

PART ONE: FOUNDATIONS

taught at home, so it's just reinforcing that 'living in two worlds' kind of thing.”

- Participants reinforced the importance of teaching to a variety of different student-learning styles.
- Students need to be given ample opportunities to explore topics that are of interest to them.
- Students are more likely to develop a deeper interest in science if it is an interactive, hands-on, creative experience, rather than a passive experience which places a primary emphasis on rote methods of acquiring knowledge, including lectures, notes and memorization. Such methods of instruction are in stark contrast with traditional Indigenous ways of learning (which includes, but is not limited to, learning situated in a natural environment, experiential learning, and collaborative learning) and this may further alienate Aboriginal students who bring with them a strong sense of cultural connection.
- Indigenous Knowledge should be included at every level of science education. Indigenous content should be included in all science courses, particularly at the senior-secondary level, which are formative years for students as they transition into adulthood.

See Anne Tenning, “Metaphorical Images of Sciences: The Perceptions and Experiences of Indigenous Students who are Successful in Senior Secondary Science” in *Knowing Home: Braiding Indigenous Science with Western Science, Book 2*, page 34.

<https://tinyurl.com/fnesc76>

6. Suggestions for Developing Locally Based Resources

This guide gives sample units which incorporate Indigenous Science perspectives into science activities. Teachers are encouraged to develop local units that speak to the local sense of place and non-appropriated knowledge of local First Nations, in collaboration with knowledgeable community members.

Framework for Designing Indigenous Science Resources

On the following pages is a rubric for designing locally-based Indigenous science resources. It was developed by, and reprinted with the permission of Dr. Judy Thompson. Some fundamental aspects for involving Indigenous science include:

- Indigenous Voice. What cultural experts can contribute to the unit implementation?
- Indigenous Languages. How can the local First Nations languages be included in the lessons?
- Diversity of Indigenous Groups. Do the lessons recognize the diversity of First Nations? Can the unit be shared and adapted to other groups?
- Protocol. What protocols need to be followed during the implementation of the unit?
- Relationship with the Land. How can the unit reinforce the importance of the land, plants and animals to Indigenous people?
- Ways of Learning, Ways of Teaching. Are traditional ways of learning included? Are activities student centered? Is evaluation formative?

Framework for Designing Indigenous Science Resources

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<i>Criteria</i>	<i>Gradations of Quality</i>			
	<i>4</i>	<i>3</i>	<i>2</i>	<i>1</i>
<i>Indigenous Voice</i>	Cultural experts are a significant and critical part of unit implementation. Elders and community members are involved at all stages of the curriculum development process and an Indigenous person is directly involved in the writing of the curriculum.	Cultural experts are involved. Elders and community members have been involved in many stages of the curriculum development process.	Cultural experts have been involved, but their role is not clear.	Involvement of cultural experts not mentioned.
<i>Indigenous Languages</i>	Indigenous languages are recognized as being an integral part of Indigenous ways of knowing and worldview. The language plays a large part in the lessons and activities.	Indigenous languages are recognized as being an integral part of Indigenous ways of knowing and worldview. While the language does not play a large part in the lessons, the importance of learning the language from Elders and other fluent speakers is stressed.	No mention of the importance of Indigenous languages to Indigenous ways of knowing and worldview but there are Indigenous words used here and there throughout the curriculum.	Indigenous languages are not part of the curriculum and there is no mention of their importance to Indigenous ways of knowing and worldview.
<i>Diversity amongst Indigenous Peoples</i>	Focus of curriculum is on one particular Indigenous group. The curriculum is flexible enough so that it can be adapted to other Indigenous groups.	Focus of curriculum is on one particular Indigenous group. There is not much flexibility in the lessons so that they cannot be adapted to other Indigenous groups.	Curriculum is very general and is not focused on any particular Indigenous group. However, it does make reference to the diversity amongst Indigenous groups.	Curriculum is very general and is not focused on any particular Indigenous group. Does not make reference to the diversity amongst Indigenous groups.

Adapted from: Appendix F, pp. 136-140. Thompson, J.C. (Edösdí), (2004). *Gitga'at Plant Project: The Intergenerational Transmission of Traditional Plant Knowledge Using School Science Curricula*. (Unpublished Master's Thesis). University of Victoria, Victoria, BC.

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<i>Protocol</i>	It is recognized that when working with specific Indigenous communities and cultural experts that there are protocols to be followed. These are explicitly stated.	It is recognized that when working with specific Indigenous communities and cultural experts that there are protocols to be followed. These are not stated, but are directed to individuals and/or organizations (e.g. hereditary chiefs, band council members, educators, etc.) in order to find out the proper protocol to be followed.	The importance of following protocol is not highlighted, but individuals and/or organizations within the community are listed as contacts for general information.	There is no mention of the importance of following protocol.
<i>Relationship with the Land</i>	States the importance of the land, plants and animals to Indigenous peoples. Lessons either take place out of the classroom on the land (e.g. at fish camps, seaweed camps, etc.) or in the classroom. Cultural experts are integral to the lessons.	States the importance of the land, plants and animals to Indigenous peoples. While some lessons take place out of the classroom on the land, many of the lessons take place in the classroom. Cultural experts are often involved.	Does not state the importance of the land, plants and animals to Indigenous peoples. Most of the lessons take place in the classroom but cultural experts are brought in once in a while.	Does not state the importance of the land, plants and animals to Indigenous peoples. Lessons take place inside a classroom without the involvement of cultural experts.
<i>Ways of learning, ways of teaching</i>	Traditional ways of learning and teaching are outlined. Activities are numerous and varied and are student-centred. They often take place on the land with Elders (observation, practice, participation, active involvement, etc.). Learning and evaluation ideally take place at the same time; is formative.	Traditional ways of learning and teaching are mentioned. Several activities take place, such as videos, guest speakers, field trips, guided labs, non-directed labs. Lectures are limited and teacher acts as a facilitator. Evaluation is a balance of formative and summative.	Traditional ways of learning and teaching are not mentioned. Some activities, such as videos or guided labs. Evaluation is a balance of formative and summative.	Traditional ways of learning and teaching are not mentioned. Activities are teacher-centred (lecture oriented). Evaluation is summative.

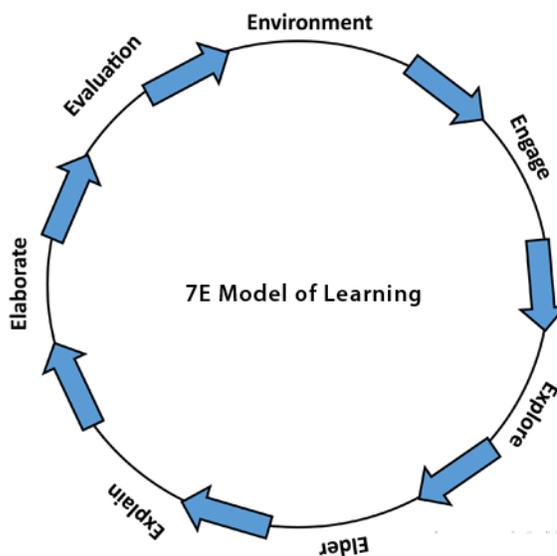
Working in Partnership with Community Members

Great success comes from working in collaboration with the local community. Here are some fundamental considerations when consulting with community members.

- Develop classroom resources in collaboration with Elders, knowledge keepers and other community members.
- Approach the community members with respect.
- Prepare to consult with community members by reading published or online resources relating to your topic to get an idea of local knowledge.
- Explore ways to allow students to get out onto the land and to experience the “place” of the local First Peoples.
- Remember that not all knowledge can be, or will be, shared. This needs to be respected.
- All cultural knowledge remains the copyright of the community. Educators, schools and/or school districts should not attempt to copyright lessons developed in collaboration with First Nations communities.
- How you connect with the local First Nations community will depend on your school and location.
 - Most school districts have a District Aboriginal Principal or similar position who may be able to connect you with community members.
 - Band operated schools have an education coordinator or other band council member whose responsibility is liaison with the schools.

7E Model

The 5E model has been widely used as a structure for developing experiential learning activities for science. This model can be expanded to include two significant components that incorporate Indigenous science: Environment and Elders. It can be used to structure a single lesson, or a unit over a number of days. It works well as an organizer for inquiry learning.



Environment

Situate the lessons in the local land and environment. This builds an appreciation for the concept that everything is connected to everything else and taps into a sense of Place.

Engage

Capture student attention and curiosity. Raise scientifically relevant questions. Connect what students know with a new question or idea. Ask a question, show something interesting, pose a problem.

Explore

Experiential. Students observe, record, connect ideas, and ask questions, usually in groups. Teachers are coaches and facilitators.

Elder

Elders and other knowledgeable community members represent the Indigenous Knowledge held by the community. They can connect the science activities through sharing their traditional knowledge. Where Elders or other knowledge keepers are not available, students may consult other authentic and appropriate cultural resources such as video, print and online sources.

Explain

Describe observations and come up with explanations. Develop vocabulary, apply and interpret evidence. Students reflect on their processes, thinking and conclusions. Teachers guide students with questions and suggest additional resources.

Elaborate

Use information to extend learning to new situations. Make connections to their personal lives and to society. Teachers help students broaden understanding.

Evaluation

Students demonstrate their understanding of concepts and skills learned. Teachers ask open-ended questions and encourage students to self-assess their learning.