We hope other teacher educators will see the benefits of connecting Cree Indigenization and PBE to the teaching of school mathematics. Through our research conversations with Kiwi and PK, we confirmed that classrooms extend beyond the walls of a school to include the natural environment and local community—particularly for school mathematics, which is a subject often disassociated from cultural, linguistic, and familial experiences.

Kiwi and PK remarked on the difficulties of overcoming the established practices of schooling that normalize passive learning from desks that face chalkboards. Part of PBE is interrogating long-held beliefs about what is deemed legitimate regarding learning and assessments (Hall, 2015; Wilson & Battiste, 2011). For example, de-schooling mathematics might shift the focus from rote learning and standardization towards student-centred contextualization rooted in one's individualized sociocultural experiences and environments.

Kiwi and PK described their work as *weechihitowin* (stewards of education on the land). Part of their Cree worldview is providing the drive toward change needed to support and nurture

their relationships with each other, their students and communities, and the land on which they live and play. They agreed that by using Cree language whenever possible to animate school mathematics, they are adding to the mysteries of Indigenization. Importantly, *miyō-pimōhtēwin* is in the way Kiwi and PK hold space in their relationships with students—an ontology of being—that is the lifeblood of Cree Indigenization in their practice.

There are more opportunities for differentiation when the classroom is expanded to include the environment and local ecology. When students are given a meaningful task that engages community organizations and promotes ecological justice, they are motivated to demonstrate their skills. Students learn to collect, interpret, and represent data that is relevant to them.

As authors and researchers, our intention is not to prescribe methods of incorporating PBE pedagogical approaches but to share experiences that might help us shape an understanding of the promising practices and potential of Cree Indigenization and PBE. We hope this article opens up the conversation to more stories of student-centred sociocultural experiences and differentiated instruction grounded in community engagement and ecological justice.

References

Aikenhead, G. (2006). Towards decolonizing the pan-Canadian science framework. *Canadian Journal of Science*, *Mathematics, & Technology Education*, *6*(4), 387-399. https://doi.org/10.1080/14926150609556712

Archibald, K. (2002). Best place: Out-of-school education concept plan. Retrieved from the Saskatoon Public School Division website: https://www.spsd.sk.ca/Schools/brightwater/about/vision/Documents/Best-Place-Education.pdf

Battiste, M. (1986). Cognitive assimilation and Micmac literacy. In J. Barman, Y. Hébert, & D. McCaskill, (Eds.), *Indian education in Canada: The legacy*. Vol. I. (pp. 23-44). UBC Press.

Battiste, M. (2002). *Indigenous knowledge and pedagogy in First Nations education: A literature review with recommendations.* Ottawa: National Working Group on Education and Indian and Northern Affairs Canada.

Battiste, M. (2011). Cognitive imperialism and decolonizing research: Modes of transformation. In C. Reilly, V. Russell, L.K. Chehayl, & M. M. McDermott (Eds.), *Surveying borders, boundaries, and contested spaces in curriculum and pedagogy* (pp. xv-xxviii). Information Age Publishing, Inc.

Battiste, M. (2013). *Decolonizing education: Nourishing the learning spirit.* Purich Publishing Press Limited. https://doi.org/10.59962/9781895830972

Battiste, M., & Henderson, J. Y. (2009). Naturalizing Indigenous knowledge in Eurocentric Education. *Canadian Journal of Native Education, 32*(1), 5-18. https://doi.org/10.14288/cjne.v32i1.196482

Battiste, M., & Henderson, J.Y. (2000). *Protecting Indigenous knowledge and heritage: A global challenge.* Purich Publishing Limited.

Brake, J. (2019, February). Canada unveils Indigenous languages bill to fanfare, criticism. https://aptnnews.ca/2019/02/05/canada-unveils-indigenous-languages-bill-to-fanfare-criticism/

Brandes, G. M., & Kelly, D. M. (2004). Teaching for social justice: Teachers inquire into their practice. *Educational Insights, 8*(3), 1-7. http://www.ccfi.educ.ubc.ca/publication/insights/v08n03/articles/teaching.html

Burke S., & Robinson R. (2019). Reflections on métissage as an Indigenous research praxis. *Alternative: An International Journal of Indigenous Peoples*, *15*(2), 150–157. https://doi.org/10.1177/1177180119837755

Cardinal, T., Murphy, M. S., & Huber, J**.** (2019). Movements toward living relationally ethical assessment making: Bringing Indigenous ways of being, knowing, and doing alongside narrative inquiry as pedagogy. *Revista Interuniversitaria de Formación del Profesorado*, *94*(33), 121-140. https://recyt.fecyt.es/index.php/RIFOP/issue/view/4598/979

Chambers, C. (1999). A topography for Canadian curriculum theory. *Canadian Journal of Education, 24*(4), 137-150. https://doi.org/10.2307/1585924

Chambers, C. (2008). Where are we? Finding common ground in a curriculum of place. *Journal of the Canadian Association for Curriculum Studies*, *6*(2), 113-128. https://doi.org/10.25071/1916-4467.18099

Clandinin, D. J., & Connelly, F. M. (2000). *Narrative inquiry: Experience and story in qualitative research*. Jossey-Bass.

Clandinin, D. J., & Rosiek, J. (2007). Mapping a landscape of narrative inquiry: Borderland spaces and tensions. In D. J. Clandinin (Ed.), *Handbook of narrative inquiry: Mapping a methodology* (pp. 35-75). Sage. https://doi.org/10.4135/9781452226552

Clark, C. (2016). Beyond the muskeg: Poetic expressions of a narrative inquiry into curriculum making and identity making on the edges of community. [Unpublished dissertation.] University of Saskatchewan. https://harvest.usask.ca/handle/10388/7564

Clark, D. (2012). Learning to make choices for the future. Connecting public lands, schools and communities through place-based learning and civic engagement. (Manual). The Center for Place-based Learning and Community Engagement and A Forest for Every Classroom. http://www.promiseofplace.org/assets/files/PBE_Manual_2012.pdf

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed.). Routledge.

Connelly, F. M., & Clandinin, D. J. (2006). Narrative inquiry. In J. Green, G. Camilli, & P. Elmore (Eds.), *Handbook of complementary methods in education research* (pp. 477-487). Lawrence Erlbaum.

Demarest, A. (2015). *Place-based curriculum design: Exceeding standards through local investigations*. Routledge.

Dewey, J. (1938). *In experience and education*. Collier Books.

Deer, F. (2013). Integrating Aboriginal perspectives in education: Perceptions of pre-service teachers. *Canadian Journal of Education, 36*(2), 175-211. https://www.jstor.org/stable/canajeducrevucan.36.2.175

Donald, D. (2009). Forts, curriculum, and Indigenous Métissage: Imagining decolonization of Aboriginal-Canadian relations in educational contexts. First Nations perspectives. *The Journal of the Manitoba First Nations Education Resource Centre, 2*(1), 1–24.

Donald, D., Glanfield, F., & Sterenberg, G. (2011). Culturally relational education in and with an Indigenous community. *in education*, *17*(3), 72-83. https://doi.org/10.37119/ojs2011.v17i3.73

Doolittle, E., & Glanfield, F. (2007). Balancing equations and culture: Indigenous educators reflect on mathematics education. *For the Learning of Mathematics, 27*(3), 27-30. https://www.jstor.org/stable/40248584

Eijck, V. M., & Roth, W.M. (2010). Towards a chronotopic theory of "place" in place-based education. *Cultural Studies of Science Education, 5*, 869-898. https://doi.org/10.1007/s11422-010-9278-2

Furman, C. G., & Gruenewald, D. A. (2004). Expanding the landscape of social justice: A critical ecological analysis. *Educational Administration Quarterly, 40*(1), 47-76. https://doi.org/10.1177/0013161X03259142

Gaudry, A., & Lorenz, D. (2018). Indigenization as inclusion, reconciliation, and decolonization: Navigating the different visions for indigenizing the Canadian academy. *AlterNative: An International Journal of Indigenous Peoples, 14*(13), 218-227 https://doi.org/10.1177/1177180118785382

Goulet, L. M., & Goulet, K. N. (2014). *Teaching each other: Nehinuw concepts & Indigenous pedagogies.* UBC Press.

Gruenewald, D. (2003a). Foundations of place: A multidisciplinary framework for place-conscious education. *American Educational Research Journal, 40*(3), 619-654. https://doi.org/10.3102/00028312040003619

Gruenewald, D. (2003b). The best of both worlds: A critical pedagogy of place. *Educational Researcher, 32*(4), 3-12. https://doi.org/10.3102/0013189X032004003

Gruenewald, D. A & Smith, G. A. (Eds.). (2008). *Place-based education in the global age*. Taylor and Francis.

Hall, R. (2015). Implementing place-based education in the elementary classroom. (Master's research paper). Ontario Institute of Studies in Education of the University of Toronto, Toronto, Canada. https://hdl.handle.net/1807/68678

Huber J., Cardinal, T., & Murphy, M. S. (2022) Relational narrative inquiry alongside a young Métis child and her family: Everyday assessment making, pimatisiwin, pimosayta, and teacher education and development. *Frontiers in Education*. 6:698647. https://doi.org/10.3389/feduc.2021.698647

Illich, I. (1971). *Deschooling society*. Harper & Row.

King, T. (2003). *The truth about stories: A native narrative*. House of Anansi Press.

Kirkness, V. (1998). Our peoples' education: Cut the shackles; cut the crap; cut the mustard. *Canadian Journal of Native Education, 22*(1), 10-15.

Kirkness, V., & Barnhardt, R. (1991). First Nations and higher education: The four Rs: Respect, relevance, reciprocity, responsibility. *Journal of American Indian Education, 30*(3), 1-15. https://www.jstor.org/stable/24397980

Korteweg, L. & Russell, C. (2012). Decolonizing + Indigenizing = Moving environmental education towards reconcilliation. *Canadian Journal of Environmental Education, 17,* 5-14.

Kovach, M. E. (2010a). *Indigenous methodologies: Characteristics, conversations, and contexts.* University of Toronto Press.

Kovach, M. (2010b). Conversational method in Indigenous research. *First Peoples Child & Family Review, 5*(1), 40-48.

Kovach, M. (2018). Doing Indigenous methodologies: A letter to a research class. In N. K. Denzin, & S. L. Yvonna (Eds.), *The SAGE handbook of qualitative research* (5th ed., pp. 214-234). SAGE.

Kovach, M. (2021). *Indigenous methodologies: Characteristics, conversations, and contexts*. University of Toronto Press.

Kumashiro, K. K. (2000). Toward a theory of anti-oppressive education. *Review of Educational Research, 70*(1), 25-53. https://doi.org/10.3102/0034654307000

McInerney, P., Smyth, J., & Down, B. (2011). 'Coming to a place near you?' The politics and possibilities of a critical pedagogy of place-based education. *Asia-Pacific Journal of Teacher Education, 39*(1), 3-16. https://doi.org/10.1080/1359866X.2010.540894

Miller, D., & Twum, S. (2017). The experiences of selected teachers in implementing place-based education. *In education, 23*(1), 3-13. https://doi.org/10.37119/ojs2017.v23i1.282

Murphy, M. S. (2009). Mathematics and social justice in grade 1: How children understand inequality and represent it. *YC Young Children*, *64*(3), 12-17. https://www.jstor.org/stable/42730425

Powers, A. (2004). An evaluation of four place-based education programs. *The Journal of Environmental Education, 35*(4), 17-32. https://doi.org/10.3200/JOEE.35.4.17-32

Quiles-Fernández, S., Saleh, M., Cardinal, Murphy, S., & Huber, J. (2022). Taking care of the stories: A relational approach to the experience of narrative inquiry. In N. Simó-Gil, M. P. Londoño, & C. P. Bedoya (Eds.). *Lugares de la narración: Aproximaciones a la investgación narrative en educación* (pp. 149-165). Universitat Central de Cataluñya.

Razack, S. (Ed). (2002). *Race, space, and the law: Unmapping a white settler society.* Between the Lines.

Regan, P. (2010). *Unsettling the settler within: Indian residential schools, truth telling, and reconciliation in Canada.* UBC Press.

Schick, C. (2000). 'By virtue of being white': Resistance in anti-racist pedagogy. *Race, Ethnicity and Education, 3*(1), 83-101. https://doi.org/10.1080/713693016

Skoutajan, S. (2012). Defending place-based education. *Green Teacher, 97*, 34-36.

Smith, G. (2002). Learning to be where we are. *Phi Delta Kappan, 83*(8), 584-594. https://doi.org/10.1177/003172170208300806

Smith, G. A. (2007). Place-based education: Breaking through the constraining regularities of public school. *Environmental Education Research, 13*(2), 189-207. https://doi.org/10.1080/13504620701285180

Smith, G. A., & Sobel, D. (2010). *Place- and community-based education in schools*. Routledge.

Smith, L. T. (2019). *Decolonizing research: Indigenous storywork as methodology*. Bloomsbury Publishing.

Snively, G. (1990). Traditional Native Indian beliefs, cultural values, and science instruction. *Canadian Journal of Native Education, 17*, 44-59.

Sobel, D. (1996). *Beyond ecophobia: Reclaiming the heart in nature education*. Orion Society.

Sobel, D. (2004). *Place-based education: Connecting classroom and communities*. Orion Society.

St. Denis, V. S. (2004). Real Indians: Cultural revitalization and fundamentalism in Aboriginal education. In C. Schick, J. Jaffe, & A. M. Watkinson (Eds.), *Contesting fundamentalisms* (pp. 35-47). Fernwood.

St. Denis, V. S. (2007). Aboriginal education and anti-racist education: Building alliances across cultural and racial identity. *Canadian Journal of Education/Revue canadienne de l'éducation*, *30*(4), 1068-1092. https://doi.org/10.2307/20466679

St. Denis, V. S. (2011). Silencing Aboriginal curricular content and perspectives through multiculturalism: "There are other children here". *Review of Education, Pedagogy, and Cultural Studies*, *33*(4), 306-317. https://doi.org/10.1080/10714413.2011.597638

Stavrou, S. G. (2020). *A narrative inquiry into my experiences co-teaching alongside Cree educators: Indigenization and school mathematics*. [Unpublished doctoral dissertation]. University of Saskatchewan. http://hdl.handle.net/10388/12973

Stavrou, S. G. (2021). A narrative inquiry into Indigenizing school mathematics through miyō-pimōhtēwin and kamskénow. *Frontiers in Education*, *6*:679087. https://doi.org/10.3389/feduc.2021.679087

Stavrou, S. G., & Miller, D. (2017). Miscalculations: Decolonizing and anti-oppressive discourses in Indigenous mathematics education. *Canadian Journal of Education Revue Canadienne De l'éducation*, *40*(3), 92–122. Retrieved from https://journals.sfu.ca/cje/index.php/cje-rce/article/view/2382

Stavrou, S. G., & Murphy, M. S. (2019). Identity-making through Cree mathematizing. *Canadian Journal of Education, 42*(3), 692-714. https://www.jstor.org/stable/26891581

Stavrou, S. G., & Murphy, M. S. (2020). What comes after newaw? When generalization disrupts experience in mathematics. *Canadian Journal of Native Studies*, *40*(1), 121-131.

Stavrou, S. G., & Murphy, M. S. (2021). School mathematics and miyō-pimōhtēwin. *Journal of the Canadian Association for Curriculum Studies*, *19*(1), 22-33. https://doi.org/10.25071/1916-4467.40669

Sterenberg, G., Barrett, L., Blood, N., Glanfield, F., Lunney Borden, L., McDonnell, T., Nichol, C., & Weston, H. (2010). To become wise to the world around us: Multiple perspectives of relating Indigenous knowledges and mathematics education. *delta-k, 47*(2), 21-29.

Theobald, P. (1997). *Teaching the commons: Place, pride, and the renewal of community*. Westview Press.

Truth and Reconciliation Commission (2015). Honouring the truth, reconciling for the future: Summary of the final report of the Truth and Reconciliation Commission of Canada. Ottawa, ON: Library and Archives Canada. Retrieved from http://www.trc.ca/assets/pdf/Honouring_the_Truth_Reconciling_for_the_Future_July_23_2015.pdf

Twum, S. (2014). *Place-based education in transition: (Re)integrating place-based education into a teacher education program*. [Unpublished master's thesis]. University of Saskatchewan. http://hdl.handle.net/10388/ETD-2014-08-1677

University of Saskatchewan. (n.d.). *What is indigenization?* Indigenization. https://teaching.usask.ca/curriculum/indigenization.php#WhatisIndigenization

Vowel, C. (2016). *Indigenous writes: A guide to First Nations, Métis, and Inuit issues in Canada*. Highwater Press.

Vowel, C. (2020). Where no Michif has gone before: The form and function of Métis futurisms. [Unpublished master's thesis]. University of Alberta.

Wildcat, D. R. (2001). Prelude to a dialogue. In V. Deloria & D. R. Wildcat (Eds.), *Power and place: Indian education in America*. Fulcrum Resources.

Wilson, A., & Battiste, M. (November 30, 2011). Environmental scan of educational models supporting Aboriginal post-secondary education. Report prepared for the Commonwealth of Australia as represented by the Department of Education, Employment and Workplace Relations, Saskatoon, SK, Canada.

Zeichner, K. (2010). Rethinking connections between campus courses and field experiences in college- and university-based teacher education. *Journal of Teacher Education, 61*(1-2), 89-99. https://doi.org/10.1177/0022487109347671