

**The Integration of Indigenous Knowledge in Education**

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**Abstract**

This project consisted of a rational, literature review, action plan, and discussion on the topic of Indigenous knowledge integration in education. The literature review consisted of three main sections, decolonization through education, best teaching practices for integration, and how ontological differences shape the integration process. Going into this project I predicted that before proper integration can happen, Western and Indigenous communities have to build authentic relationships that go beyond just recognizing another viewpoint. My literature review consisted of 30 sources involving Indigenous communities from all over the world. The most common recommendation found across all studies was the importance of including the local Indigenous population in the integration process. Going forward Western communities need to build authentic relationships with local Indigenous communities before attempting to integrate their knowledge. Educators of all positions must also recognize and deal with any bias they may have towards another knowledge system that is not their own.

*Keywords:* indigenous, indigenous knowledge, integration, education, place-based, decolonization

## **The Integration of Indigenous Knowledge in Education**

### **Focal Problem**

The main focus of my project is how Indigenous knowledge is being integrated into education. I am going to be looking at how current research views integration through multiple lenses. For example, one section will look at decolonization efforts through integration and another focuses on the ontological similarities/differences that regulate integration. Indigenous knowledge is the power of the people not for the people. It is knowledge of the oppressed that has been suppressed for centuries around the world. I want to see how education systems all around the world have attempted to include Indigenous knowledge in modern curricula to bring back identity and power to oppressed communities.

### **Context**

Locally, the Pacific Northwest is home to many Indigenous tribes that called these lands home long before European settlers arrived (The Nisqually Tribe is the closest to where I call home). Indigenous tribes here like many others across the world were forced to abandon much of their homeland and their ways of life were threatened. Students from these tribes often attend local public schools where there historically has been a harsh clash between home life and schooling. Local tribes also possess a rich history of knowledge about our lands and seas that is not seen in Western science.

Regionally we see a lot of efforts coming out of Canada that I believe can help guide future efforts in the United States. Canada saw a surge in integration efforts with the creation of its Truth and Reconciliation Commission. This commission called for major changes to be made across Canada's public school system with the incorporation of Indigenous knowledge. While

not everything has gone perfectly and not every effort is authentic, it provides a strong foundation for changes to be made and supports efforts towards decolonization.

Countless Indigenous populations around the world have been devastated by colonialism and still to this day face the oppression of Western society. Efforts must be made to work against this system of oppression and bring power back to marginalized communities. Power in the form of knowledge, knowledge that is localized to a specific set of beliefs and culture. This is not knowledge that must be given to these communities, instead knowledge of the communities that should be allowed to flourish again. Instead of viewing knowledge that does not agree with Western science as “obsolete”, it should be valued and used concurrently with Western science when appropriate.

### **Importance**

While I am not Indigenous, my time in environmental science studies (undergraduate) exposed me to new ways to view the earth and all it contains. It provided me with a new lens to problem solve and showed me that Western methods are not the end all be all of education. Now as a teacher, I hope to provide this opportunity to other students and provide multiple means of learning to help them grasp educational concepts. I am very passionate about our environment and have loathed for many years the futile attempts our government (United States) has made to keep our land safe. Western culture based on capitalism has resulted in max production of products and the depletion of many natural resources. With monetary value being placed above all in this society, the focus on maintaining balance in our ecosystems has been cast aside. Indigenous knowledge can provide us with new approaches to the way we live our lives, and how we live with the land.

This is important to my future students because it teaches them about the environment we occupy and how it came to be. For Indigenous students, I aim to create a learning environment where students can see themselves in the content. I want to foster positive self-determination and create a connection between home life and school. For non-indigenous students, I hope to open them to new ways of thinking and to create pathways for students to recognize biases they may have about another knowledge system's beliefs. By creating partnerships with our local tribal community my students will get exposed to Indigenous knowledge from Indigenous populations themselves. Providing students with Western and Indigenous perspectives will increase opportunities for understanding depending on what the individual students connect with more.

The closest tribe in my community is the Nisqually Indian Tribe. There is a rich history of political activism from this tribe with Billy Frank Jr. being a nationally recognized Indigenous figure. Billy Frank Jr. fought for the right to fish on the land his people had occupied since time immemorial. Bill Frank Jr. and many other members of the Nisqually Indian Tribe fought for the rights to their fisheries in the 1960s-1970s which resulted in conflict between the tribe and law enforcement. Throughout the fish wars, Billy Frank Jr. was arrested over 50 times in his effort to fight for his people's right to fish. After a decades-long fight for fishing rights, a federal judge rendered a decision in a national court case that guaranteed treaty tribes 50% of the total harvestable catch. This example can show students the power that people hold when collectively working together to fight against oppression.

### **Purpose**

The purpose of this project is to transform my education so that it is inclusive in multiple ways of knowing and engaging students, especially those from tribal communities. This project also aims to work against the system of oppression imposed on Indigenous knowledge and to

serve as a starting point for my career work as a community advocate. I recognize the inherent power I will have as an educator throughout my career, and I aim to use that power to bring power back to communities that have had their identities and culture suppressed.

### **Focal Questions**

- What does research suggest are the best models for Indigenous knowledge being incorporated into education?
- How does the addition of Indigenous knowledge affect student learning (Indigenous and non-Indigenous)?
- How do ontological differences and similarities regulate the integration of Indigenous knowledge?

### **Literature Review**

I first want to state that I am approaching this research from an outside perspective (non-Indigenous) and recognize the inherent settler bias I must constantly navigate while conducting this research. These terms recur throughout the discussion; therefore, it is important at the outset to define them. But, note that these definitions are not all-encompassing nor represent all people's definitions of these terms. Instead, they are working definitions I have adopted for the parameters for this research project and reflect my views only.

Indigenous: Describes any group of people who are native to a certain region of the world. These populations have lived in their specific region since time immemorial.

Indigenous populations lived and thrived in these areas before colonists/settlers arrived.

This definition is influenced by location. There are countless Indigenous populations all over the world, and the biggest deciding factor of belonging to these populations has to do with location.

Indigenous Knowledge: Knowledge of the historically oppressed; knowledge that is organized and selected for taking back identity and power; knowledge is power of the (Indigenous) people not for the people. It is place-based, a reflection of the local area and the people who call it home.

Settler: A foreign population that settles permanently on land already inhabited by Indigenous residents. Intending to eliminate or colonize the Indigenous population residing on land, they wish to take. Settlers are not just people from the past but all non-Indigenous people are settler-colonizers, regardless of being born in the United States or not. Settler colonialism impacts the present as much as it did the past and those who find themselves in a settler identity must recognize this inherited advantage.

Since Time Immemorial (STI) Curriculum: STI is a curriculum developed by states in partnership with recognized Indigenous tribes. Only one state I know of has an official statewide STI curriculum (Washington). California has lessons made available by different organizations but lacked a central statewide defined curriculum. The curriculum consists of lessons on the history, culture, and ways of life of Indigenous people who originally resided on these lands.

The purpose of this section is to focus on how research approaches the question of how indigenous knowledge is being implemented and received in education. It must be noted that locality is very important when it comes to the specifics of different Indigenous knowledges (Mawere et al., 2022). However, the overarching theme of fighting oppression and working to reverse the effects of colonialism remains consistent regardless of geological location.

- Decolonization: Focusing on change and work towards decolonization through education in a multitude of facets.

- **Improving Equitable Teaching Practices Through Integration:** The lessons we can learn from how Indigenous knowledge has been incorporated into education at all levels to improve education for all students.
- **Ontology and Epistemology:** Looking at integration methods from communities all around the globe and exploring how knowledge systems mesh together or pull apart.

One core idea that cuts across the literature when dealing with the successful integration of Indigenous knowledge is the inclusion of Indigenous peoples themselves. There is only so much someone can learn about a culture that is not their own. Authenticity comes from including someone who lives the life you are planning to teach about; someone whose ancestors used the knowledge you are teaching about to survive (Mpofu 2014). The researchers and teachers who reached out to Indigenous peoples in the planning and execution of teaching Indigenous content had a more complete learning experience that also reflected the ideas of local Indigenous populations.

### **Decolonization**

The first theme that is very clear in the literature around Indigenous knowledge is the idea of decolonization. Decolonization focuses on bringing power back to oppressed and occupied communities and creating a plan for healing and reconciliation. Over time, Indigenous culture was suppressed all over the world, being replaced by the dominant white settler culture that still dominates today (Tom et al., 2019). Many researchers have pointed to the fact that to begin the process of decolonization we must first recognize and understand the ways our world (education) is shaped by colonialism.

Decolonization starts with recognizing changes that need to be made in how Indigenous populations and their ways of life have been viewed from outside perspectives. According to

Tuck (2009), Indigenous communities have historically been framed as damaged, and the research conducted focused on “fixing” these Indigenous populations to fit the Western culture. Eve Tuck is an Indigenous author, scholar, and professor of critical race and Indigenous studies. This is an open letter to communities (theoretical) regarding damage-based research. Tuck addressed the problem of damage-based research which paints Indigenous communities as broken and defeated. Tuck called for an end to damage-based research stating the power lies in the Indigenous communities to begin shifting discourse away from damage and toward desire. It is not simply about including Indigenous populations, but rather having them be active participants in the research. The population being studied should have a say in the planning and execution of said research and the goals should be oriented so that Indigenous and non-Indigenous contributors each benefit from the work. This letter has been instrumental in how I approach this paper not only in the way I navigate my own bias, but it provides me with points of reference to critique other research dealing with Indigenous communities.

Coinciding with Tuck, the call for decolonizing research of/with Indigenous populations continues to be a prevalent topic in academia. According to Thambinathan et al. (2021), qualitative researchers should exercise critical reflectivity, show reciprocity and respect for self-determinations, embark others' way of knowing, and embody a transformative praxis. Vivetha Thambinathan is an Eelam Tamil doctoral candidate at Western University in Canada. Elizabeth Kinsella is the Director and Full Professor at McGill University Institute of Health Sciences Education (IHSE). Together they wrote a paper on methods for decolonization in academia (qualitative). They stated the purpose of their paper was to show the necessity of anti-oppressive research and propose key practices and methods for qualitative researchers. The researchers proposed four key practices for anti-oppressive qualitative research with their framework

grounded in decolonial theory. They offer a thorough and personalized approach when explaining the four practices for improving qualitative research. Each researcher also addresses their positionality concerning their research recognizing that their work is more a way of life than just a career. This paper is similar to Eve Tuck's, "Suspending Damage" in that it will act as a guide for evaluating qualitative research regarding Indigenous knowledge and populations.

Working towards reconciliation at a national level, Canada called for educational institutions to integrate Indigenous knowledge. According to Battiste (2009), naturalizing Indigenous knowledge in educational programs will allow Aboriginal people to decolonize themselves, their communities, and institutions, leading to transformation and change. Marie Battiste is a professor of educational foundations at the University of Saskatchewan. She conducted a literature review on the topic of naturalizing Indigenous knowledge in Eurocentric education. Battiste reviewed the history of Indigenous knowledge education in Canada and puts it into a perspective of power. She is addressing the issue that not one school, college, or university in Canada responds fully to Aboriginal learners. The researcher found that naturalizing Indigenous knowledge in these Eurocentric institutions will allow Indigenous populations to bring power back to their communities. It was stated that Indigenous knowledge creates learning potential for Aboriginal and non-aboriginal learners that Western knowledge cannot provide on its own.

One study, in particular, exemplifies the complexity of re-working and building relationships with Indigenous populations to create a more sustainable and equitable future for all. According to Hill et al. (2021), habitat restoration can be achieved through community connections that form diverse relational webs that exceed partnerships. In this study, a diverse group of people came together to create an action plan for restoring a local creek. Cher Hill is an

Assistant Professor in the Faculty of Education at Simon Fraser University. Rick Bailey is serving as Ɂíçəý Councillor of First Nations Title and Rights, Fish and Wildlife, Treaties, and Justice. Cheryl Power is an Assistant Manager of the UBC Malcolm Knapp Research Forest, and Nicole McKenzie is a Vice Principal in the Maple Ridge School District. This qualitative, action research project brought together members of diverse communities to care for salmon to facilitate holistic healing and restorative learning. The authors (Indigenous and non-Indigenous) addressed the problem of habitat destruction and salmon survival through the lens of indigenous knowledge and partnership. The overall design was action research that focused on restorative practices through ecological restoration, personal restoration, and community restoration. Their methods were specifically situated in a paradigm where knowledge is developed through reflective action, a praxis, grounded in our being in the world. Their work consisted of iterative and ongoing reflection, conversation inquiry, storytelling, and community events. The researchers found that once they formed initial partnerships, they were surprised to learn how many people care about the same things they did and were actively working towards the same solution as them. Through community events and meetings, the overall web of connections grew exponentially. The unique and diverse expertise areas of everyone involved helped amplify their research beyond institutional boundaries and helped create a bridge of communication and healing between Indigenous and non-indigenous communities. The research involved members from all different levels of the community and fields limiting the amount of bias from one party.

Another study focusing on building relationships with Indigenous communities concerning land use policy, stresses the importance of authenticity. According to Gordon et al. (2023), authenticity is more important than ever due to the tension that still resides between Indigenous and Western communities. The authors completed a literature review and quasi-case

study focusing on land management practices and the inclusion of Indigenous knowledge. Historically Indigenous knowledge has been taken over by Western ideals when dealing with land management practices. The authors used an environmental justice lens to review current land management practices and explain how to integrate Indigenous knowledge into Western land management practices through Indigenous-academic partnerships. The researchers stated that to conduct mutually beneficial research, the researchers and Indigenous Communities need to both benefit from the work being done. According to the researchers, one of the biggest challenges with Indigenous knowledge integration deals with authenticity. To this day there is still tension between Western and Indigenous communities, which makes it that much more important to thoroughly and genuinely engage with Indigenous communities if you plan to include their knowledge. It is also important to approach Indigenous knowledge with the least amount of bias possible. They also stated that integrating Indigenous knowledge and Western science into land management has the potential to change the way people collectively care for the land they live on and shed light on long-standing environmental injustices that Indigenous communities still face today.

The inclusion of Indigenous populations was a prevalent theme in many articles focusing on decolonization. A study in particular looked at how including Indigenous populations local knowledge, affects the outcomes of conservation practices. According to Dawson et al. (2021), locally controlled conservation practices on average performed better than operations overseen by external groups. The authors completed a literature review on the topic of the role Indigenous peoples and local communities play in effective and equitable conservation practices. They investigated how different forms of influence affect conservation ideas and practices. The authors wanted to see how outcomes differed in conservation practices when controlled by local

(Indigenous) populations versus external groups. The literature search used keywords to find articles and ended up with 3100 peer-reviewed papers. To sort through these papers, the authors used three inclusion criteria which centered around including any papers with empirical evidence about Indigenous populations or/and conservation effectiveness. The information from these articles was coded thematically to provide some structure and initial direction for analysis. The authors found that locally controlled conservation cases reported positive social and ecological outcomes for over half of their examples (55.9%). Whereas cases that were controlled by external groups only reported positive social and ecological outcomes for a select few areas (15.7%). This shows a stark contrast between conservation outcomes when you include the local population in the planning and execution of said conservation practice decisions.

Many studies stated that place-based knowledge provides Indigenous populations with unique methods and practices that reflect the land in which they have survived since time immemorial. Western science often provides broad answers to complex problems that do not fit every situation that arises in the natural world. According to Baul et al. (2015), the inclusion of Indigenous knowledge can build on the principles of Western science and help provide more contextualized and complete solutions. The authors completed a mixed study examining how Indigenous knowledge can help fight climate change in India. Agriculture is vital in supplying food and income to the rural parts of India. The rising global and local temperatures have had negative impacts on farming for the rural communities of India. The authors wanted to see if the integration of Indigenous knowledge could help farmers in other regions have successful harvests. The study focused on a farming village near Kathmandu. The authors categorized the farms, sent out questionnaires, held focus group discussions, and assessed the vulnerability of each farm. The authors found that the farmers of the Middle Hill region of India, possess a great

deal of local knowledge. The farmers learned from nature and applied these lessons to their farming practices. For example, farmers often made the correct choice when selecting cropping

Lastly, place-based knowledge provides more inclusive learning opportunities for young learners by seeing their day-to-day lives and culture reflected in the curriculum. According to da Silva et al. (2022), the current school system in Papua New Guinea does not support the transmission of a student's Indigenous culture or language. The authors worked together on an action research project focusing on integrating local knowledge into the school curriculum in Papua New Guinea. Papua New Guinea's constituents have more languages than any other country in the world, yet its schools teach in English. The authors are addressing the problem that the school system does not support the transmission of a student's Indigenous culture or language. The authors observed 57 students from the Nalik region of Papua New Guinea. Nalik clans are represented by birds, whereas other clans in the country are represented by their respective animal. The action research project revolved around a circular system in which information about Nalik culture was obtained from dialogue with tribal elders and this information was then shared in community workshops to create instructional material. Through dynamic collaboration students, community leaders, and researchers, were able to work together to create a book for educational purposes that mixed Western and local Indigenous knowledge. The book consisted of eight chapters (New Ireland Province, Nalik area, Nalik society and culture, Origin of clans, birds of New Ireland, description of birds, other important birds in Nalik culture, and information about the book) that covered Nalik culture and local bird species. This allowed students to learn about and express their culture while still meeting the needs of the countries' Westernized curriculum. During the study, participants mentioned that this process of collaboration and inclusion prevented the creation of decontextualized descriptions of local culture.

### **Improving Equitable Teaching Practices Through Integration**

This section focuses on research that deals with integrating Indigenous knowledge into school curricula to improve and diversify learning for Indigenous and non-Indigenous students. Efforts from countries around the world have been sparked by government legislation, such as Canada calling for instructors to Indigenize courses (Wilbiks, 2021).

First in this section, I will be covering three studies that looked for complementarity between inquiry-based science instruction and culturally responsive teaching methods. According to Brown (2017), inquiry-based science instruction can help disadvantaged students achieve academically, but culturally responsive methods are needed to help students embrace their backgrounds, stand against oppressive systems, and prevail over any self-doubt in their abilities. Julie C. Brown is an associate STEM professor at the University of Minnesota and completed a meta-synthesis of culturally responsive and inquiry-based science education in K-12 settings. They aimed to determine the nature and scope of complementarity between culturally responsive teaching methods and inquiry-based science practices. The meta-synthesis included the author examining 52 empirical articles on culturally relevant and responsive STEM teaching methods, through a technique articulated by past research. It included re-reading the studies, recording similarities and differences, categorizing the data, and only including other authors' interpretations if they were backed by direct evidence. The author found that multiple sections of the inquiry framework (NGSS) were complementary to culturally responsive teaching practices and assisted students in expanding their thinking when analyzing sociopolitical problems in specific. However, one section of inquiry (using mathematics and computational thinking and engaging in argument from evidence) was underutilized in assisting culturally responsive teaching practices. The author completed a thorough meta-analysis and organized data in a way

that eliminated as much bias as possible and only included information that was backed by first-hand evidence. This research gives an important look into how our current science curriculum (NGSS) can work with culturally responsive teaching to enhance student learning by incorporating Indigenous knowledge and methods alongside traditional Western science.

Another study focusing on the complementarity between Western science and Indigenous knowledge advocated for integration to improve sustainability education. According to Zidny et al. (2020), the incorporation of culture in science education provides extra meaning to the curriculum and allows students to see their day-to-day lives in their educational experience. The three authors are professors at their respective universities across the world (Sweden, Germany, and Indonesia). They completed a multi-perspective reflection on how Indigenous knowledge can improve science education related to sustainability. They stated the main issue with science education is that students often view the content as irrelevant, boring, and not engaging enough. The researchers stated Indigenous knowledge offers rich contexts to initiate learning interest and connect science education to more holistic worldviews that support sustainability. They stated more work needs to be done on evidence-based curriculum practices that relate to the integration of Indigenous knowledge in science education.

The third resource focused on creating a culturally competent geoscience curriculum by integrating place-based Indigenous knowledge. According to Johnson et al. (2014), successful integration relies heavily upon the strength of the relationship between the Western and Indigenous communities involved. The authors worked together on an action research project focusing on Indigenous knowledge in geoscience. The authors argue for place-based and culturally congruent education systems that allow Western and Indigenous knowledge to work together to create a more holistic learning experience. It should be noted that this study is part of

the Flathead Geoscience Education Project (FGEP). The FGEP's main goal is to diversify geoscience education in local K-16 by promoting Western and Indigenous knowledge integration. The project consisted of a multitude of methods that focused on creating relationships before stepping forward with instructional material and lessons. Members of the FGEP worked with members of the local tribal community going on field trips, participating in meetings, and holding interviews. This allowed the staff members of the FGEP to form relationships with the people they were going to be working with and played a key role in selecting material the tribal community felt was appropriate for inclusion with Western knowledge. Tribal members were filmed on several local field sites discussing native narratives and the historical significance of the specific locations. These films were transcribed and summarized for use in the project's curriculum. The project also held workshops for local 6-12 teachers to prepare them to teach the FGEP's curriculum. The study suggested that the success of this integration in tribal communities relied upon the relationships between members of the local tribal community and members of the Western community. This study highlights the importance of not just including indigenous people in the efforts of the project, but building relationships that go beyond just the academic realm.

Next, I will look at three studies that examined the integration of Indigenous content in classroom settings. These studies were either quantitative/mixed and provided data on how the instruction of Indigenous content affects student outcomes. The first study dealt with integration efforts in the United States public school system. According to Dupis et al. (2017), Indigenous students performed well on test content that included Indigenous knowledge but still failed to match their white counterparts in overall standardized test scores. The researchers completed a correlational quantitative study looking at student achievement on standardized science tests in

Montana. They wanted to see how American Indian students in Montana achieved on state standardized science tests when the test included questions based on Indigenous knowledge. Indigenous students have historically performed worse than their white counterparts on standardized science tests in Montana. The authors wanted to see if Montana's efforts came to fruition in the form of higher-achieving Indigenous students, in the hope to provide a model to other states that share a large population of Indigenous peoples. Their sample consisted of 8th-grade, White, and American Indian students who took the state standardized science test (2584 students 2008-2009, 10,247 students 2009-2010). Test scores were computed with a regression model analysis including the variables achievement, race, gender, and location. The results showed that American Indian students performed better on questions dealing with Indigenous knowledge, but still performed worse than their white counterparts on overall achievement on state science tests. The researchers stressed that much work needs to be done to improve test construction, curriculum development, teacher support, and school funding. This study provides a first-hand look at Indigenous knowledge integration in the United States public school system.

The second study focused on how Indigenous knowledge of the local area (Nigeria) affected student achievement in secondary chemistry courses. According to Ugwu et al. (2016), the integration of Indigenous knowledge and practices into a chemistry course enhanced students' understanding of chemistry concepts and improved overall achievement. The authors conducted a quasi-experimental research study focusing on student achievement in secondary-level chemistry classes, due to the addition of Indigenous knowledge. According to the study, secondary student achievement in chemistry had been lacking over the past few years at the time of the study (2005-2010). The purpose of the study was to integrate Indigenous knowledge into the practices of chemistry teaching for sustainable living and student achievement. The

researchers utilized a pre-test, post-test non-equivalent control group design. 115 secondary chemistry students were randomly selected from 16 public senior secondary schools in Nigeria. The results revealed that the experimental group (Indigenous knowledge integration) achieved significantly higher scores on the final evaluation than the control group (no Indigenous knowledge). The authors hypothesized this could be due to students forming relationships between what they do in their day-to-day lives, and the new topics they learn at school. Due to these results, the authors suggest Indigenous knowledge and practices should be integrated into chemistry teaching as it will help students easily grasp new concepts (in this specific region of the world).

The third study focused on integrating Indigenous knowledge in a social studies classroom to promote intercultural competence. According to Dewi et al. (2022), the integration of Indigenous content can be supplemented by a detailed and thorough process. The authors completed a qualitative research study on the integration of Indigenous knowledge in a social studies classroom in Indonesia. According to the authors, culture is one of the proud assets of the Indonesian state, but with so many cultures, citizens often have trouble understanding and/or recognizing the diversity of Indigenous Indonesian cultures. The researchers' goals were to discover how to integrate Indigenous knowledge into the social studies classroom to promote intercultural competence. The study observed elementary classrooms and elementary teacher programs across the state, and descriptive qualitative analysis was utilized to analyze the results. Data collection methods included a reflective journal, interview, and classroom observations. The authors created a plan for integrating content which involved eight steps (collection and identifying, analyzing, implementing, evaluating students, reflecting the cultural value, evaluating the lesson process, expanding, and sharing). From their results, the researchers

identified three critical reasons for incorporating Indigenous knowledge into school curricula. First, a system like the one they conducted promotes and reflects the cultural values that local people have accumulated since time immemorial. Second, Indigenous knowledge has dissipated over time due to it historically being disregarded by Western establishments. Last, they stated that lectures should cover more advanced topics compared to what was being taught at the time.

To end this section, I will focus on a study that was outside the usual setting of Indigenous knowledge integration. It provided another way to utilize Indigenous knowledge that brings power in the form of health to Western and Indigenous communities. In the field of health, researchers were attempting to integrate Indigenous knowledge to create medical education that is better prepared to deal with planetary health problems. According to Brand et al. (2023), overseeing human and planetary health will require a prepared and environmentally responsible healthcare workforce. The authors are professors or faculty at medical universities in Australia. They worked together on a case study focusing on embedding Indigenous knowledge and voices in planetary health education. They focused on addressing the issues of Western science often not considering the complex interdependence of ecosystems and human health. They aimed to implement educational strategies supported by Indigenous health humanities and arts-based strategies to offer an alternative way of seeing, knowing, and understanding planetary health. The researchers stressed that the approaches provided in this study can be adopted by educators in other countries, specifically mentioning New Zealand, Canada, and the USA as most relevant to their work. They advocated for a change to traditional health profession education that allows for a more inclusive learning experience and that prepares our future medical personnel to provide a healthy future for all.

### **Ontology and Epistemology**

While the whole paper wrestles with the integration of Indigenous knowledge, this section dives deeper into how Ontology and Epistemology regulate the success of integration. Research suggests the coupling of Western and Indigenous knowledge relies heavily on educators' beliefs (Smythe et al., 2020). I will briefly define Ontology and Epistemology below for context.

**Ontology:** What is valid and true; Identifying entities that exist. Asking questions such as: What is the nature of the universe? What is existence? What is the nature of all things true?

**Epistemology:** The decisions we make based on our ontology; Nature of knowledge itself. Asking questions such as: How do we go about knowing things? How do we know what is true? How do we differentiate between true and false?

While these concepts dive deep into the realm of metaphysics and philosophy, research suggests that these concepts can help explain the successes and failures of Indigenous knowledge integration. Before integration takes place, teachers, administrators, coaches, and any other educators need to self-evaluate their own beliefs regarding the content (Mavuso et al., 2021).

To start this section, I discuss a study looking at the ontological overlap in ethnobiology between Western and Indigenous knowledge. According to Ludwig (2016), the integration of Indigenous knowledge is regulated by ontological and epistemological differences or similarities. Ludwig is a university professor and researched the topic of Indigenous knowledge integration. He addressed the issue from a philosophical perspective focusing on the ontological overlap between Western and Indigenous communities. The author provides a literature review with three sections (knowledge integration, integration failures, and ontological self-determination). Each section breaks down different ways in which Indigenous knowledge has attempted to be

integrated, and why on a philosophical level, the integration worked or didn't. Ludwig provided models to show where there was complementarity during integration, and where there was a disconnect between two different ontologies. The author found that in some situations integration was necessary (in the field of ethnobiology) to practice appropriate conservation practices relating to local fauna and animals. Ontological divergence almost always resulted in knowledge integration failure. Ludwig suggests this happens because it would require Western science to have intimate familiarity with the epistemic and social goals of a community and the unique features of its environment. This research points to the importance of ontological overlap as a vital puzzle piece in successful Indigenous knowledge integration.

A second study also examining comparative perspectives analyzed the complementarity between different knowledge systems through the lens of dialectical logic. According to Fleer (2008), dialectical logic is an effective strategy for re-theorizing science teaching and learning in areas with culturally diverse communities. Marilyn Fleer is a professor of early childhood education and development at Monash University in Melbourne, Australia. She conducted a qualitative study review of "Culturally Sensitive Schooling". The researcher aims to add discourse to the topic of culturally sensitive science education methods by building on its constructivist foundation. The researcher conducted a cultural-historical reading of "Culturally Sensitive Schooling" and added commentary to re-theorize the previous studies' findings from a different lens. She utilizes the framework of dialectical logic to guide her critique of the article. The author explains the constraints of a constructivist viewpoint when integrating Western schooling and Indigenous knowledge in early science education. She also offers points for further research to work towards the successful integration of methodologies in science curricula. This research provided me with a social science perspective analyzing current education

practices relating to the complementarity of Western and Indigenous science knowledge/methods.

Teachers however have biases that leave them unable to integrate knowledge. I will examine three studies focused on teachers. First, according to Ogunniyi (2004), before teachers can begin integrating Indigenous knowledge, they need to address the biases they may have towards the content. Ogunniyi completed a mixed research project on the topic of preparing science teachers in higher education to integrate Indigenous knowledge systems into their teaching practices. The colonization of Africa by multiple Western countries has led to the erasure of local Indigenous cultural values and practices over time. Ogunniyi wanted to assess current teachers' (Cape Town) worldviews and attitudes towards Western and Indigenous science. To assess teachers' worldviews, the MIAN (My Idea About Nature) test was used and was given before and after the PISME (Psycho-socio-cultural Issues in Science and Mathematics Education) module. This test consisted of eight fictitious stories dealing with different types of natural phenomena. It asks teachers to express agreement, disagreement, or don't know statements in response to the story. The researcher found that while a lot of work still needs to be done to understand the worldviews of this sample of educators, the goal of working against internal bias towards Indigenous knowledge was achieved in some light. She suggested that higher education teacher programs should give pride of place (locality) to learners' Indigenous knowledge systems so that their teachers are more prepared to overcome their prejudices when teaching Indigenous content. When integrating Indigenous content educators (being non-Indigenous) will have to navigate the ontologic and epistemic differences to the knowledge system they are aiming to integrate into their lesson.

Another study focusing on teacher perspectives looked at how Indigenous knowledge

was viewed by educators and students. According to Douglas et al. (2020), Indigenous knowledge is often labeled as “difficult” due to its difference from Western knowledge. This qualitative research project focused on renegotiating relationships with Indigenous perspectives and knowledges. They addressed the problem that Indigenous perspectives and knowledge have been rendered “difficult” to teach and learn due to settler-colonial norms that are naturalized through the K-12 education system in Ontario's public school system. A critical question they asked themselves was, “How do teachers with diverse populations of students critically engage pedagogy and knowledge when making visible indigenous perspectives and knowledges in classrooms in ethical ways.” Two of the authors conducted practitioner inquiry research in K-12 classrooms in an urban area of southern Ontario, Canada. Practitioner inquiry was used to make an explicit connection between the stance of the teacher and learners, who draw on their positionalities to create knowledge. The researchers conclude that although students experience disruptions, they seek out new currents so that they can renegotiate relationships and come to new understandings about their contexts. They stated there is nothing inherently difficult about Indigenous perspectives and knowledge. It is viewed as disruptive because it asks students to think about the world differently and to consider how notions of settler colonialism have shaped their worldview. The researchers acknowledged their different positionalities as it is a multi-author paper with each taking a slightly different approach, yet all having the same end goal. Each has had extensive public school teaching experience and aims to serve the community they live in. There may be some bias that all researchers are from the same university, but no outside motive can be noted. This paper took a narrower approach and focused on the classroom teacher. Looking at the differences they can make in how we look at Indigenous knowledge incorporation and perceived attitude towards teaching and learning the content.

The last study dealing with teachers' bias, developed a method for investigating science teachers' views on Indigenous knowledge. According to Cronje et al. (2015), while many educators in South Africa recognize the value of Indigenous knowledge, many science teachers still struggle to authentically incorporate Indigenous knowledge into their classroom experience. The researchers are professors at the University of Johannesburg in South Africa. They worked together on a qualitative study that aimed to develop and validate a tool used to evaluate teacher views towards Indigenous content. The researchers administered the test to 46 science teachers in rural and metropolitan areas of South Africa. They stated that it was very difficult to establish the validity or trustworthiness of this tool based on the information they gathered due to the nature of the issue being quite complex and multifaceted. However, they stated the study gave insight into how educational programs can shape teaching training to focus on the integration of Indigenous knowledge in an authentic and meaningful way. It can also be used as a pre-, and post-test questionnaire that will allow education programs to evaluate how successful their integration training was.

Finally, Bohenseky et al. (2011), examined the language used by researchers when conducting studies about integrating Indigenous knowledge. This study emphasized the importance of the language and how it affects current and future research regarding the integration of Indigenous knowledge. According to Bohenseky et al. (2011), the integration of Indigenous knowledge is far more complex than a difference in agendas between different groups. The authors completed a literature review on the topic of Indigenous knowledge integration in science over the last decade (2001-2010). The authors aimed to advance appropriate knowledge integration processes. The literature review contained 50 papers including, collected works, special journal issues, and edited books. The criteria for selecting

articles focused on including Indigenous knowledge, local knowledge, traditional knowledge, and concepts of social-ecological systems. The authors approached this review with three overarching questions; “What themes, questions, or problems are encountered for the integration of indigenous knowledge and science? What is the relationship between knowledge integration and social-ecological system resilience? What critical features of knowledge integration practice need greater emphasis to foster productive and mutually beneficial relationships between indigenous knowledge and science?”. The authors found that the integration of Indigenous knowledge is far more complex than just the duality of technical and political agendas that previous studies had highlighted. The literature they analyzed stressed the importance of comprehending the nuanced meanings of the language used to analyze processes of bringing two knowledge systems together. The authors suggested rather than just maintaining knowledge identities during integration, knowledge identities should be enriched through interaction with one another.

### **Summary**

Thus far, I have looked at what research says about decolonization efforts through education, the best teaching practices associated with integrating Indigenous knowledge, and how ontological differences affect integration efforts along with teachers' perceived attitudes towards the content. Throughout all three sections, all research stressed the importance of including Indigenous populations in the integration process. In the next section, I will apply these findings to my particular research site at “Western” middle school in the lower Puget Sound area.

### **Action Plan**

Research has shown that the integration of Indigenous knowledge is a complicated process that has no one solution. Each case of integration deals with its nuances of language

culture, geological location, and much more. Locality plays an enormous role in the specifics of each case of integration. However, through my literature review, I found three key components that impacted the integration (design and outcomes) of Indigenous knowledge across the globe. The first component focused on the aspect of decolonization as a goal for indigenous populations in the integration process. The second component dealt with best practices for integration by looking at the outcomes for Indigenous and non-indigenous students. And the third component established ontology and epistemology as key regulators of integration.

The site I am utilizing for my action plan is a middle school located in Western Washington. I will refer to the school as Western Middle School (pseudonym). I will be a long-term substitute in a 7th-8th grade science classroom, for the 4th quarter of 2023. Western Washington is home to multiple large military bases and Native Reservations often leading to diverse school populations. This school is located in a more suburban area of Western Washington (American Indian/ Alaskan Native 1.2%, Asian 8.6%, Black/ African American 5.7%, Hispanic 23%, Native Hawaiian/ Other Pacific Islander 3.0%, Two or More Races 16.6%, and White 41.9%).

In the section below, I will be walking through Action Plan tables where I will discuss what research has said about a topic, how my site school approaches the topic, and what I recommend to be acted on.

### **Decolonization in Education**

Research suggests that the inclusion of Indigenous people in the creation and implementation of Indigenous knowledge plays an important role in the accuracy and success of integration. Sadly, a lot of historical information on Indigenous populations comes from outdated (racist) settler perspectives where Indigenous populations were viewed as subjects, not humans.

By including Indigenous populations, something as simple as re-narrating a tribal film (by tribal members) can have a huge impact on the message of the educational content (Dollman 2021).

**Table 1**

*Decolonization in Education Action Table*

Research	“Western Middle School”	Recommendation
<p>Decolonization starts with recognizing the past to make changes and build relationships for the future. Indigenous communities have historically been framed as damaged, and a shift must be made to focus on desire (Hill et al.,2021; Tom et al., 2019; Tuck, 2009).</p>	<p>The school has a land acknowledgment recognizing the past that they say on the morning announcements after the pledge of allegiance. The school also has an Indigenous People’s Day where a PowerPoint is shown in advisory. The history classes are supposed to teach the STI curriculum provided by the state that covers local historical treaties and events that led to the suppression of many Indigenous tribes’ identities and power. I talked with one middle school history teacher and he stated that a lot of what they decide to teach is in the power of the teacher.</p>	<p>The school should also have time set aside to talk about the land acknowledgment and allow students to engage with each other about the topic. Rather than just talking about these issues in advisory, it would be beneficial to tie conversations about Indigenous peoples and beliefs into other classes as well (math, science, history, language arts, etc.). The only class that seems to teach about Indigenous peoples in history/social studies</p>
<p>The inclusion of the local Indigenous population in the planning and execution of integration plays a key role in the accuracy, message, and effect on the community (Dawson et al., 2021; Hill et al.,2021; Tuck, 2009).</p>	<p>To the best of my knowledge, Western does not have any members from the local tribe play a part in the creation or execution of the land acknowledgment or the Indigenous People’s Day PowerPoint. I also do not see any links on the school website to any information about connections with our local tribe.</p>	<p>The school/district should reach out to local tribal reservations as a step to establish a partnership. The land acknowledgment and PowerPoint had quality information, but I believe the content’s accuracy and message can be enriched by adding local context and meaning.</p>
<p>Place-based Indigenous</p>	<p>The school’s Indigenous</p>	<p>Efforts should be made by the</p>

<p>knowledge teaches people about the environment they live in and helps bring identity and power back to historically overlooked populations (Baul et al., 2015; da Silva et al., 2022; Dawson et al., 2021; Mawere et al., 2022).</p>	<p>knowledge content seems to reflect ideas of our state/nation more than the immediate tribal communities near the school. I talked with a history teacher at the school and he confirmed that only state-provided material is used (if teachers commit to using it).</p>	<p>district to understand and represent the native populations that attend their schools. It would be beneficial to all students to introduce place-based learning content that reflects the local environment.</p>
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**Best Practices for Integration**

This section focuses on the best practices for integration from studies that focused on classroom experiences. A lot of recommendations from this section are focused on local knowledge and reflect the area in which the study took place. However, there are still important takeaways that can be applied to other integration efforts.

**Table 2**

*Best Practices for Integration Action Table*

Research	“Western Middle School”	Recommendation
<p>The integration of Indigenous knowledge with Western curriculum can assist students in grasping sociopolitical issues and provide them with a new lens for approaching a topic (Brown, 2017; Ugwu et al., 2016).</p>	<p>The Indigenous People's Day advisory slide is the only content I have seen. The state's STI curriculum is online and required to be covered in 7th and 8th-grade history/social studies. I talked to a social studies teacher and they stated that the responsibility lies in the individual teacher to cover the topics.</p>	<p>The school district/school should require and support teachers to utilize the STI curriculum that is made available by the state. This content could also be covered more frequently in advisory where students often tackle sociopolitical issues.</p>
<p>The integration of Indigenous knowledge should be a thorough process that goes beyond the classroom.</p>	<p>The district/school process to the best of my knowledge relies on using state-provided resources. I was able to talk</p>	<p>The school/district should go beyond the resources they have provided and work on a plan to create a more</p>

Integration should promote intercultural competence and reflect the values local peoples have accumulated since time immemorial (Dupis et al., 2017; Dewi et al., 2022).	with a social studies teacher and confirm that only state-provided material is being used, if at all.	complete contextualized curriculum and set of resources that reflect the local Indigenous population.
The success of integration heavily relies upon the authenticity and strength of the relationship between Indigenous and Western communities (Dupis et al., 2017; Johnson et al., 2014).	One high school in the district has an after-school Native STEAM program that focuses on robotics, Drones, art, and traditional plants & foods.	The district should build on this program by expanding to more schools in the district. They could also increase the number of students exposed to this content by integrating it into part of the school day

**Ontology & Epistemology**

The last table focuses on how ontological and epistemological differences shape the integration process. Research suggests educators must first take a look at themselves and their positionality with the content before jumping into integration.

**Table 3**

*Ontology & Epistemology Action Table*

Research	“Western Middle School”	Recommendation
According to one author, ontological divergence almost always leads to integration failure because it asks Western science to have intimate familiarity with the epistemic and social goals of an external community (Ludwig, 2016).	There would need to be more integration efforts from the school for this to apply. However, if integration were to happen tomorrow, it would most likely fail due to unfamiliarity with the intimate details of our local tribal communities.	The school/district needs to form intimate relationships with our local tribe before integrating local Indigenous knowledge into classroom content. This starts with reaching out to the local tribe. While it would be more effective from a district decision, a teacher can also make a difference by reaching out to the local tribe.
Educators must recognize and	The district has PD days	When the school/district

<p>work against the inherent internal bias they face when attempting to integrate Indigenous knowledge (Douglas et al., 2020; Mavuso et al., 2021; Ogunniyi, 2004).</p>	<p>where teachers go through training on various topics. Not sure if Indigenous knowledge is one of those topics. (If there is not much integration then there would probably be no training on it).</p>	<p>chooses to integrate Indigenous knowledge in various classes, the teacher should go through the proper training, to address the bias, they have towards the content. It also allows teachers to become more familiar with the content and allow for collaboration with other teachers about the topic. The district should develop PLC training in correspondence with our local tribal leaders. I would recommend that you have a tribal member lead the training.</p>
<p>Knowledge identities are enriched through interaction with one another; rather than maintaining and treating each knowledge system as isolated (Bohensky et al., 2011, da Silva et al., 2022).</p>	<p>Knowledge systems seem to be separated and I have not seen much interaction between the two. When Indigenous content was involved, it stood alone on its day separate from other subjects.</p>	<p>The school/district should put effort into integrating Indigenous content into more classroom settings in combination with Western content. With proper material that represents the local Indigenous populations, knowledge systems can be enriched through interaction. As with all other suggestions relationships need to be formed. This can be achieved through community meetings, visits to the tribe, attending tribal council meetings, and inviting tribal members to our local schools.</p>

**Summary**

As discussed above, there are various recommendations stemming from what I discovered in the literature review. So far, my site has failed to meet the expectations suggested by research in multiple ways. I have not personally seen any example of Indigenous knowledge integration

since I started my long-term sub position in science. The school is within 10 miles of an Indigenous reservation and has plenty of opportunities to form and create relationships. In the upcoming section, I will explore the challenges that integration faces and answer the three focal questions mentioned at the beginning of this paper. I will also make recommendations for what should follow in this project.

### **Discussion**

The purpose of this project aimed at evaluating the current landscape for Indigenous knowledge integration in education across the globe. Research showed multiple key findings brought forth by the varying degrees and perspectives of integration efforts across studies. While Indigenous knowledge places insurmountable importance on place-based local knowledge, I believe certain lessons and principles can be applied to benefit any instance of Indigenous knowledge integration. Most importantly, the inclusion of Indigenous peoples in an authentic way lays the groundwork for successful integration to even be possible. Without thoroughly creating relationships with populations whose knowledge system you aim to explain, the learning experience can be shallow and misrepresent the population you aim to speak for. While my site school has a land acknowledgment, I fail to see examples of authentic integration or relationship-building with our local Indigenous communities.

### **Discussion of Findings**

For my literature, I used three questions to guide my research on the integration of Indigenous knowledge. These questions were [1] What does research suggest are the best models for Indigenous knowledge being incorporated into education? [2] How does the addition of Indigenous knowledge affect student learning (Indigenous and non-Indigenous)? And [3] How do ontological differences and similarities regulate the integration of Indigenous knowledge? I

will start by addressing these questions based on implications from the research I selected, and then I will compare integration studies from the United States to international literature.

### *Addressing the Original Research Questions*

#### **What Are the Best Models for Incorporating Indigenous Knowledge in Education.**

My first question focused on the overall big picture of Indigenous knowledge integration pulling from examples from all over the world. There are two main ways in which educators can improve their strategies for integrating Indigenous knowledge. Educators should include Indigenous populations in the planning and execution of the integration process, and educators should work toward forming authentic relationships with their local Indigenous tribe. My thought here was to find as many different types of Indigenous knowledge integration examples as I could find. This allowed me to find commonalities between integration methods that will hopefully apply to most, if not all instances of Indigenous knowledge integration across the globe. I believe the most important factor that played a part in successful knowledge integration was the inclusion of Indigenous populations in every step of the process (Dawson et al., 2021; Hill et al., 2021; Tuck, 2009). Tuck acted as a guide for future research, that Hill & Dawson followed. These studies incorporated Indigenous people in the planning, execution, and reflection of said knowledge integration. If it were not for these Indigenous communities in the first place, there would be no knowledge to integrate, so it only seems right that we include those who have thrived on this knowledge since time immemorial. When Indigenous populations are not included in these steps the content was often lacking accuracy and meaning (Palmer et al., 2009). While the researchers in this study had positive intentions, they failed to communicate with the local Indigenous population in the creation of the college course. The key factor of not including any Indigenous people in the planning and teaching of this college course can explain

the inconsistent findings of the integration affecting a student's learning experience. Another key takeaway from looking at Indigenous knowledge integration examples was the authenticity of relationships between Western and Indigenous communities (Gordon, 2023). To include Indigenous populations in the process of knowledge integration there needs to be appropriate relationships formed between members of each community. These relationships will help build the groundwork for successful integration instances, as the information is more likely to accurately and authentically represent the local Indigenous populations. Each instance of Indigenous knowledge integration will be different. It will require its own unique set of interactions and methods, but the notion of authentically working to create a partnership between Western and Indigenous communities is universally applicable.

At my site school, I was not able to find any connection with our local Indigenous tribe. The closest thing I was able to spot during my time, was the district having a day to honor Billy Frank Jr. However, while his picture was displayed on our virtual message board at the front of the school. There was no mention of it throughout the day, and I did not hear a single teacher or student talk about Billy Frank Jr. or any other historical Indigenous figure. I believe the main reason why the school district is failing to build relationships with our local Indigenous tribe is due to a lack of effort. At this moment, there are not enough people in administration or at the teaching level who authentically value the benefit of forming relationships with our local tribe.

**How Does the Addition of Indigenous Knowledge Affect Student Learning.** My second focal question aimed at finding quantitative or mixed studies that showed the results of Indigenous knowledge integration on students' understanding of the topics covered. I believe that including more voices will almost always give you a complete and more accurate picture of a situation/topic. While it may have started as my personal belief, research backed up that

statement with examples of increasing student achievement in a wide range of age groups and content areas. Researchers hypothesized that this achievement increase was a result of creating more meaningful experiences for students, by connecting their day-to-day lives with the content covered in class (Ugwu, 2016). This study while not huge, (115 participants) showed a drastic difference between students who were exposed to Indigenous content and those who were not. This study shows support for the increase in achievement for Indigenous students as their Indigenous culture is deemed relevant to modern science practices. A lot of Indigenous knowledge centers around survival and has an intimate connection with the local ecosystem. I believe it provides those who are part of historically marginalized communities a sense of belonging and power that their knowledge is being recognized. For those that are not, it provides another lens to understand a topic and even a new way to think about the natural world in many instances. There was one instance of Indigenous content being included on a (United States) state standardized test. The integration effort was not perfect and the researchers pointed to much work needing to be done to further Indigenize curriculum and state standardized tests. However, students that identified as being Indigenous had higher scores on questions that dealt with Indigenous knowledge and concepts (Dupis et al., 2017). The integration of Indigenous knowledge did not seem to have any negative impacts on students' achievement or success in any of the research covered. While Indigenous knowledge may not immediately increase all student scores or understanding it was hard to see any downside to authentically integrating Indigenous knowledge in students' learning experiences (K-12 & university).

**How do Ontological Differences and Similarities Regulate the Integration of Indigenous Knowledge.** My third focal question took a step back and approached the topic from a philosophical perspective. Most of the research I looked at assumed that knowledge integration

was possible from the start and there was little disagreement between the articles on that topic if even mentioned at all. However, I came across a study that focused solely on the aspect of whether integration between these two knowledge systems is even possible in the first place (Ludwig, 2016). Ludwig suggested that when there is an ontological difference between two knowledge systems, integration faces a steep hill that it (in most cases) cannot climb. This is because the Western world as a whole does not have a deep understanding of Indigenous populations. For integration to be successful without ontological overlap would require Western science to have intimate familiarity with the epistemic and social goals of Indigenous communities, along with a deep understanding of the local environment. This focal question also led me to find research that looked at how educators viewed Indigenous knowledge. In a lot of examples, educators had not realized the amount of internal bias they had towards another knowledge system, and how it shaped their approach to teaching Indigenous content (Douglas et al., 2020; Mavuso et al., 2021; Ogunniyi, 2004). Each of these studies focused in some aspect on the minds of teachers, and how they will affect the integration process. Teacher preparation programs should include local Indigenous knowledge within the multicultural classes offered by the university or college. To properly and authentically do that, schools would need to create positive relationships with our local tribal populations.

At my site school, I was able to talk with our lead social studies teacher on the topic of the STI curriculum. I found out that there are a lot of inconsistencies between schools and teachers in the district when it comes to teaching STI curriculum. At my site school, the social studies team had one meeting about how they would teach the STI curriculum and what they would cover for the year. My site school seems to have all the teachers on the same page of what they are going to teach, but not necessarily how. At other schools, there were talks about teachers

being on their own when it comes to STI content, and some teachers not covering it at all. There seems to be a big disconnect at the district-wide level on how teachers should be approaching using the STI curriculum. I also found out that the teachers had no specific training on how to use the STI curriculum (to the best of my sources memory).

### ***United States Vs. International Research on Indigenous Knowledge***

When it comes to Indigenous knowledge integration, the United States falls short compared to international efforts. I originally attempted for my project to solely be based upon the United States education system and how it dealt with the integration of different knowledge systems. But after a few weeks of research, it seemed I had run out of sources that I felt applied to my focal questions. As I started looking through other countries' resources, it was clear that the United States has a lot of work to do. Most of my resources came from Canada and South Africa, where Canada's efforts were set in motion by a national decree requiring educators to Indigenize their curriculum.

United States sources focused mainly on higher education and standardized testing when it came to Indigenous knowledge integration (Estrada et al., 2022; Johnson et al. 2014). It seems that studies from the United States were more focused on trying to make Indigenous knowledge fit into a Western model, instead of truly honoring another knowledge system. For example, a study looked at the complementarity between N.G.S.S (Next Generation Science Standards) and culturally responsive teaching methods (Brown 2017). I think the study assumed there was going to be complementarity and was trying to find any way possible to represent that. Instead of viewing Indigenous knowledge as a mode of learning, the researcher wanted to "find its place" in Western education. Compared to a study I covered from Canada, where the Western researcher was just one piece of the puzzle (Hill et al. 2020). Members of the tribe were included in every

step of the process, including writing the formal research paper. Instead of trying to fit Indigenous knowledge into a Western model, this study honored and valued Indigenous knowledge as a vital instrument for healing their local watershed.

### **Implications for Education Stakeholders**

Indigenous knowledge integration in the United States seems to lack behind other established countries such as Canada, New Zealand, and multiple African countries. With there being 50 different states and 574 different recognized tribal communities in the United States, there is great diversity in methods and content related to the knowledge integration process. I happen to teach in a state that has an established state-wide STI (since time immemorial) curriculum. However, even with this established curriculum available, seven years later the content has still not been integrated into all classrooms and grade levels across the state. In my time at my site school, I have not seen the use of the STI curriculum across any subject/grade level. While the resources are there, it does not seem to be enforced by the district or even principals to utilize the STI curriculum. On a global scale, the implications are complex and simple at the same time. The goal of decolonization through education is present in all instances of knowledge integration, but the intricate local nuances of culture that differentiate between Indigenous populations across the world will make each instance unique.

### ***Policymakers***

I believe the best step for policymakers to take at this point would be to strengthen and deepen Indigenous curricula in areas that have already adopted this type of instructional material. For areas that have not adopted any curricula at this point, policymakers should require school districts to take the proper steps to form relationships with tribal communities. Policymakers should also require school districts to hire members of the local tribal community to host

community meetings with educators and school district staff (if wanted by the Indigenous community). However, if the process is rushed by policymakers and school districts the curriculum created will not authentically represent the local Indigenous populations.

### ***Schools/District***

Schools/districts have the most power when it comes to making important decisions regarding the integration of Indigenous knowledge. Districts especially have the power to start the path toward creating authentic relationships with Indigenous communities. These could be community talks, visits to the tribal reservation by district staff, or hosting events focusing on reconciliation. The important part here is that districts have the power to establish these events, acting as a catalyst for branching Western and Indigenous communities together. Before even attempting to Indigenize a certain curriculum, members of the Indigenous community need to fully trust the members of the Western community they are going to be working with. You can't just send a district admin to the tribe and expect in one day to walk away with everything you need to integrate Indigenous knowledge into the curriculum. Instead, these relationships should be built over months and years where the goals of not only the district but that of the tribe are honored as well. There will always be teachers who go above and beyond to create and more diverse classroom experience. However, the main responsibility lies in districts and schools to make changes that stick and are followed for years to come.

### ***Educators***

Teachers have the power to bring more attention to the issue of integrating Indigenous knowledge and to start the process of forming relationships with our local tribal communities. Through interactions I have had with tribal members in the Puget Sound area, sometimes it's as simple as having a conversation and reaching out to get the process started. Teachers can form

relationships by showing genuine interest in another's culture, and simply listening to what someone else has to say. Teachers can also push through their union to have the issue brought up in meetings and reach a wider range of audience. Teachers that have STI curricula available in their state, should familiarize themselves with the content, and address any internal bias they may have towards the content (as a reminder, Since Time Immemorial curriculum was developed by the state government and the tribes who occupy that state in efforts to work towards decolonization and understanding Indigenous history). However, most educators will not recognize this internal bias until deep questions are asked about their viewpoint on the Indigenous knowledge and messages they share with their students.

Regardless of whether your state, country, or locale has an official Indigenous curriculum, educators should reach out to their local tribe to start the process of creating a trusting relationship between Western and Indigenous communities. While I do not believe this responsibility should lie solely on teachers to start this process, it may be the only way we start to see Indigenous knowledge utilized more in public education. Teachers may be the spark needed to start the fire.

### **Implications for Future Research**

Indigenous knowledge integration is still relatively new, especially in the United States with politics playing a huge part in which states have adopted Indigenous curriculum. In terms of methodology, future research should focus on building relationships with Indigenous populations before attempting to integrate Indigenous knowledge. Once these relationships are built, then researchers can start setting up studies to see the effects that authentic Indigenous knowledge integration can have on students. The populations being studied should be included in

every step of the process and the goals/outcomes of said research should be just as important as their Western counterparts.

There is still a lot of research that needs to be done on how Western and Indigenous communities work to build authentic relationships that are in the interest of both parties. While the general implications of said research will apply to the global effort of bringing power back to Indigenous communities all around the world, the specifics of each case will relate to its locality. I believe future research will have its greatest impact at the local level. Researchers should be asking questions about the goals of Indigenous communities in the process of reconciliation and how Western communities can help aid that process (if wanted).

In terms of specific studies, I want to see research that asks, “How can Western and Indigenous communities overcome ontological divergence to form authentic relationships that benefit all involved?”. I would also like to see research that asks, “What effect does non-concurrence in teachers' opinions on Indigenous knowledge integration have on student outcomes?”

### **Limitations of the Project**

My research contained sources from the years 2004-2022. However, only five articles were from 2004-2009. All the other sources were from 2014 and up, with 11 articles coming from the year 2020-2023. I started off my research trying to find the most recent articles possible, but I found out fairly quickly that this was not going to net me enough resources in total. I originally wanted to keep my articles to North America (U.S.A & Canada), but also quickly realized that would not be possible due to a lack of resources in the United States. I decided to include sources from all over the world as the theme of fighting against oppression applied to all instances of Indigenous populations regardless of geographic location. I was only

at my site school for the 4th quarter of the 2023 school year as a long-term sub. This limited the amount of exposure I had when trying to figure out the amount of Indigenous content being taught at the school, especially in other subjects. Being a substitute this year has made it difficult to get a good understanding of a school's culture as I am constantly moving between buildings daily. While I am now in a long-term sub position, I did not substitute at this school before the 4th quarter and have little knowledge of what the rest of the school year was like for my site.

### **Conclusion**

The integration of Indigenous knowledge is a complex multifaceted issue that demands attention and action from researchers and educators. In this paper, I have tried to explore what the possibility is for largely settler communities to engage with Indigenous knowledge and authentically work with Indigenous communities. Indigenous communities all over the globe are fighting to retake power and have their voices heard. The narrative of their history, culture, and ways of life should be told from their perspective. The world is constantly changing and the inner workings of a Western empire are being reworked, (even if against the will of the system) due to the pressure from Indigenous populations fighting to take back power, self-identity, and respect.

### References

- Battiste, M. (2009). Naturalizing indigenous knowledge in eurocentric education. *Canadian Journal of Native Education*, 32(1). <https://doi.org/10.14288/cjne.v32i1.196482>
- Baul, T. K., & McDonald, M. (2015). Integration of indigenous knowledge in addressing climate change. *Indian Journal of Traditional Knowledge*, 1(1), 20–77.
- Bohensky, E. L., & Maru, Y. (2011). Indigenous knowledge, science, and resilience: What have we learned from a decade of international literature on “Integration”? *Ecology and Society*, 16(4). <http://www.jstor.org/stable/26268978>
- Brand, G., Wise, S., Bedi, G., & Kickett, R. (2023). Embedding indigenous knowledges and voices in planetary health education. *The Lancet Planetary Health*, 7(1), e97-e102. [https://doi.org/10.1016/S2542-5196\(22\)00308-4](https://doi.org/10.1016/S2542-5196(22)00308-4)
- Brown, J. C. (2017). A meta-synthesis of the complementarity of culturally responsive and inquiry-based science education in K-12 settings: Implications for advancing equitable science teaching and learning. *Journal of Research in Science Teaching*, 54(9), 1143–1173. <https://doi-org.offcampus.lib.washington.edu/10.1002/tea.21401>
- Cronje, A., De Beer, J., & Ankiewicz, P. (2015). The development and use of an instrument to investigate science teachers' views on indigenous knowledge. *African Journal of Research in Mathematics, Science and Technology Education*, 19(3), 319-332. [DOI:10.1080/10288457.2015.1108567](https://doi.org/10.1080/10288457.2015.1108567)
- Estrada, M., Young, G., Flores, L., Hernandez, P. R., Hosoda, K. K., & DeerInWater, K. (2022). Culture and quality matter in building effective mentorship relationships with native STEM scholars. *BioScience*, 72(10), 999–1006. <https://doiorg.offcampus.lib.washington.edu/10.1093/biosci/biac064>

- Fleer, M. (2008). A cultural-historical reading of “culturally sensitive schooling”: thinking beyond a constructivist view of science learning. *Cultural Studies of Science Education*, 3(3), 781–786. <https://doi-org.offcampus.lib.washington.edu/10.1007/s11422-008-9114-0>
- da Silva, C., & Volker, C. (2022). Integrating local traditional wisdom into school: An example from Papua Guinea. In *State of the Art of Indigenous Languages in Research* (pp. 34–40). UNESCO.
- Dawson, N. M., Coolsaet, B., Sterling, E. J., Loveridge, R., Gross-Camp, N. D., Wongbusarakum, S., Sangha, K. K., Scherl, L. M., Phan, H. P., Zafra-Calvo, N., Lavey, W. G., Byakagaba, P., Idrobo, C. J., Chenet, A., Bennett, N. J., Mansourian, S., & Rosado-May, F. J. (2021). The role of indigenous peoples and local communities in effective and equitable conservation. *Ecology and Society*, 26(3), 1–. <https://doi.org/10.5751/ES-12625-260319>
- Dewi, K. P. ., Probosiwi, P., & Rahmawati, I. . (2022). The integration of indigenous knowledge in the social studies classroom to promote intercultural competence. *Taman Cendekia: Jurnal Pendidikan Ke-SD-an*, 6(2), 35–48. <https://jurnal.ustjogja.ac.id/index.php/tamancendekia>
- Douglas, V., Purton, F., & Bascuñán, D. (2020). Possibility not difficulty: Difficult knowledge in K-12 classrooms as opportunities for renegotiating relationships with Indigenous perspectives and knowledge. *Alberta Journal of Educational Research*, 66(3), 307–324.
- Dollman, M., Sorrell, R., & Jenkins, J. L. (2021). Tribesourcing Southwest Films. *KULA Knowledge Creation, Dissemination, and Preservation Studies*, 5(1), 1–7.

<https://doi.org/10.18357%2Fkula.133>

- Dupuis, J., & Abrams, E. (2017). Student science achievement and the integration of Indigenous knowledge on standardized tests. *Cultural Studies of Science Education*, 12(3), 581–604. <https://doi-org.offcampus.lib.washington.edu/10.1007/s11422-016-9728-6>
- Gordon, H. S. J., Ross, J. A., Bauer-Armstrong, C., Moreno, M., Byington, R., & Bowman, N. (2023). Integrating indigenous traditional ecological knowledge of land into land management through Indigenous-academic partnerships. *Land Use Policy*, 125, 106469. <https://doi-org.offcampus.lib.washington.edu/10.1016/j.landusepol.2022.106469>
- Hill, C., Bailey, R., Power, C., & McKenzie, N. (2021). Supporting communities in caring for salmon and each other: Creek restoration as a site for multi-system change and wholistic re/conciliation. *Canadian Journal of Action Research*, 21(3), 72–94.
- Johnson, A. N., Sievert, R., Durglo, M., Finley, V., Adams, L., & Hofmann, M. H. (2014). Indigenous knowledge and geoscience on the flathead indian reservation, northwest Montana: Implications for place-based and culturally congruent education. *Journal of Geoscience Education*, 62(2), 187–202. <https://doi.org/10.5408%2F12-393.1>
- Ludwig, D. (2016). Overlapping ontologies and Indigenous knowledge. From integration to ontological self-determination. *Studies in History & Philosophy of Science Part A*, 59, 36–45. <https://doi-org.offcampus.lib.washington.edu/10.1016/j.shpsa.2016.06.002>
- Mawere, J., Lee, K. S., & Tshamano, W. (2022). Curriculum transformation in South Africa: An indigenous knowledge systems perspective. *Journal of African Education*, 3(3), 11-27.
- Mavuso, M. P., Olawale, B. E., & Mkosi, N. (2021). Integration of indigenous knowledge in the intermediate phase curriculum: A case of South African schools. *Knowledge, Innovation and Enterprise*, IX, 7–19.

- Mpofu, V., Mushayikwa, E., & Otulaja, F. (2014). Exploring methodologies for researching indigenous knowledge of plant healing for integration into classroom science: Insights related to the data collection phase. *African Journal of Mathematics, Science and Technology Education, Vol. 18*, 164–175. <https://doi.org/10.1080/10288457.2014.928451>
- Ogunniyi, M. B. (2004). The challenge of preparing and equipping science teachers in higher education to integrate scientific and indigenous knowledge systems for learners: the practice of higher education. *South African Journal of Higher Education*, 18(3), 289-304.
- Palmer, M., Elmore, D., Watson, M., Kloesel, K., Palmer, K. (2009). Xoa: dau to maunkau: integrating indigenous knowledge into an undergraduate earth systems science course. *Journal of Geoscience Education.*, 57(2), 137–144. <https://doi.org/10.5408/1.3544247>
- Smythe, W., Clarke, J., & Hammack, R. (2020). Native Perspectives about Coupling Indigenous Traditional Knowledge with Western Science in Geoscience Education from a Focus Group Study. *Original Paper*. <https://doi.org/10.22158/grhe.v3n2pxx>
- Thambinathan, V., & Kinsella, E. A. (2021). Decolonizing methodologies in qualitative research: Creating spaces for transformative praxis. *International Journal of Qualitative Methods*, 1–9. <https://doi-org.offcampus.lib.washington.edu/10.1177/16094069211014766>
- Tom, M. N., Sumida Huaman, E., & McCarty, T. L. (2019). Indigenous knowledges as vital contributions to sustainability. *International Review of Education*, 65(1), 1–18. <https://doi.org/10.1007/s11159-019-09770-9>
- Tuck, E. (2009). Suspending damage: A letter to communities. *Harvard Educational Review*.79(3), 409–428. <https://doi.org/10.17763%2Fhaer.79.3.n0016675661t3n15>
- Ugwu, A. N., & Diovu, Christian. (2016). Integration of indigenous knowledge and practices into chemistry teaching and students' academic achievement. *International Journal of*

*Academic Research and Reflection*, 4(4).

Wilbiks, J. M. P. (2021). Indigenizing the introduction to psychology course: Initial course content suggestions and call for collaboration. *Canadian Psychology / Psychologie Canadienne*, 62(4), 391–399. <https://doi-org.offcampus.lib.washington.edu/10.1037/cap0000284>

Zidny, R., Sjöström, J., & Eilks, I. (2020). A multi-perspective reflection on how indigenous knowledge and related ideas can improve science education for sustainability. *Science & Education*, 29(1), 145-185. <https://doi-org.offcampus.lib.washington.edu/10.1007/s11191-019-00100-x>