

2022 INDIGENOUS KNOWLEDGE AND STEM

This was a collaboration between Green Bricks Education Society, Urban Nations Youth Association (FNSEA), Skye Consulting, teachers, and students currently enrolled in First Nations Schools in B.C. Many thanks to all who contributed.



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LAND ACKNOWLEDGEMENT

We respectfully acknowledge and are grateful to be able to live, work and gather on the traditional, ancestral and unceded Territory of the Coast Salish People - Sk̓wx̓wú7mesh (Squamish), Stó:lō and Səlílwətaʔ/Selilwítlh (Tsleil-Waututh) and x̓w̓məθk̓wəy̓əm (Musqueam) Nations.

We encourage everyone to take a moment and consider with gratitude whose traditional territories you live, work, and play upon.

Green Bricks Education Society is committed to developing respectful and collaborative relationships as we work towards decolonization and reconciliation.

WHAT YOU WILL FIND IN THIS DOCUMENT:

- 🌱 Introduction
- 🌱 Learnings and shared perspectives
- 🌱 Indigenous knowledge and STEM thought starters
- 🌱 Online resources for STEM educators and classrooms

INTRODUCTION

According to research by the Conference Board of Canada, “STEM education must be reformed to engage Indigenous youth”. They also report currently many Indigenous youth opt out of STEM once they reach high school as Indigenous cultures and ways of understanding are not represented in curriculum and students feel alienated¹. STEM careers are critical to the future of Canada, and despite STEM jobs being in high demand, Indigenous people remain underrepresented in these careers.

Indigenous youth need to be heard and we need to provide opportunities for youth to explore and understand the barriers preventing some youth from engaging in STEM topics and pursuing STEM jobs, how they can integrate a holistic approach to healing the planet through STEM careers, and to help break down the barriers preventing them from pursuing STEM learning, and jobs. Subsequently, during Winter 2021, we held collaborative meetings with representatives from Green Bricks Education Society, Skye Consulting, Urban Nations Youth Association (UNYA), teachers, and students currently enrolled in First Nations Schools in B.C. These meetings were held in person and online and were a practical opportunity to listen, learn and share perspectives, ideas, and resources to make STEM come alive for Indigenous youth and change the dialogue and teaching to bring Indigenous perspectives to all youth. The goal was to help present a road map for educators to provide an inclusive learning environment in STEM, combining Indigenous ways of knowing with Western scientific knowledge (often referred to as ‘Two-Eyed Seeing’). By engaging Indigenous youth in STEM learning and careers, we will strengthen our future workforce in Canada, but also be bringing invaluable, and vital Indigenous knowing to STEM.

In small groups students and teachers participated in discussing topics like:

1. What types of learning environments works for you (classroom/hands on/outdoor experience/groups)?
2. What is your favourite way to learn a new topic?
3. Share an experience that motivated you to discover more (or less) about the STEM topic?
4. Consider an activity you like to do (skateboarding, playing video games, exploring outdoors), and how it connects with STEM topics.

<https://conferenceboard.ca/insights/featured/indigenous-northern-communities/stem-education-must-be-reformed-to-engage-indigenous-youth>

LEARNINGS AND SHARED PERSPECTIVES

During our collaboration meetings, we invited students and teacher participants to share their thoughts and perspectives on how educators can engage Indigenous youth in STEM. While the topics of discussion changed, many of the responses from educators and students were that they wanted to “experience” STEM, learning from others but also making their own discoveries.

1) Learning Environment	2) Favourite way to learn something new	3) Share an experience	4) Linking activities with STEM topics
I like doing things rather than just listening	I learn working on my own, solving puzzles	I did some testing and experimenting to see what happens	Coding and math for video games
I like to learn outside with a friend	I like to watch videos sometimes but often just to try it out, hands on	I experimented to see what happened with an ant hill and water	Biology for gardening and fishing
I like to engage students using multi-modality and tech like videos/ppt and stories; students get drawn into stories	I like to learn from a mentor or elder, someone who knows how it do it	I tried making a snowman from water to see what would happen	Math and physics for playing different sports like soccer
Hands on / outdoors is great to connect with youth but not always practical	I like sharing stories about when we were young, perhaps digging for clams	I like making sculptures	Engineering for building new things
When we ‘do’ things it’s more engaging than just listening	I like to try it out myself for a few hours	I want to learn more about how electric cars are made	I want to learn more about how electric cars are made
	Storytelling		Make a project and test it out like a wind turbine

INDIGENOUS KNOWLEDGE AND STEM THOUGHT STARTERS

After capturing the conversations and discussions from participating educators and students, we have compiled a list of thought starters to help integrate Indigenous ways of knowing with Western teachings. This will help to provide an inclusive environment for Indigenous youth. In addition, all students will benefit from this holistic approach to STEM, and blending Western science with Indigenous knowledge will benefit society and help lead to a sustainable future. Many educators are already employing a variety of these thought starters, but we wanted to summarize a list of ideas.

Have students study science by getting out and experiencing it. Many teachers recognize the benefits to all students and are taking them outside to watch, observe and learn.

Raise awareness in classrooms that Indigenous ways of knowing are thousands of years of observing and working with nature to build sustainable systems. This is valuable knowledge that needs sharing and respect.

Teach students that understanding science from Indigenous perspectives will provide robustness to face the climate crisis. We need to have a sense of conscience for relationship, interconnectedness and responsibility between people and the land.

Western science has become cut off from the practical side of science and focuses more on one small part of the whole. Indigenous science focuses on experience and is holistic enabling people to see how, for example, all species are functioning together. This is an important concept for youth to learn and comprehend the difference because everything on our planet is interconnected and does not work in isolation.

Share examples of sustainable Indigenous practices like the clam gardens where for hundreds of years indigenous people along the Pacific Northwest coast cultivated clams. Restorations projects are underway, bringing elders and youth together investigating and learning through songs and stories.

Indigenous knowledge can teach us about resilience adaptation, through thousands of years of living sustainably on the land, often in harsh and changing climates. Understanding and learning from this knowledge will help prepare youth to be engineers and scientists capable of responding to our current changing climate.

Storytelling is embedded in Indigenous culture, and many of these stories contain information on how to live in harmony on the planet. Listening and learning from these stories can help shape how understanding of living respectfully with nature.

INDIGENOUS KNOWLEDGE AND STEM THOUGHT STARTERS

Invite Indigenous students to share their knowledge in a safe and inclusive environment. Our classrooms are enriched with multi cultures, and we can all learn from different perspectives and ways of living on the earth.

Discover with students the value of Art and Science. Observing and recording what we see helps to inform and understand what happens and how things work.

Undertake projects with students that happen over time and observe how, for example, plants grow, and change with seasons, and protect themselves. This helps build skills of patience, humility, respect, and connection with nature.

Language is a powerful tool. Many of the words and phrases we use are based in Western perspectives and sometimes alienating. Review and consider the language and phrases used to embrace inclusiveness and acceptance.

RESOURCES

(READING, VIDEOS, AND PROGRAMS) FOR STEM EDUCATORS AND CLASSROOMS

Here is a list of books, video links and programs that teachers and students shared with us during our collaboration meetings. If you have any further resources to share, please email info@greenbricks.ca

Name	Details
<u>Dialogue 13: Decolonizing Science Education & Practicing Indigenous Science</u>	The nature of the need for change, good work underway, and future avenues for change that educators, researchers, practitioners can help bring about in their work and lives are discussed.
<u>Making science relevant to Indigenous students</u>	This blog explores how science till recently was taught only from the perspective of Western science
<u>Science First Peoples, Teacher Resource Guide</u>	A secondary science guide developed by First Nations Education Steering Committee and First Nations Schools Associations
<u>Knowing Home: Braiding Indigenous Science with Western Science</u>	A resource to guide educators in reaching Aboriginal students, and teaching Indigenous scientific knowledge, perspectives and applications.
<u>BC Hydro power smart for schools</u>	Science-based activities developed with Indigenous students, educators, communities, knowledge keepers, and Elders.
<u>A Wall Worth Building: Making Clam Habitat Great Again</u>	Clam gardens YouTube video by Skye Augustine
Indigenous Writes by Chelsea Vowel	A guide to First Nations, Metis and Inuit Issues in Canada
First Nations 101 by Lynda Gray	Tons of stuff you need to know about First Nations people

RESOURCES

(READING, VIDEOS, AND PROGRAMS) FOR STEM EDUCATORS AND CLASSROOMS

Braiding Sweetgrass by Robin Wall Kimmerer

Indigenous Wisdom, Scientific Knowledge and the Teaching of Plants

Igniting the sparkle by Gregory Cajete

An Indigenous Science Education Model

[Institute for Integrative Science & Health](#)

Website with guiding principles, resources, and articles on bringing together Indigenous ways of knowing and Western scientific knowledge

For any corrections, additions or suggestions, please email info@greenbricks.ca.