

Turtle Island (North America) Indigenous Higher Education Institutions and Environmental Sustainability Education

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ABSTRACT

This article explores the environmental and sustainability programs of Indigenous Higher Education Institutions (IHEIs) in North America. There are 38 Tribal Colleges and Universities in the United States and 26 Indigenous post-secondary institutions in Canada. Deploying a critical discourse analysis, the study examines IHEI websites to document Indigenous environmental sustainability education (ESE) program offerings. The comparative analysis of IHEI programming in each national context finds that 41 out of 62 IHEIs in Canada and the United States have Indigenous ESE programs. Findings also indicate that ESE programs are more prevalent among IHEIs in the United States than in Canada. Moreover, IHEIs in the United States also offered greater diversity of program types, from certificates to graduate studies. The findings highlight the importance of IHEI environmental and sustainability education program design for centering

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Indigenous Knowledge in higher education through Indigenous-controlled institutions.

Keywords: Indigenous higher education, Indigenous Peoples, environmental education, North America, comparative discourse analysis

INTRODUCTION

Across Turtle Island (North America) there are more than 1,208 Indigenous Nations with historic and cultural connections to the land or territories on which they live (AFN, 2021; BIA, 2021). Indigenous Peoples are on the frontlines of climate change. The international community has increasingly recognized the importance of Indigenous Knowledge toward improving environmental sustainability. For instance, Assessment Report AR5 of the Intergovernmental Panel on Climate Change has identified Indigenous and traditional knowledge as “a major resource for adapting to climate change” and highlighted the need for “[i]ntegrating such forms of knowledge with existing practices [to increase] the effectiveness of adaptation” (IPCC, 2014, p. 19). Now more than ever before, Western scientists are turning to Indigenous Knowledge and science to gain valuable insights into the world's most pressing environmental concerns. However, this urgency for Indigenous Knowledge and science for environmental management and governance has highlighted the need to better understand the landscape of Indigenous environmental and sustainability education programs across Turtle Island. Indigenous Higher Education Institutions (IHEIs) in Canada and the U.S. share a commitment to centering Indigenous Knowledge and promoting the advancement of students and communities through Indigenous-controlled institutions (Warrior, 2012). The comparative and complementary approach undertaken in the proceeding analysis of existing IHEIs programs in the U.S. and Canada highlights the interconnected histories of Indigenous Peoples of Turtle Island and the synergies of Indigenous

institutional development for advancing Indigenous Knowledge for environmental and sustainability education.

The epicenter of Indigenous Knowledge is Indigenous communities. To better understand the mobilization of Indigenous Knowledge for addressing environment and sustainability challenges, we need to explore programmatic innovations designed and implemented by IHEIs. To date, there are limited comparative studies of Indigenous post-secondary education in the U.S. and Canada (Warrior, 2012; Jenkins, 2007); and fewer that examine environmental and sustainability education of IHEIs (Dockry et al., 2016). This paper fills that gap by providing a comparative analysis of the Indigenous environmental sustainability education strategies of IHEIs located in what is currently referred to as Canada and the United States. The paper identifies pathways needed for IHEIs to continue their work advancing Indigenous environmental and sustainability education grounded in Indigenous Knowledge.

The article's primary goal is to explore the conceptualization of environmental sustainability education by IHEIs, through analyzing institutional websites. Additionally, the research documents the status of environmental sustainability education across IHEIs in Canada and the United States by providing background on the emergence of Indigenous environmental sustainability education programs. The subsequent section explains the methodological approach used to select and analyze IHEI websites. Theoretical framing was guided by the College of Menominee Nation Sustainable Development Institute (SDI) Model, which describes seven dimensions of Indigenous sustainability. A description of the findings follows, identifying the types of degree programs offered and mapping the program descriptions across the seven SDI Model dimensions.

LITERATURE REVIEW

Indigenous Environmental Sustainability Education

Indigenous Peoples have unique knowledge systems and languages that guide our relationships with all living things. These ways of being function as systems of sustainability that have been passed on to present generations by our ancestors and have helped Indigenous Peoples thrive in times of peace and persist through times of peril. Indigenous Environmental Sustainability Education is defined as fostering a learning environment in which students and faculty can develop and grow a deep understanding of how Indigenous values, philosophies, and practices can: (1) guide and support individual and community growth; (2) encourage sustainable practices in all aspects of community life; and (3) promote environmental protection guided by Traditional Ecological Knowledge (TEK) and Indigenous Science. As Peach et al. (2020) highlight Indigenous Knowledge cannot be separated from the land, and thereby, the unique position of IHEIs as place-based institutions supports their efficacy and effectiveness in environmental and sustainability education. As Sumida Huaman et al. (2019) point out, IHEIs are “distinct from mainstream institutions as they are the only institutions of higher education situated on Indigenous lands, within the tribal community, where severely threatened knowledge systems and languages are core learning material and given primary space” (p.10). Limited research has explored the ways in which IHEIs are uniquely positioned to address pressing environmental and sustainability education gaps in higher education.

Education for Sustainable Development (ESD) is an emerging area of education that responds to calls for sustainability education in higher education. ESD is the development of knowledge, skills, and values for students to be “global citizens” who will protect the environment and society today for future generations (Fredriksson et al., 2020, p.1; Hernandez et al., 2018).

Although there has been minimal research on the implementation of education for sustainable development among Indigenous Higher Education Institutions (IHEIs) of Turtle Island, there is a stark difference between ESD and Indigenous environmental sustainability education (ESE) in large part due to different understandings of sustainability among Indigenous and western knowledge systems. This paper aims to document the manifestation of ESE programs at IHEIs across Turtle Island. In doing so this paper employs definitions of Indigenous sustainability for mapping program innovations.

Sustainability within Indigenous Knowledge Systems centers on maintaining balance (Dockry et al., 2016). As Dockry et al. (2016), quoting Dr. Verna Fowler, founding President of the College of Menominee Nation, underscore the Indigenous values “At the core [of sustainability] are respect for the land, water, and air; partnership with other creatures of earth; and a way of living and working that achieves a balance between use and replenishment of all resources” (p. 129). In this way, sustainability recognizes not only the protection of human future generations but future generations of all life on the planet, including our non-human relations (Whyte, Caldwell, and Schaeffer, 2018). Expanding on this conceptualization, Crazy Bull and White Hat (2019) provide the following Indigenous definition for sustainability:

Embedded in Indigenous understandings of the world is the recognition that sustainability requires an acceptance of the ways in which diverse ecological and human systems interact to ensure persistent survival. Sustainability means that we must explore ways of living that reduce harmful practices; our aim being to eliminate the destruction of resources and relationships. As Indigenous people, we are reminded through everyday acts of the necessity of sustainable practices. (p. 119)

This is in stark contrast to western definitions of sustainability that generally build from the sustainable development definition captured by the World Commission on Environment and Development (1987), which describes it as “development that meets the needs of the present without compromising the ability of the future generations to meet their own needs” (Brundtland et al., 1987, p. 43). Sustainability within western environmental education is largely anthropocentric and often measured by environmental, societal, and economic safeguarding for future generations. In addition to variations in approaches to sustainability Indigenous educational sovereignty has also been constrained due to colonialism and assimilation policies.

Colonial systems of educational oppression and assimilation bind Indigenous Nations within what is currently known as the United States and Canada. As Jenkins (2007) notes, this shared struggle accounts for the complementary development of Indigenous post-secondary institutions across Turtle Island in the past 50 years. Indigenous post-secondary institutions are performatives of sovereignty and beacons of self-determination in action. As Cole (2011) states, “Equal access to and participation in mainstream educational institutions is a human right, whereas control of separate institutions is a sovereign right” (p. 4). IHEIs support the protection of Indigenous Knowledge Systems and the decolonization of colonial education systems through community capacity building. Indigenous control of all levels of education is paramount for exercising sovereignty and protecting Indigenous rights. In what is currently known as Canada and the United States, over 60 Indigenous Higher Education Institutions (IHEIs) align education strategies with the Indigenous knowledge systems of the communities they serve.

Simpson (2002) identified core reasoning behind why many Indigenous communities and IHEIs are championing the creation of environmental and sustainability education programs,

Founding Indigenous Environmental Education programs within Indigenous Knowledge systems is one of the most important ways of strengthening our cultures, promoting environmental protection, realizing sustainable local economies, and supporting students through healing and decolonizing processes. It requires the participation and leadership of the Elders in all aspects of the program, access to the land, the application of Indigenous education models and philosophies of education, the employment of Indigenous teaching and learning mechanisms, and a constant decolonization process for both instructors and students. (pp. 16-17)

In creating environmental and sustainability education programs at Indigenous-controlled institutions, Indigenous Peoples are building capacity for Indigenous survivance and prioritizing the safeguarding of Indigenous Knowledge not only to meet current needs but to ensure its continued intergenerational transmission.

Indigenous Higher Education Institutions (Canada)

Indigenous Higher Education Institutions (IHEIs) developed in Canada alongside movements for self-determination after the emergence of the 1969 White Paper, which advocated for the termination of Indigenous rights. In response to the White Paper, the Indian Chiefs of Alberta, on behalf of First Nations, published the Red Paper in 1970 outlining the comprehensive protection of Indigenous rights and Indigenous involvement in all policy-making that would affect Indigenous Peoples within Canada (Jenkins, 2007). Education policy was a tool to advance the principles of the Red Paper. In 1971, Blue Quills First Nation College was founded, now known as University Nuhelot'įne Thaiyots'į Nistameyimâkanak Blue Quills. The following year the National Indian Brotherhood, now known as the Assembly of First Nations, published the policy paper "Indian Control of Indian Education" (1972) (Jenkins, 2007; AFN, 1972). The policy paper

included a statement on the Indian Education Philosophy of which one of the values is: “Living in harmony with nature will ensure the preservation of the balance between man and his environment which is necessary for the future of our planet, as well as for fostering the climate in which Indian Wisdom has always flourished” (AFN, 1972, p. 1). As highlighted in the 1972 paper, environmental education for planetary protection has been at the heart of Indigenous education revitalization efforts since the beginning. Shortly thereafter in 1976, Saskatchewan Indian Federated College, known today as the First Nations University of Canada (FNUiv), was founded (Cole, 2011). Today, FNUiv offers the most Indigenous environmental and sustainability programs for post-secondary students of all IHEIs in Canada. It is clear from this groundbreaking founding that the contemporary integration of Indigenous Knowledge and educational philosophy among IHEIs is primarily due to the Indigenous logic of institutional design.

Nine of the twenty-six IHEIs in Canada are located within Ontario and recognized in 2017 through the Indigenous Institutes Act. Within the Act, Indigenous Institutes “are Indigenous governed and operated institutions that provide opportunities for students to start and complete post-secondary education credentials in a flexible, personalized and culturally responsive learning environment” (Government of Ontario, 2017). Notably, the provincial government recognized Indigenous Peoples' right to education protected under the United Nations Declaration on the Rights of Indigenous Peoples. Since the passage of the Indigenous Institutes Act (2017) in Ontario there is increased interest for more Indigenous-controlled universities throughout Canada. However, many IHEIs are still citing the absence of options for accreditation in other parts of Canada as a significant barrier to progress (Hallmark and Reed, 2016). Although not an Indigenous-controlled institution, it is essential to highlight that within Canada, Trent University was the first post-secondary institution to develop an undergraduate degree program (B.A./B.Sc.)

in Indigenous Environmental Studies/Science (Simpson, 2002). The university accomplished this in consultation with Indigenous students, faculty, and Indigenous community leaders, and it remains one of the leading environmental and sustainability education programs in Canada.

Indigenous Higher Education Institutions (United States)

Similarly, to Canada, Indigenous sovereignty and self-determination movements in the second half of the 20th century, in response to colonial termination policies, led to the creation of many U.S. Indigenous Higher Education Institutions (Jenkins, 2007; Crazy Bull and White Hat, 2019). As Tribal Nations advocated for the protection of sovereignty through the American Indian Movement, Tribal Colleges and Universities (TCUs) emerged to allow Tribal Nations to control the post-secondary education of their tribal citizenry (Crazy Bull and White Hat, 2019). In 1968 the Navajo Community College, now known as Diné College, was founded by the Navajo Nation and became the first TCU in the United States (Sumida Huaman et al., 2019). It was formally recognized and provided grants alongside other U.S. community colleges in 1971 with the passage of the Navajo Community College Act (Jenkins, 2007). Following the success of Diné College, the Tribally Controlled Community College Assistance Act of 1978 was subsequently passed and supported Tribal Nations in developing their own higher education institutions (Sumida Huaman et al., 2019). There was a model for these institutional developments in the U.S. given the prevalence of Minority Serving Institutions (MSIs), including Historically Black Colleges and Universities. Jenkins (2007) argues that existing MSIs allowed for less political resistance to the formation of Indigenous HEIs in the U.S. than in Canada because there was a template for legislative recognition and autonomy. In 1994 the Equity in Educational Land-Grant Status Act designated all TCUs as land grant institutions, providing greater access to resources and funding supports (Crazy Bull and White Hat, 2019). The 1990s were a formative period for Indigenous

education reclamation following the quincentennial of the invasion and colonization of Turtle Island. As IHEIs began to reimagine their futures new models of Indigenous environmental and sustainability education philosophy emerged.

THEORETICAL CONSTRUCT

This study was theoretically guided by the College of Menominee Nation Sustainable Development Institute Model or SDI Model (Dockry et al., 2016). The College of Menominee Nation was founded in 1993, and one of its first initiatives was the establishment of the Sustainable Development Institute charged with the protection of the Menominee forest through education and economic development. In creating the institute, the college went through a process of conceptualization of what sustainability means to them, carving out a paradigm centered within Menominee knowledge systems and responsive to the past, present, and future needs of the nation (Caldwell, 2019). Through an evolving and living process, the SDI Model emerged highlighting seven interconnected dimensions: “(1) land and sovereignty; (2) natural environment (which includes human beings); (3) institutions; (4) technology; (5) economics; (6) human perception, activity, and behavior and (7) cultural values” (Dockry et al., 2016, p. 129). Dockry et al. (2016) champion the use of the SDI Model by researchers and educators to “create a complex narrative to understand the past and present and create visions and solutions for the future” (p. 135). As such, the SDI Model provides the theoretical lens through which the comparative and critical discourse analysis of this study is grounded.

The research considers how existing Indigenous Higher Education Institutions (IHEIs) across Canada and the United States include the listed SDI Model dimensions in their environment and sustainability education program offerings. This lens allows for reflection on how sustainability, as defined by an IHEI, is implemented by other IHEIs in different settler-colonial

contexts. In many ways, Indigenous Peoples' knowledge systems have been erased from western environmental education replaced by stereotypical notions of the “Ecological Indian.” Cherokee scholar Jeff Corntassel (2020) notes that the “attempted erasure of Indigenous peoples, communities, plants and other relationships from homelands and waterways is a central facet of settler colonialism” (p. 353). Recent reconciliation efforts in education recognize the erasure of Indigenous Peoples from western education models and now are attempting to remedy past assimilationist policies by integrating Indigenous Knowledge into higher education. However, Simpson (2014) and Ahenakew (2017) note that the attempt to incorporate Indigenous Knowledge and Indigenize western educational institutions is a further act of settler colonialism that oppresses Indigenous innovation and autonomy. Cajete (2015) argues that contemporary Indigenous education must revitalize, reclaim, and prioritize Indigenous ways of knowing for future sustainability.

Similarly, Corntassel (2020) calls for a process of “restorying” whereby Indigenous researchers focus on acts of resurgence and Indigenous excellence. This article considers the existing activities of IHEIs to build educational systems reflective of imaginative sustainable Indigenous futures. This theoretical framing combined with the methodology outlined below presents an Indigenist research approach that centers the experiences of Indigenous Higher Education Institutions and their operationalization of Indigenous environmental sustainability education programs across Turtle Island (Hart et al., 2017; Wilson, 2007).

RESEARCH METHOD

The article seeks to document how Indigenous Higher Education Institutions (IHEIs) describe their environmental sustainability education (ESE) programs and curricula through their websites. A qualitative document analysis was undertaken where data was collected from 62

websites of IHEIs across Canada and the United States. Previous studies have examined higher education institutions' websites using content analysis (Lažetić, 2020; Davis et al., 2019; Saichaie and Morpew, 2014). However, to date, there have been no qualitative studies of websites of Indigenous Higher Education Institutions. As such, this research is a novel contribution to an emerging area of comparative education studies.

Critical discourse analysis (CDA) and content analysis were used to evaluate IHEIs websites (Fairclough, 1993). CDA recognizes unequal relationships and attempts to explain and understand differences. As Wilson and Carlsen (2016) note, "CDA understands a text as a description of something occurring within a wider cultural context that is interpreted and acted upon by social actors within a field of rules and norms" (p. 29). Lowan-Trudeau (2020) used CDA to analyze differences in media coverage of Indigenous environmental action across Canada and the United States. CDA is a tool to understand better how IHEIs describe their environmental and sustainability education programming and discuss themes as emergent in text.

Data was collected from web pages of IHEIs describing the academic majors and or programs of study (Wilson and Carlsen, 2016; Saichaie and Morpew, 2014). Websites are "documents" for qualitative analysis (Wilson and Carlsen, 2016). Data collection occurred between August 2020 and March 2021. As Saichaie and Morpew (2014) underscore, this timeframe for data collection is ideal as it parallels the timeline during which prospective and newly admitted students would be visiting the IHEI's website to explore study options. It should be noted that this research is a snapshot in time and IHEI programming and curriculum are not static. The study findings may be limited by the publicly accessible websites of IHEIs and may not account for the digital divide or resource constraints that may limit IHEIs ability to develop and maintain robust websites.

In the first phase of analysis, websites were read and coded using an open-coding process documenting environmental sustainability education through codes such as “environment” or “sustainability” or “natural resources”. The subsequent phase transitioned to interpretation, an axial coding process, allowing for recoding the websites into analytic categories framed by the College of the Menominee Nation Sustainable Development Model. For example, “land” is connected to the analytic category of “sovereignty”. See Table 1 for categories and example data.

Table 1

Sample Analytic Categories and Text of the Sustainability Development Institute Model

SDI Model Category	Example	Text
Land and sovereignty	Sovereignty; control over land and territory; self-determination; self-governance; law; justice; decision-making authority; etc.	“The program will prepare graduates to work within tribal communities in support of environmental stewardship, conservation, and revitalization” (Northwest Indian College).
Natural environment	People, human communities, plants, animals, rocks, water, and air; interconnected; relationality; etc.	“Students participate in hands-on laboratory and field experiences to learn about topics including but not limited to; cellular biology, animal physiology, oxygen depletion in water, bird diversity, rangeland management and animal and plant genetics” (Haskell Indian Nations University).
Institutions	Clan system, First Nation, Tribal government, Tribal college, etc.	“This unique degree is being designed to equip students with the knowledge and skills needed to

		contribute to food sovereignty, community growth, economic development and ecological restoration at First Nations, Métis and Inuit communities across Canada” (First Nations Technical Institute).
Technology	Community access to telecommunications; cultural tools and practices; GIS; tools; etc,	"Smipúlexwtn is the Salish word for GIS and translates to "an instrument used on the land." GIS technology is new and evolving, yet it is traditional in spirit and thousands of years old. For example, searching for a campsite requires knowledge of many aspects of the landscape and an analytical mind—basically a geographic information system" (Salish Kootenai College).
Economy	Across scales (local to global); subsistence harvesting; food sovereignty; commercial activity; entrepreneurship; etc.	“Students will expand their knowledge and hone their skills in sustainable farm principles and practices by participating in year-around internships in the campus greenhouse and gardens or local agricultural business” (United Tribes Technical College).
Human	Individual perceptions, activities, perception, activity, and behavior	and behaviors to local/community “Learning from academic, industry, and community experts as well as Indigenous Elders, students will learn how renewable energy

	understandings, values, and collective pursuits; etc.	technology and Traditional Ecological Knowledge (TEK) are vital in balancing traditional values and the needs of industry and communities in the development of green energy” (Yellowhead Tribal College)
Cultural Values (profound sense of place/tie to the land)	Cultural beliefs and practices; autochthony; indigeneity; elders; connection to land; oral tradition; traditional knowledge; etc.	“All students enrolled in these programs are required to take specific courses that incorporate traditional Lakota concepts concerning language, land, plants and animals” (Oglala Lakota College).

A comparative website analysis was further deployed to understand the thematic differences across ESE program areas of IHEIs (Lažetić, 2020). Tables 2 and 3 document the IHEIs reviewed in this study. Notably, some IHEIs (n=2) were not included in this study as they did not have a website or lacked publicly available information on their degree programming.

RESULTS

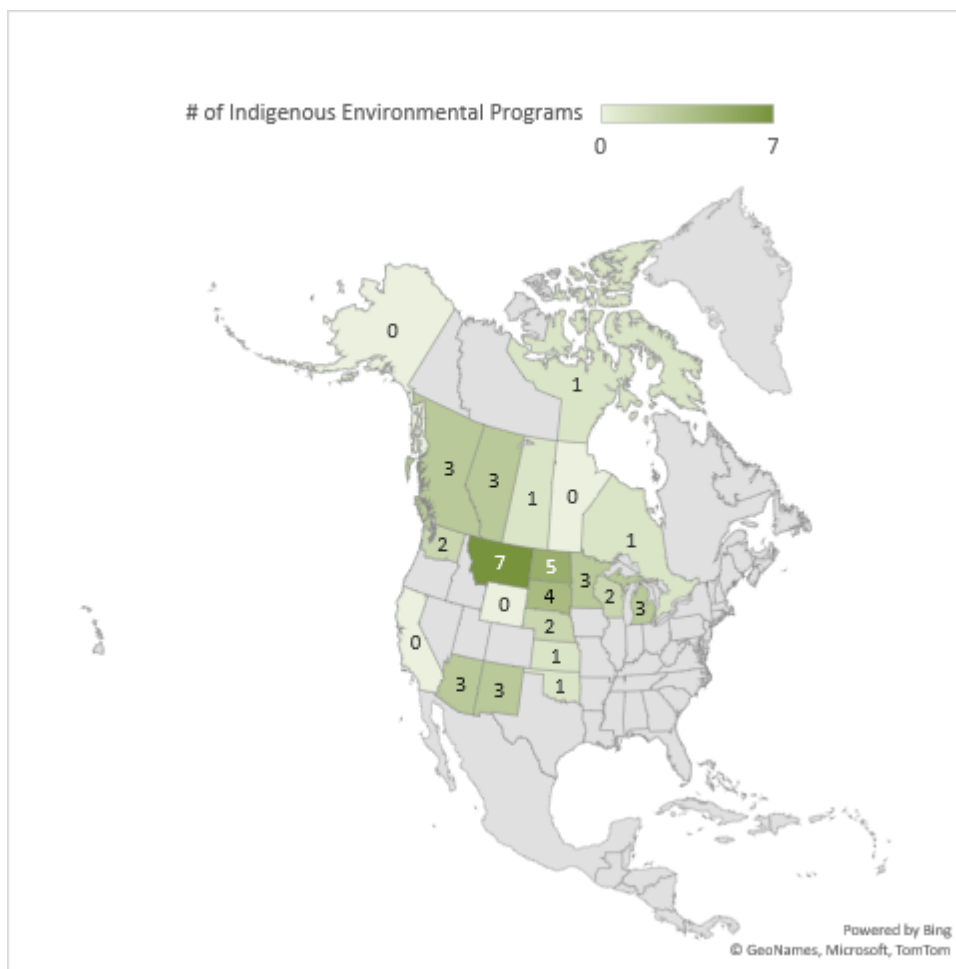
Indigenous Institutional Responses to Environment and Sustainability

Figure 1 and Tables 2 through 4 offer descriptive results of the Indigenous Higher Education Institutions (IHEIs) that have developed Indigenous environmental sustainability education (ESE) programs across Turtle Island. The comparative analysis of Indigenous ESE programming in each national context found that 41 out of 62 IHEIs in Canada and the United States have ESE degree programs. Several discursive themes emerged in the analysis that aligned with Sustainable Development Institute Model (SDI Model): natural environment, technology, cultural values, and institutions. Less prevalent thematic areas included: land and sovereignty;

economy; and human perception, activity, and behavior. Notably, these diminished discursive dimensions are also highly contested by the settler-colonial state that views Indigenous sovereignty and economic self-determination as a threat to settler-colonial territorial integrity.

Figure 1

*Indigenous Higher Education Institution Environmental Programs Across Turtle Island
(Canada/United States)*



Note. 0 = Presence of IHEIs but no ESE programs. Areas in gray at time of publication lack accredited IHEIs.

Indigenous Higher Education Institutions (Canada)

There are 26 Indigenous Higher Education Institutions across what is currently known as Canada (See Table 2). In contrast to the growth of IHEIs in Ontario, there is an absence of degree granting IHEIs in eastern Canada as defined in this study, although there are Indigenous post-secondary support programs in the region. Canadian IHEIs highlighted in this study include a range of institutions such as universities, colleges, institutes, and training and knowledge centers. There is a greater diversity of institutional design among IHEIs in Canada than among U.S. TCUs (Cole, 2011).

Table 2

Summary of Indigenous HEIs website data with Environmental and Sustainability Science programs in Canada

Indigenous HEI	Country	State/ Province	Environmental Program	Degree/ Certificate
Chemainus Native College	Canada	British Columbia	No data	No data
Heiltsuk College	Canada	British Columbia	No data	No data
Wilp Wilxo'oskwhl Nisga'a Institute	Canada	British Columbia	None	N/A
Gitksan Wet'suwet'en Education Society	Canada	British Columbia	Yes	Certificate
Native Education College	Canada	British Columbia	Yes	Certificate
Nicola Valley Institute of Technology	Canada	British Columbia	Yes	Diploma; Certificate
Seabird College	Canada	British Columbia	None	N/A
Maskwacis Cultural College	Canada	Alberta	None	N/A

Old Sun Community College	Canada	Alberta	Yes	Transfer Credit
Red Crow Community College	Canada	Alberta	Yes	Certificate
University nuhelot'ine thaiyots'į nistameyimâkanak Blue Quills	Canada	Alberta	None	N/A
Yellowhead Tribal College	Canada	Alberta	Yes	Diploma; Certificate
The First Nations University of Canada	Canada	Saskatchewan	Yes	Bachelor of Science; Bachelor of Arts; Certificate
Saskatchewan Indian Institute of Technologies	Canada	Saskatchewan	None	N/A
Gabriel Dumont Institute Training and Employment Inc.	Canada	Saskatchewan	None	N/A
Anishinabek Education Institute	Canada	Ontario	None	N/A
First Nations Technical Institute (FNTI)	Canada	Ontario	Yes	Bachelor of Arts and Science
Kenjgewin Teg	Canada	Ontario	None	N/A

Iohahi:io Akwesasne Education and Training Institute	Canada	Ontario	None	N/A
Oshki-Pimache-O- Win: The Wenjack Education Institute	Canada	Ontario	None	N/A
Ogwehoweh Skills and Trades Training Centre	Canada	Ontario	None	N/A
Seven Generations Education Institute	Canada	Ontario	None	N/A
Shingwauk Kinoomaage Gamig	Canada	Ontario	None	N/A
Six Nations Polytechnic	Canada	Ontario	None	N/A
YellowQuill College	Canada	Manitoba	None	N/A
Nunavut Arctic College	Canada	Nunavut	Yes	Diploma

Indigenous Higher Education Institutions (IHEIs) in Canada have developed environmental and sustainability programs that center Indigenous stewardship and knowledge while balancing technical capacity for Indigenous community self-determination. More than a third of IHEIs in Canada offer an environmental program for their students resulting in either a Bachelor of Science, Bachelor of Art and Science, Diploma, Certificate, or Transfer Credits (See Table 2). Currently, no IHEI in Canada offers a graduate-level degree in environmental or sustainability program areas. The most common offering is a Certificate. First Nations University

of Canada (FNUniv) in Saskatchewan and First Nations Technical Institute (FNTI) in Ontario are currently the only IHEIs in Canada to offer Bachelor Degree Programs. FNUniv offers a Bachelor of Science and a Bachelor of Arts in Indigenous Knowledge and Science that blends Indigenous and western science and includes Elders as foundational to instruction. FNTI offers a Bachelor of Arts and Science in Indigenous Sustainable Food Systems that supports knowledge acquisition for food sovereignty and ecological restoration. In contrast there is greater diversity of program types, from certificates to graduate studies at IHEIs located within the United States.

Indigenous Higher Education Institutions (United States)

There are 38 Indigenous Higher Education Institutions, also known as Tribal Colleges and Universities (TCUs), across what is currently known as the United States (See Table 2). These TCUs are members of the American Indian Higher Education Consortium (AIHEC), which provides resources, support, and a forum for policy transfer and learning (Crazy Bull and White Hat, 2019). There is an absence of degree-granting IHEIs/TCUs in the eastern region of the United States.

Table 3

Summary of Indigenous HEIs website data with Environmental and Sustainability Science programs in the United States

Indigenous HEI	Country	State/ Province	Environmental Program	Degree/ Certificate
Aaniiih Nakoda College	USA	Montana	Yes	Bachelor of Science; Associate of Science
Bay Mills Community College	USA	Michigan	Yes	Associate of Science; Certificate

Blackfeet Community College	USA	Montana	Yes	Associate of Science; Certificate
California Tribal College	USA	California	None	N/A
Cankdeska Cikana Community College	USA	North Dakota	Yes	Associate of Science
Chief Dull Knife College	USA	Montana	Yes	Associate of Science (Concentration)
College of Menominee Nation	USA	Wisconsin	Yes	Associate of Arts and Science
College of the Muscogee Nation	USA	Oklahoma	Yes	Associate of Science
Diné College	USA	Arizona/New Mexico	Yes	Bachelor of Science; Associate of Science; Certificate
Fond Du Lac Tribal and Community College	USA	Minnesota	Yes	Associate of Applied Science; Associate of Science; Certificate
Fort Peck Community College	USA	Montana	Yes	Associate of Science

Haskell Indian Nations University	USA	Kansas	Yes	Bachelor of Science; Associate of Science;
Ilisaġvik College	USA	Alaska	None	N/A
Institute of American Indian Arts	USA	New Mexico	None	N/A
Keweenaw Bay Ojibwa Community College	USA	Michigan	Yes	Associate of Science; Certificate
Lac Courte Oreilles Ojibwa Community College	USA	Wisconsin	Yes	Associate of Applied Science; Associate of Science;
Leech Lake Tribal College	USA	Minnesota	Yes	Associate of Science;
Little Big Horn College	USA	Montana	Yes	Associate of Science;
Little Priest Tribal College	USA	Nebraska	Yes	Associate of Arts
Navajo Technical University	USA	Arizona/New Mexico	Yes	Bachelor of Science; Associate of Applied Science; Certificate

Nebraska Indian Community College	USA	Nebraska	Yes	Associate of Science
Northwest Indian College	USA	Washington	Yes	Bachelor of Science
Nueta Hidatsa Sahnish College	USA	North Dakota	Yes	Bachelor of Science
Oglala Lakota College	USA	South Dakota	Yes	Bachelor of Science
Red Lake Nation College	USA	Minnesota	None	N/A
Saginaw Chippewa Tribal College	USA	Michigan	Yes	Associate of Science
Salish Kootenai College	USA	Montana/Wa shington	Yes	Bachelor of Science
San Carlos Apache College	USA	Arizona	None	N/A
Sinte Gleska University	USA	South Dakota	Yes	Bachelor of Science; Associate of Applied Science
Sisseton Wahpeton College	USA	South Dakota	Yes	Associate of Science

Sitting Bull College	USA	North Dakota/ South Dakota	Yes	Master of Science; Bachelor of Science
Southwestern Indian Polytechnic Institute	USA	New Mexico	Yes	Associate of Applied Science
Stone Child College	USA	Montana	Yes	Associate of Science
Tohono O'odham Community College	USA	Arizona	Yes	Associate of Arts; Associate of Science
Turtle Mountain Community College	USA	North Dakota	Yes	Associate of Science
United Tribes Technical College	USA	North Dakota	Yes	Bachelor of Science
White Earth Tribal and Community College	USA	Minnesota	Yes	Associate of Arts
Wind River Tribal College	USA	Wyoming	None	N/A

Tribal Colleges and Universities in the U.S. offer a wide range of environment and sustainability programs and course offerings grounded in Indigenous Knowledge Systems of the Indigenous Nations who mandated their creation and to whom they are accountable. More than 80% of TCUs

offer an environmental program for their students resulting in either a Master of Science Degree, Bachelor of Science Degree, Associate of Science Degree, or Certificate (See Table 4).

Table 4

Summary of Program Types offered by Indigenous HEIs across Canada and the United States

Program Type	IHEI – Canada (Number of Programs)	IHEI - United States (Number of Programs)
Transfer Credit	1	0
Certificate	6	6
Diploma	3	0
Associate of Applied Science	0	5
Associate of Science	0	20
Associate of Arts	0	3
Associate of Arts and Science	0	1
Bachelor of Arts and Science	1	0
Bachelor of Science	1	11
Bachelor of Arts	1	0
Master of Science	0	1

The most common degree program offered among TCUs for environmental programs is an Associate of Science; however, 11 TCUs offer Bachelor of Science Degrees in environmental and sustainability-related areas. The advancements in the environmental and sustainability curriculum at TCUs do not stop at undergraduate education. Sitting Bull College, located on the Standing Rock Sioux Reservation, created the first Indigenous graduate program in environmental studies offering a Master of Science in Environmental Science where students are expected to “demonstrate an understanding of Native Science as it relates to the Lakota/Dakota culture, while maintaining the balance with and the integrity of Western Science” (Sitting Bull College, 2019). The integration of Indigenous Science and Western Science in non-indigenous higher education institutions is discussed through decolonization and indigenization efforts at universities

throughout North America without large-scale meaningful results. However, IHEIs have already built a template for implementation that non-Indigenous institutions can learn from for broader success. Comparative analysis of ESE program types among Indigenous Higher Education Institutions (IHEIs) in the U.S. and Canadian contexts highlighted limited bachelor degree program options at Canadian IHEIs and only one graduate ESE degree-granting program across all IHEIs on Turtle Island (See Table 4). The second question guiding this study was what SDI Model categories appeared on IHEI websites. The following section discusses the seven dimensions and the frequency at which they appear with attention to cross-national variances.

DISCUSSION

Indigenous Environmental Sustainability Programs in IHEIs

The 62 websites of Indigenous Higher Education Institutions varied widely but reveal distinct patterns in program offerings across their divergent settler colonial contexts of Canada and the United States (See Table 5).

Table 5

Summary of SDI Model category frequency across IHEI websites by country

SDI Model Category	United States	Canada
Land and sovereignty	8.1%	3.0%
Natural environment	53.5%	12.1%
Institutions	9.3%	15.2%
Technology	54.7%	27.3%
Economy	10.5%	6.1%
Human perception, activity, and behavior	1.2%	3.0%
Cultural Values (profound sense of place/tie to the land)	27.9%	30.3%

Land and sovereignty

Land and sovereignty are essential to the political integrity of Indigenous nations across Turtle Island. According to Dockry et al. (2016), “the land and sovereignty dimension is concerned with how decisions are made for their land and community” (p. 129) as such land and sovereignty are vital areas for inclusion in environmental sustainability education programs at IHEIs within Canada and United States. Wildcat et al. (2014) underscore the importance of land-based education for upholding Indigenous sovereignty in the face of settler colonialism and continued attempts to displace Indigenous Peoples from the land. Notably, the study findings show that in comparison to Canada, IHEIs within the United States had more programmatic references to land and sovereignty, including control over land and territory, self-determination, self-governance, law, justice, and decision-making authority. IHEIs within the United States included courses in their ESE programs that emphasized Tribal law, policy, and governance.

On the other hand, IHEI programs in Canada included more references to stewardship of the land. Indigenous legal scholars John Burrows and Aimée Craft note that Indigenous law is centered on relationships and responsibilities rather than solely a rights-based framework (Borrows, 2016; Craft, 2015). The discursive differences in references to land and sovereignty across IHEIs may relate to the varying settler-colonial legal systems Indigenous Nations have to navigate across Canada and the United States as they work to reconstitute Indigenous legal orders outside of the colonial rights-based framework.

Natural environment

The most prominent category under the dimension of natural environment across IHEIs within the United States was that of *wildlife*, accounting for 40% of the website references in this

theme. Among the concentration of IHEIs in the Great Lakes region of the United States, environment and sustainability programs focused on forestry, fisheries, manoomin (wild rice), and wildlife science. In contrast, the most salient categories across IHEIs within Canada include *soil* and *fish*, accounting for 30% of the website discourse in this theme. According to the SDI Model, the natural environment dimension is broadly “interpreted to go beyond natural resources to include examples such as people, human communities, plants, animals, rocks, water, and air” but may “also incorporate western ecological science perspectives” (Dockry et al., 2016, p. 130). Additional salient categories across all IHEIs in this theme included: *forests*, *plants*, and *water*. Moreover, *hydrology* and *biology* were also referenced most frequently across physical science program offerings at IHEIs. Notably, Yellowhead Tribal College was the only IHEI to offer coursework on air quality monitoring. Additionally, Little Priest Tribal College is the only IHEI to have a degree program offering an Associate of Science degree in Indigenous Science. In recent decades Indigenous scholars have identified the need for greater inclusion of Indigenous science in education to address pressing environmental concerns (Cajete, 1999; Cajete and Bear, 2000; Cajete, 2008; Brayboy and Castagno, 2008; Whyte et al., 2016). Whyte et al. (2016) define Indigenous science broadly as:

[T]he idea that Indigenous peoples have their own systems of knowledge for observing, collecting, categorizing, recording, using, disseminating and revising information and concepts that explain how the world works; they use their own knowledge systems to ensure the flourishing of their communities’ health, livelihood, vibrancy and self-determination. The historic origins of Indigenous sciences are unique to each Indigenous peoples and differ from the dominant scientific disciplines found in countries such as the US... (p. 25)

IHEIs are responsible for shaping the future of environmental sustainability education for Indigenous nations. The inclusion of Indigenous science in program offerings recognizes that ESE is broader than natural resources and should include diverse knowledge systems, traditional ecological knowledge, and ways of embracing the natural world as kin rather than resource commodification.

Institutions

“Institutions” was a less salient category than other areas of the SDI model across IHEIs. This dimension included website references to governance, clan system, Tribal government, First Nation, etc. According to the SDI model, “Institutions refers to structures that develop and enforce rules of behavior and social interactions (which can include interactions among humans, plants and animals, and the environment)” (Dockry et al., 2016, p. 130). For example, First Nations Technical Institute (FNTI) created a new Bachelor of Arts and Science in Indigenous Sustainable Food Systems and grounded the program in “experiential learning on the land with teachings that revolve around the traditional Haudenosaunee food systems cycle” (FNTI, 2021). FNTI is centering Haudenosaunee rules of behavior and interaction with the intent to allow for students of the program “to contribute to food sovereignty, community growth, economic development and ecological restoration at First Nations, Métis and Inuit communities across Canada” (FNTI, 2021). As Haudenosaunee scholar Theresa McCarthy (2010), argues this process of re-storying is needed to support traditional Haudenosaunee identity, citizenship, and nationhood for future generations. Ransom and Ettenger (2001) recommend that institutions should reflect Indigenous “models of problem solving, such as consensus-based forums” and in particular, Haudenosaunee institutions should “reflect traditional ideals and values, including such concepts as peace, harmony, and mutual respect” (p. 221). References to institutions may have been less explicit on IHEIs websites

as their very existence as Indigenous institutions founded within Indigenous territories by Indigenous governments requires no other mention or reflection on their purpose of institutional design.

Technology

Technology was the most prevalent dimension across IHEI websites within the United States. Moreover, it was the second most salient category across IHEI websites within Canada after cultural values. This dimension included references to technology, geospatial information systems (GIS), tools, and Indigenous TEK (pronounced “tech”) – recognizing the inherent value of cultural tools and practices built over millennia. The SDI Model defines technology as “rural community access to modern advances in telecommunications” and “cultural tools and practices” (Dockry et al. 2016, p. 130). The dimension embraces Indigenous ingenuity from canoe-making to contemporary mapping using GIS. Salish and Kootenai College offers a Certificate in Geospatial Science, and the description of the program on the website states:

Smipúlexwtn is the Salish word for GIS and translates to "an instrument used on the land."

GIS technology is new and evolving, yet it is traditional in spirit and thousands of years old. For example, searching for a campsite requires knowledge of many aspects of the landscape and an analytical mind—basically a geographic information system. (Salish Kootenai College, 2021)

Indigenous Peoples have always been cartographers (Rose-Redwood et al., 2020). The focus on GIS by TCUs is critical because of the invisibility Tribal Nations face within modern mapping systems (Leonard, 2021). Tribal Nations’ lands, territories, and waters are often absent or erased from contemporary maps of the U.S. and Canada. TCUs have taken on a proactive role in changing the landscape of contemporary cartography by training students in GIS studies to develop the next

generation of Indigenous mapping specialists and those who can work to assist Tribal Nations with their mapping needs. When Tribal Nations are not included on maps, they are often excluded from environmental and sustainability decision-making processes that affect their lands, territories, and resources. New technology, such as GIS, does not supplant existing knowledge but mobilizes new knowledge-sharing pathways, acquisition, and translation to future generations. Most of the references under the theme of technology were under the *GIS* category.

Economy

The economy dimension was most salient among IHEIs in the United States. This dimension included categories such as subsistence harvesting, food sovereignty, commercial activity, and entrepreneurship. Within the SDI model, the economy “incorporates multiple scales ranging from the individual household, to the tribe, to the region, to the nation, to the globe” (Dockry et al., 2016, p. 130). The category with the most prevalence across IHEIs in the United States was *agriculture*. Comparatively, within the dimension of economy among IHEIs in Canada, the focus shifted to *energy*. As Crazy Bull and White Hat (2019) highlight, the emphasis on economic development through agriculture among Tribal Colleges and Universities is primarily due to their legacy as land grant institutions. Conversely, there was no similar confining historical institution of land grant path dependency for IHEIs within Canada.

Canadian IHEI websites, as compared to the U.S., focused more on energy and specifically on renewable energies. Program areas highlighted postgraduate opportunities for students to enter the Indigenous renewable energy sector. Yellowhead Tribal College offers Renewable Energy Installation Assistant - Photovoltaic Program where students, through blended knowledge instruction by scientists and elders, “learn how renewable energy technology and Traditional Ecological Knowledge (TEK) are vital in balancing traditional values and the needs of industry

and communities in the development of green energy” (Yellowhead Tribal College, 2020). This programmatic area development aims to empower the self-determination and sovereignty of Indigenous nations and communities across Canada whose lands and territories have been threatened by extractive industries. As Lowan-Trudeau (2017) notes, there has been an exponential growth of Indigenous renewable energy projects across Canada, with Indigenous communities in British Columbia and Ontario leading innovation in the sector growth. As Melina Laboucan-Massimo (Lubicon Cree) Program Director at Indigenous Climate Action and Founder of Sacred Earth Solar states,

There are solutions out there. We need to see change in this world. We need to push for renewable energy systems that help communities to be self-sufficient and self-sustaining. We need to shift away from fossil fuel-based systems and push for a renewable energy system that can help us transition out of what we are currently facing. (Laboucan-Massimo, 2017)

Laboucan-Massimo underscores the environmental justice reality facing many Indigenous students exploring post-secondary education options. Indigenous nations and communities are working towards sustainable economies that support their sovereignty and self-determination, and for many, that has included pursuing renewable energy projects. However, without community members with knowledge of the industry, technology, and science needed to be successful long-term community self-determination goals are in jeopardy. IHEIs have stepped forward to fill this gap and provided education pathways for renewable energy and environmental justice that empower Indigenous students and their communities. These Indigenous-controlled institutions have developed innovative models for Indigenous renewable energy education.

Human perception, activity, and behavior

This dimension was the least salient across all IHEIs. However, there were greater references to this dimension among Canadian IHEIs. Categories referenced among IHEI websites in this dimension included community, values, and collective. Human perception, activity, and behavior is a cross-cutting dimension within the SDI model defined as including “different scales ranging from individual perceptions, activities and behaviors to community understandings, values, and collective pursuits” (Dockry et al., 2016, p. 130). The website descriptions that captured this dimension include the program description for the Bachelor of Science in Hydrology at Salish and Kootenai College. Students are expected “to integrate hydrologic science concepts with awareness of place-based (local or community) issues and their related cultural perspectives” (2021). The emphasis on integration allows for exploration across scales.

Another example is from Nueta Hidatsa Sahnish College, where the Environmental Science Program “focuses on integrating local Fort Berthold environmental issues with Mandan, Hidatsa and Arikara cultures” (NHSC, 2021). As Johnson et al. (2016) observe, Indigenous science and western science have the potential to be woven together if done so in a mutually respectful and beneficial manner. The authors further underscore that our ability to integrate knowledge across scales and work collaboratively will forge our shared prosperity (Johnson et al., 2016). As such, this dimension requires the most growth among IHEIs as they chart a course for environmental sustainability education that meets the demands of our current climate crisis.

Cultural Values (profound sense of place/tie to the land)

This dimension was most salient among IHEIs within Canada, and among those IHEIs, this dimension was the most frequently referenced of all SDI Model dimensions within the websites analyzed. The dimension includes categories such as elders, language, and place. Within the SDI

model, this dimension allows for balancing tensions between dimensions and focuses on a “sense of place” (Dockry et al., 2016, p. 132). As Northwest Indian College, which offers a Bachelor of Science in Native Environmental Science and coursework in marine sciences, describes:

Our cutting-edge program is designed to support students in becoming leaders in their fields and in their communities. Our curriculum is place-based, experiential, and culturally grounded. That is, we draw on the deep and sustained connections to place and commitment to environmental protection to guide our programming. Our students excel in understanding the changing world around them by working within Indigenous Knowledge Systems and utilizing cutting-edge scientific methods, technology, and tools. (Northwest Indian College, 2020)

IHEIs connection to place inspires other post-secondary institutions to value Indigenous Knowledge in environmental education for meeting sustainability demands (Crazy Bull and White Hat, 2019).

The most salient categories referenced by IHEI websites within Canada included *language* and *elders*. For example, in the Bachelor of Science program in Indigenous Knowledge and Science offered by The First Nations University of Canada, student courses “combine “textbook science” with teachings from the Elders” (2021). IHEIs more frequently referenced elders for teaching or mentorship within Canada than the United States. Leanne Simpson (2002) underscores that one of the core principles of Indigenous environmental education includes “elders as experts” and “grounding programs in Indigenous philosophies of education” (p. 17-20). IHEIs in Canada, as evidenced through their websites, embody this pedagogy by incorporating elders throughout their programming.

Another category *language* was a salient issue among IHEIs within Canada and the United States. Simpson (2002) also lists language as a cornerstone of Indigenous environmental education. IHEIs references to language generally centered on the inclusion of Indigenous language as a mandatory requirement for degree completion. For example, Diné College requires the student to complete at least one Navajo Language course as part of the degree requirements for an Associate of Science in Agroecology/Environmental Science. As Tuck et al. (2014) note, “language is not something developed in isolation in human brains, but in relationship to land and water” (p. 12). IHEIs focus on language is a process of re-storying, resistance, and resurgence in pursuit of greater justice, equity, inclusion, and belonging within environmental sustainability education. As Tuck et al. (2014) further underscore, “a focus on language is required in order to ‘rupture’ the cognitive imperialism of the zero point of Eurocentric universalism and its rule over ontology and epistemology” (p. 13). In naming language in their program descriptions, IHEIs recognize language as inherent to culture and how Indigenous nations understand a sense of place. Language is the symbiotic reverberation of ancestral knowledge whispered across eons guiding our inherent responsibilities to Mother Earth.

IMPLICATIONS AND CONCLUSION

Indigenous Higher Education Institutions (IHEIs) across Turtle Island (North America) have been at the forefront of environmental and sustainability education for more than 50 years. Scholars argue that many IHEIs formed in response to termination policy agendas directed at Tribes and First Nations in the first half of the 20th century by the U.S. and Canadian governments. Indigenous nations championed their right to self-determination in resistance to those policies and led with calls for educational changes that would advance Indigenous rights and sovereignty (Cole, 2011; Jenkins, 2007). Thereby Indigenous communities invested in IHEIs for self-determination

and nation-building. As Simpson (2002) highlights, the survivance of Indigenous Peoples relies on our ability to develop educational systems grounded in our Indigenous Knowledge Systems so that youth can engage and reclaim their knowledge and languages while also developing an educational system that will support future generations of Indigenous learners to do the same.

This article analyzed IHEIs websites to better understand and compare the scope of environmental and sustainability education program offerings within the United States and Canada and determine thematic alignment with the Sustainable Development Institute Model. The comparative study revealed the need for increased levels of graduate post-secondary training in Indigenous environmental and sustainability education as Indigenous students graduating from IHEI undergraduate programs look to advance their academic credentials and scientific research. In addition, the analysis of IHEIs in Canada and the United States highlighted the absence of Indigenous post-secondary institutions under Indigenous control within the eastern regions of the United States and Canada. The absence of IHEIs in the East of Turtle Island limits the educational pathways for Indigenous students of this region to pursue environmental and sustainability post-secondary education at an institution within their homelands that is accountable to the communities they belong to. To center Indigenous Knowledge from the eastern regions of Turtle Island for environmental and sustainability education, Indigenous Nations, in coordination with the U.S. and Canadian federal governments, will need to establish IHEIs in the region. An IHEI in the region could be under control and accountable to a coalition of Indigenous Nations if independent chartering would not be sustainable.

This study has shown that IHEIs continue to champion environmental and sustainability education because it is rooted in the process of decolonization that empowers Indigenous Knowledge Systems to fight systemic legacies of educational assimilation of Indigenous Peoples

in the U.S. and Canada. IHEIs were formed to respond to Indigenous needs. This included the need to reclaim Indigenous environmental knowledge. IHEI students are connected to Indigenous nations and communities on the frontlines of climate change. As environmental challenges continue to grow, IHEIs are vital institutions for developing scientists and researchers who can tackle those pressing challenges utilizing Indigenous Knowledge while grounded in their connection to land and communities directly impacted. Above all, IHEIs commitment to environmental and sustainability education aims to position Indigenous youth and communities with the capacity and resilience to respond to emerging sustainability challenges and opportunities in our homelands.

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