



Using Two-Eyed-Seeing to Integrate Science Teaching and Indigenous Practices in a Graduate Course for Teachers

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Abstract

The Calls to Action^[1] from The Truth and Reconciliation Commission of Canada clearly state the need to “educate teachers on how to integrate Indigenous knowledge and teaching methods into classrooms” (p.7, 62.ii). In an attempt to respond to this appeal, we designed and implemented a graduate level course focused on K-12 science and Indigenous practices, which introduced students to respectful and authentic ways to integrate the teaching of Western Modern Science concepts and Indigenous Science and practices. In the context of the restrictions imposed by the COVID-19 pandemic, the course was delivered online and asynchronously, with a strong hands-on experiential component through curated home-based experiences and investigations. We utilized the Two-Eyed Seeing principle^[2], developed by Elder Albert Marshall of the Mi'kmaw Nation, to encourage students to rethink their approach to curriculum integration in ways that emphasize the strengths of a multiplicity of worldviews. In this paper we describe the structure and content of the course, the pedagogical approaches used, the challenges and opportunities afforded by co-teaching online, the intersectionality of our diverse ethnic backgrounds (new-Canadian Latina and settler, Anishinaabe of Eabametoong First Nation, and Canadian Jewish and settler, respectively) and discuss our perception of students’ struggles and growth during the course.

Keywords: Indigenization; STEM Education; Teacher Professional Development; Reconciliation

1. Introduction and Situation of Self

1.1 Amy Farrell

In keeping with standard traditional Indigenous (First Nation, Metis, Inuit) and, specifically, Anishinaabe (Ojibwe) practices, I begin this chapter with a respectful introduction and situation of self^[3:4]. I am Anishinaabe, a member of Eabametoong First Nation in Northwestern Ontario, Canada, with maternal ancestral ties to Whitewater Lake First Nation and the Slipperjack Family. My father is of English, Irish, and Scottish descent. I grew up in Thunder Bay, Ontario - in the land of the Sleeping Giant and Anemki Wajiw (Thunderbird Mountain/Mount McKay).

My view of and place within the world, although not always easy, has always been a blend of both of these cultural worldviews and perspectives from my parents. My Indigeneity has influenced my research interests within areas of Indigenous knowledge, culture, and storytelling. Within this paper, there is a principle of Two-Eyed Seeing^[2] that describes its usefulness and value within academia. However, I personally do not prescribe to this particular approach as it is a practice I have essentially had to live through and apply in my life since I was born.

1.2 Lilian Pozzer

My journey to become a science educator was paved in collaborations and interactions with a diverse group of people, starting with my undergraduate degree in Brazil, through my graduate studies at UVic and my postdoctorate at McGill University, culminating at my current position at UofM. As an international student in Canada, and later as an immigrant and new-Canadian, I had experienced the challenges and opportunities migrants encounter in their relocation to a new country. In negotiating my identity as a dual-citizen, a professor, and a single-parent for an Autistic child, I have relied on the insights and support my education network has provided me with. Learning to become Canadian involves learning the history of this country, its educational systems, values, culture, and the history of colonization and imperialism,



oftentimes told through the perspective of the colonizers. To honour and value the experiences of Indigenous peoples in Canada, I must recognize my positioning as a settler in this land and my responsibility to broaden students' perspectives on science for validation and integration of Indigenous ways of knowing and learning in/as science.

1.3 Richard Hechter

I am a caucasian, Jewish, second generation Canadian, male. Having learned through the lens of Western Modern Science throughout my entire educational trajectory, I taught secondary level science for 11 years before joining the professoriate in 2009. Stemming from facing anti-Semitic personal experiences, my work is grounded in working with teachers from different ethnic, cultural, and religious backgrounds towards developing relevant and authentic science curriculum and teaching and learning experiences that enrich science phenomena through mitigating othering and racism, while actively promoting belonging, and inclusion in our classrooms.

2. The Truth and Reconciliation Report and Indigenous Education in Canada

The history of colonialism and imperialism in Canada was marked by the residential school system, in which over 150,000 Indigenous (First Nations, Metis, and Inuit) children were forcibly removed from their families and communities and forced to attend these religious schools, from 1831 to 1996. The Truth and Reconciliation Commission (TRC) of Canada sought to examine the long-lasting effects of this system, proposing in its Calls to Action ways in which reconciliation could be achieved. The Executive Summary from the TRC^[5], explained that,

The residential school system failed as an education system. It was based on racist assumptions about the intellectual and cultural inferiority of [Indigenous] people—the belief that [Indigenous] children were incapable of attaining anything more than a rudimentary elementary-level or vocational education [in which] the majority of students never progressed beyond elementary school. The government or church officials who operated the residential schools...created dangerous and frightening institutions that provided little learning. (p. 144)

In the residential schools, Indigenous children were not allowed to speak their native language, nor practice any of their cultural traditions or ceremonies or spirituality. They were often victims of physical, sexual, mental, and emotional abuse. As part of reconciliation, it is imperative that schools in Canada revive Indigenous languages and culture. As the TRC's *What We Have Learned*^[6] states, a part of the reconciliation process "requires...youth engagement about the history and legacy of residential schools, Treaties, and [Indigenous] rights, as well as the historical and contemporary contributions of Indigenous peoples to Canadian Society" (p. 126). Eleven of the TRC's Calls to Action^[1] are focused specifically on education.

3. Structure and Content of the Course

The course was taught online for five weeks during Summer 2020. Each week featured two asynchronous classes, one focusing on Indigenous practices and another on Modern Western Science (MWS), organized by themes: The Sky, Prairie Bird and Animals, Plants and Colours, Rocks, and STEM. During the sessions on Indigenous practices, students explored Indigenous ways of knowing and being, and the production and use of different artifacts following Indigenous traditional knowledge. The classes on MWS explored K-12 science activities that intersected with the provincial science curriculum.

Before our course started, students picked up a box of materials for performing the practical activities at home. Course content and assignments were available in the course webpage. Course assignments included (a) weekly posts to our course webpage reporting on the activities performed that week, (b) a contribution to the weekly discussion forum, and (c) the design of an integrated Indigenous practices and MWS pedagogical activity, with a critical discussion of Indigenousization of curriculum.

Co-teaching saw our own teaching personalities work to our strengths. This was strongly evident during our live meetings, with our different expertise and positionalities enriching discussions in ways that students may not otherwise experience.



4. Pedagogical Choices for Teaching Asynchronously in Covid Times

Our course was initially designed to take place in-person and mostly outside. With the advent of the COVID-19 pandemic, we became keenly aware of the limitations of virtual learning. We had to modify or completely remove some of the activities initially planned for the in-person course. For example, we had planned to harvest clay on the shore of a local river for making clay pots, and then fire the clay pots in an outside fire. Ultimately, we modified this activity, providing air dry clay for at-home use instead. That said, some instructional recordings were completed outside to reflect the original intention of the course.

We opted for asynchronous sessions in response to the fact that, at the time, schools were closed and children were at home, which could be problematic for students who were parents (the majority of our students). The asynchronous sessions provided more flexibility for students to complete course-work whenever possible. Asynchronous sessions also meant, however, that we needed to provide very clear and organized instructions for students, and create the connections from one week to the next, so that the course would flow seamlessly. To compensate for the lack of face-to-face interactions and to create both personal and content connections, we produced instructional videos for most activities.

The selection of themes for each week was grounded in the activities we planned for students. This required us to consider the availability of materials students needed to conduct the activities, the time required for its completion, and the connections to both Indigenous practices and the K-12 MWS curriculum.

5. Lessons Learned

Developing a sense of community in the classroom is challenging within virtual settings. We met virtually with our students at the beginning and middle of the course to introduce ourselves and to check on their experiences mid-way through the course. Students favoured this approach of fewer live virtual meetings, but they were also grateful for the opportunity to have a live class discussion. The discussions we had were lively and interesting, making it clear that we missed the richness of more dynamic interactions and opportunities to talk together.

Students completed activities for the week on the Fridays and had until the following Monday to contribute to the discussion forums, allowing ample time to complete the activities and comment on their peers' posts. Although the discussion board provided opportunities for students to interact, they did not replace whole-class discussions.

During the course, we saw resistance from some students to include other cultural forms of science and to recognize that mainstream science is cultural (i.e., Western-European). One of our main concerns throughout the course was to ensure students understood that integrating Indigenous knowledge into MWS does not mean merging or blending both. We were afraid students might subsume Indigenous science into Western science in their attempts to integrate both perspectives. Our intent was to demonstrate that both Indigenous science and Western science can coexist within the science classroom, with each perspective providing cultural value to science learning.

The Two-Eye-Seeing principle^[2] provided students a way to value both perspectives. Students feared tokenism, and the possibility of inadvertently crossing boundaries and being disrespectful of Indigenous traditions, which were mentioned as the largest barriers to incorporating Indigenous science perspectives in their teaching. Two-Eyed-Seeing allowed students to approach these two science perspectives, illustrating a way to present the knowledge in meaningful and appropriate ways that do not lead to tokenism.

Co-teaching was enjoyable for the three of us, and we learned more about each other and our different areas of expertise during the planning and delivery of the course. Beyond the work we have started with this course, we must continue to find creative, meaningful, and appropriate ways to include Indigenous (First Nations, Metis, Inuit) perspectives into the science curriculum, which we hope will become standard practice one day soon.

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