Runninghead: Bridging the Gap: Integrating Indigenous Knowledge and Science in a

Non-Formal Environmental Learning Program

Bridging the Gap: Integrating Indigenous Knowledge and Science in a Non-Formal

Environmental Learning Program

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INTRODUCTION

In today's world, we are faced with several pressing challenges. Acts of terrorism, war, economic disparities, obliteration of distinctive cultures, and destruction of the earth's biosphere are some of the pressing issues requiring urgent attention. Education plays a critical role in seeking to resolve the root causes of these problems. It has the power to strengthen human capacity for non-violence, trust, empathy and respect. However, the field of education is complex and within this multifaceted discipline, issues that presents itself in teaching and learning often requires equally complex approaches to determining appropriate solutions. This Research for Change study explores an approach to improving of an environmental learning program for Indigenous youth in the inner city of Winnipeg, Manitoba called Bridging the Gap, a programs which deals with and speaks to urgent issues for society and environmental learning (Swayze, 2007).

With increasing urbanization, the lives of children today are much different than in the past. Today many youth have fewer opportunities for regular contact with nature (Louv, 2005) and this is particularly true for children in inner-city neighbourhoods, where the percentage of natural areas is frequently lower than in the suburbs. Based in Winnipeg, Bridging the Gap initially began as an innovative environmental learning program providing free full-day field trips for Grade Four students from the Winnipeg School Division's Inner-City School District. With the generous support of program sponsors, all program costs are covered including round trip transportation to two of Winnipeg's largest, highest quality natural areas.

Like many non-formal environmental learning programs for school aged children, Bridging the Gap originally had an ecology-based focus and addressed learning outcomes

from Manitoba's science curriculum. Using an action research methodology, the program focus is being continuously modified to reflect: a) the close fit between the programs goals and traditional Indigenous cultural values, identified as concepts at the heart of sustainability (Graham & Peters, 2002; Manitoba Education and Training, 1995, 2000) and b) for this urban, largely Indigenous population, affected by historical issues related to colonialism (disruption of culture and loss of connection of land) traditional cultural values should be rekindled (Aikenhead, 2000; Cajete, 2000) integrating Western and Indigenous worldviews to avoid teaching science in an assimilative way (Aikenhead, 1997). The present challenge however, is finding respectful and appropriate ways to do this while ensuring attempts to integrate Indigenous worldviews are meaningful and effectively supported student learning.

A Case Narrative approach was used as a part of this study in attempt to address this challenge within *Bridging the Gap*. It was designed and implemented as an approach to re-envisioning the perceived challenge, within a topic dealing with urgent issues in science education (Aikenhead 2006, 2007, Cajete, 1999) and in society in general (Manitoba Education and Training, 2000, Haigh 2006, Hautecour, 2002; Kellert, 2005, Louv, 2005, Stapp, 1996). Rather than a challenge, what unfolded was an opportunity to critically evaluate and improve practice, not to develop a solution but take advantage of the invitation to improve understanding as a part of a continually evolving process of ongoing monitoring, critique and evaluation.

LITERATURE REVIEW

"There can be no greater contribution or more essential element to long-term

environmental strategies leading to sustainable development that respects the

environment… than the education of future generations in matters relating to the

environment," (UNESCO, 1988).

Demand for Environmental Learning – Sustainability is a core component of

Science education. Scientific knowledge is necessary, not in itself sufficient to achieve

scientific literacy. STSE understandings are an essential component of scientific literacy.

To understand the relationships among science, technology, society, and the environment,

students must understand the values related to science, technology, society, and the

environment and develop an appreciation for the importance of sustainable development,

as they learn to consider the needs of both present and future generations, balancing the

impact of economic activities, the environment, and the health and well-being of the

community (Sustainable Development Strategy for Manitoba, 1994). Education is the basis

for action. To promote sustainable development and improve the human capacity to

address environmental issues, effective education is critical (Haigh 2006; Kellert, 2005;

Stapp, 1996). Environmental learning is described as being in, about, and for the

environment. Environmental learning is rooted in the belief that humans can live

compatibly with nature and act equitably toward each other. Both aim to create a

democratic society in which effective, environmentally literate citizens participate with

creativity and responsibility (Robottom, 1995).

In December 2002, the United Nations General Assembly (UNGA) adopted

resolution 57/254 to put in place a United Nations Decade of Education for Sustainable

Development (UNDESD), spanning from 2005 to 2014. The primary goal for the

UNDESD is to encourage *"…Governments to consider the inclusion … of measures to*

implement the Decade in their respective education systems". In 2000, Manitoba

Education and Training released the document titled "Education for a Sustainable Future"

(Manitoba Education and Training, 2000) with explicit emphasis on integrating

sustainability into Manitoba curriculum. There is therefore a clear support for the

development of effective environmental learning resources and initiatives in formal and

non-formal education in Manitoba.

Demands for Culturally Relevant Environmental Learning – Canada is a nation

composed of diverse racial and ethnic groups. In this multicultural context and there is a

recognized need to provide culturally appropriate environmental learning (Fontes, 2004;

Lijmbach, et al. 2002; NAAEE, 1996; Stables & Bishop, 2001; Wais & Evert 1992).

Learners form ways of looking at the world based on personal experiences and

knowledge acquired and constructed within unique cultural and linguistic environments,

contexts that are culturally, linguistically, and cognitively meaningful and relevant to

them (Barton, 1998a, 1998b; Eisenhart, etal., 1996; Lee & Fradd, 1998; Rodríguez, 1997,

1998a).

Composed of diverse racial and ethnic groups, our natural and social environments

are unique, but also valued for a variety of aesthetic, economic, cultural, recreational, and

spiritual reasons. Balanced environmental learning programs strive to be fair, accurate and

balanced and are inclusive of different cultural ideas, taking a broad

view and presenting differing perspectives, viewpoints and theories (NAAEE, 1996, Stables & Bishop, 2001, Wais & Evert 1992). This implies a shift from teaching the 'right' attitudes and allowing for openness to inquiry and opportunities for reflection of diversity knowledge and skills required for the protection of nature and the environment (Lijmbach, et al. 2002). Programs should recognize that there are multiple perspectives on environmental issues that may conflict with each other. Providing opportunities for discussion of differences in views assists learners in considering other viewpoints while developing their own opinions. Opportunities to explore different cultures' use of and relationship to the natural world and encourages learners to open their minds to different ideas and perspectives. Programs and initiatives should express the views and interests of people of various socio-economic status, include the views of indigenous peoples, and be sensitive to the needs of persons with disabilities (NAAEE, 1996).

Environmental educators recognize the integral connections between environmental concerns and broader questions of social equity and acknowledge a need for greater emphasis cultural inclusivity within our programs. Within Canada specifically, the elimination of educational gap between Aboriginal and non-Aboriginal peoples has been identified as an economic and moral necessity (Canadian Teachers Federation, 2007, CMEC, 2008*).* The increasing diversity of the school-aged population, coupled with differential science performance among student demographic groups raises questions as to what counts as science and how science should be taught. This is particularly relevant in Manitoba, given that this is fastest growing segment of the provinces population and that Winnipeg is home to the largest urban Aboriginal population in Canada (Hanselmann, 2001; Mays, 2005; Statistics Canada, 2000, 2005).

Given that the highest percentage of Winnipeg's population of Aboriginal youth lives in and attends school in the core part of the city, within the Winnipeg School Division's Inner City School District (Statistics Canada, 2000, 2005) the inclusion of traditional Indigenous cultural values within the Bridging the Gap Program is highly appropriate.

The majority of environmental learning programs, especially those for school aged children, are typical ecology based with a focus on addressing grade level appropriate learning outcomes from the science curriculum. Canada is a multicultural society and there is a growing recognition of the need to provide environmental learning opportunities in culturally appropriately contexts. Although science is a core discipline in elementary and secondary schools around the world, the scientific models of Western culture reflect a worldview that is not held by everyone. There is striking difference between Indigenous and Western science and a variety of research that suggests science learning experiences differ between non-Western and Western students (Aikenhead,

1996, 1997, 2000, 2003; Christie, 1993; Knudtson & Suzuki, 1992; Peat, 1994). The culture and language of an individual student influences how they approach science learning (Aikenhead, 1996, 1997; Aikenhead & Jegede, 1999; Allen & Crawley, 1998; Chipman & Pachaury, 1985; George & Glasgow, 1988; Jegede & Aikenhead, 1995; Ogawa, 1995; Jegede & Okebukola, 1991; Kanu, 2006; Lee & Fradd, 1996; Lynch, 1996a; Lynch, 1996b; Lynch, McKinley, McPherson-Waiti & Bell, 1992; Sutherland, 1998; Sutherland & Dennick, 2002). The greatest challenge is to find a respectful way to compare Eurocentric and Indigenous ways of knowing and include both in contemporary modern education (Battiste & Barman, 1995). It is challenging, yet crucial, not to distort local knowledge by making it conform to the Western epistemology endemic of school

culture. Inadvertent assimilation will take place in a science classroom if the local

knowledge is taken out of its epistemic context (Aikenhead, 1996, 1997, 2000; Cajete,

1999). For urban Aboriginal populations, affected by historical issues related to

colonialism (disruption of culture and loss of connection of land) the traditional cultural

values of sustainable living should be rekindled as fundamental components of

Indigenous science (Aikenhead, 1999; Cajete, 1999).

The Potential to Integrate Indigenous Knowledge in Science Based

Environmental Learning – In many cases traditional Indigenous cultural values exemplify

the qualities of good stewardship in supporting a worldview of collective responsibility

for respecting the land, an interconnectedness and interdependence of all life forms, and a

use of only what is needed for sustenance. Indigenous environmental knowledge

developed over centuries of observing and understanding natural cycles and the

interruption of these natural cycles was considered to an act against the laws of nature.

This knowledge and understanding of the natural world, based on the importance of

sustaining Mother Earth for seven generations to come, is embedded in traditional

aboriginal cultural values and is at a concept at the heart of sustainability (Graham, K., &

Peters, 2002; Manitoba Education and Training, 1995, 2000; Western Canadian Protocol

for Collaboration in Basic Education, 2000). Education should include traditional

knowledge in order to help teachers and students understand the importance of an

education towards a sustainable society (Manitoba Education and Training, 1995, 2000).

Environmental learning has traditionally focused on natural resources and wildlife

and how people manage their behaviour to sustain healthy ecosystems. However,

environment and culture are also closely interconnected. The cultural history of a society

is the shared ideas, identities, and collective expressions of a cultural group. Culture is

intricately related to our identity as a people or peoples and to the way we define

ourselves (Brawdy, 2004). Indigenous ways of coming to knowledge are not restricted

solely to cognition; rather they encompass the four sacred aspects of life - mental,

emotional, physical, and spiritual. As described by Natalie Tays, principal of

Nishciwaskicyk High School in Nelson House Cree Nation, Manitoba, "Indigenous

Knowledge is holistic and not naturally segregated into subjects used in Western science.

It (science) doesn't need to be done in one room, with a beaker or under a microscope,"

(personal communication, Tays, 2007). Pam Colorado (1989) refers to the wisdom and

knowledge of aboriginal people as "Indian Science," a holistic and spiritual process

which, "gathers information from the mental, physical, social and cultural/historical

realms," (p.30). Unlike Western science, which places humanity apart and above the

natural world, free to exploit the physical world and its resources, Indigenous science

evolved to allow human beings to fit into, rather than outside of, the natural world with a

relationship of respect a sense of responsibility to keep it healthy. Furthermore, there is a

conflict between the importance of localized knowledge in Indigenous science and current

science curricula. The motivation for developing knowledge about nature is

fundamentally different in the two cultures (Aikenhead, 2000).

Current science curricula often emphasize the importance of conclusions that can

be generalized beyond the local context, de-emphasizing the importance of localized

knowledge, an integral component of Indigenous science. Many advocates for a more

multicultural representation of science have argued that this universalistic stance is not a

true representation of science and that there is a need for integration of other knowledge

systems. The greatest challenge is to find a respectful way to compare Eurocentric and

Indigenous ways of knowing and include both in contemporary modern education

(Battiste & Barman, 1995). It is challenging, yet crucial, not to distort local knowledge by

making it conform to the Western epistemology endemic of school culture. Inadvertent

assimilation will take place in a science classroom if the local knowledge is taken out of its

epistemic context (Aikenhead 1996, 1997, 2000; Cajete, 1999). For urban Aboriginal

populations, affected by historical issues related to colonialism (disruption of culture and

loss of connection of land) the traditional cultural values of sustainable living should be

rekindled as fundamental components of Indian science (Aikenhead, 1999; Cajete, 1999).

In the everyday world, both the culture of their community and the culture of

Western science influence students' personal identities, students should feel at ease in both

cultures and learn to move back and forth between the two cultures, becoming better

citizens in a society enriched by cultural differences (Aikenhead, 2000; Western

Canadian Protocol for Collaboration in Basic Education, 2000). The comprehensiveness

of environmental learning can be enhanced if programs seek to integrate the learning of

Western science concepts as well as cultural values that impel and sustain action (Fontes,

2004).

The Role of Elders in Science Education – The title "Elder" does not necessarily

indicate age, and "…not all Elders are teachers, not all Elders are spiritual leaders and

not all old people are Elders," (Medicine, 1987, p. 147). Elders are described as respected

individuals who have amassed a great deal of knowledge, wisdom and experience. They

include men and women, who have special gifts and they are recognized for their

wisdom. The community looks to them for guidance and sound judgment and the wisdom

of Elders is central to cultural learning.

"One of the greatest gifts a person can receive is the gift of knowledge. Our Elders have a lot of knowledge to share. They are a rich, untapped fountain of knowledge," Tays (personal communication, 2007).

Elders are the "Keepers of Knowledge," and it is their guidance that people seek as they strive for balance in their relationships with the Creator, the natural world, other people and themselves (Cajete, 1999; Report of The Royal Commission on Aboriginal Peoples, 1996; Western Canadian Protocol for Collaboration in Basic Education, 2000). Elders are not only individuals with significant wisdom in areas of traditional knowledge, but they are recognized as having the capacity to transmit this knowledge to others and play and important role in passing on knowledge to younger generations. Across North America, many educators invite Elders to share traditional cultural teachings, exposing students to a worldview that recognizes the intrinsic value and interdependence of all living things. Elders have a socio-culturally grounded role in guiding, advising and supervising younger generations based both on their "traditional" knowledge and their understanding of "modern" knowledge (Western Canadian Protocol for Collaboration in Basic Education, 2000).

The presence and wisdom of Elders have been seen as an effective way to preserve and foster traditional knowledge in education, providing support for Aboriginal learners. Their involvement in education helps close generation gaps created by legacies of residential schools while strengthening Aboriginal pride and kinship. When involving Elders in education, it is essential that Elders not be viewed as decorative or symbolic. They must be acknowledged as leaders, deeply entrenched in educational foundations. As

repositories of traditional knowledge and managers of Indigenous knowledge systems,

they are primary providers and transmitters of information (Worldbank, 2006). It is

recommended that Elders have an active role in education and be treated as professionals,

respected for their expertise, unique knowledge and skills (Cooke-Dallin, etal., 2000).

They must be seen as authoritative community stakeholders in developing culturally

relevant science curricula (Aikenhead, 2006; ANKN, 2004a; Inuit Subject Advisory

Committee, 1996; Kawagley etal., 1998; McKinley, 1996; Riggs, 2005; Sutherland &

Tays, 2004).

CASE NARRATIVE

For several years now, I have been employed part-time as an Education Coordinator with the City of Winnipeg's, Naturalist Services Branch. I have been involved in developing and managing a non-formal environmental learning program, working with students and teachers from Winnipeg's Inner-City School District. The following describes a dilemma encountered in this program, called *Bridging the Gap*.

Based in Winnipeg, Manitoba, *Bridging the Gap* initially began as an innovative, non-formal environmental learning program in 2005. The program was designed to provide free full-day field trips for Grade Four students from Winnipeg's School Division's Inner-City School District. In the program, students visit two of Winnipeg's largest, high quality natural areas - the Assiniboine Forest and Living Prairie Museum**.** Students engage in curriculum based, hands-on learning activities and participate in relevant initiatives that show respect, gratitude and appreciation of Manitoba's natural environment. Students spend the morning exploring a prairie habitat, engaging in discussions, activities and data collection. Following lunch students replicate their data collection activities and discussions in forest and wetland habitats.

Like many environmental learning programs for school aged children, the program subject matter and design was originally ecology-based. The content focused on objectives and student learning outcomes outlined in Manitoba's Science curriculum (Grade Four Life Sciences - Habitats and Communities) and discussing the concept of Habitat (need for food, water, shelter, space, air). The program also aimed to support the development of environmentally responsible behaviour and sustainable living practices, with connections made to other relevant curricular areas.

Program learning outcomes developed as follows:

Students will be able to:

③ Identify and give examples of habitat components – food, water, shelter, space

③ Collect, record and share information about three Manitoba habitats

③ Investigate and describe three Manitoba habitats

③ Acknowledge that people and other living things are part of an interdependent family using nature as home

③ Reflect on personal behaviours and attitudes towards nature and identify issues related to environmental stewardship and sustainability in Manitoba.

③ Participate in activities that show respect, gratitude and appreciation of Manitoba's natural environment

③ Discuss the importance of the nature and why we should have a healthy natural environment.

Sample Sheet from Student

Field Data Collection Booklet

		Humans	Animal:_____
	Food		
	Water		
Needs	Shelter		
	Space		

Prairie

After the first year of the program, it was noted that a large percentage of the participating students were Aboriginal (primarily First Nations and Métis). Across Canada, there is a growing recognition of the need to provide learning opportunities in culturally appropriately contexts. This is particularly true for Aboriginal students in Manitoba as this is the fastest growing segment of the provinces population and Winnipeg is also home to the largest urban Aboriginal population in Canada (Hanselmann, 2001; Mays, 2005; Statistics Canada, 2000). The highest percentage of Winnipeg's population of Aboriginal youth lives in and attends school in the core part of the city, within the Winnipeg School Division's Inner City School District (Statistics Canada, 2003).

A close fit was also acknowledged between the program focus and traditional Indigenous cultural values i.e. the idea that humans share the earth with animals and have a responsibility to care for this shared habitat, with a mutual dependence on the earth to meet our own habitat needs**.** The comprehensiveness of environmental learning can be enhanced if programs seek to integrate the learning of Western science concepts as well as cultural values that impel and sustain action (Fontes, 2004). For environmental learning programs, in many cases traditional Indigenous perspectives exemplify the qualities of good stewardship in supporting a worldview of collective responsibility for respecting the land, an interconnectedness and interdependence of all life forms, and a use of only what is needed for sustenance. Indigenous environmental knowledge developed over centuries of observing and understanding natural cycles and the interruption of these natural cycles was considered to an act against the laws of nature. This knowledge and understanding of the natural world, based on the importance of

sustaining Mother Earth for seven generations to come, is embedded in traditional aboriginal cultural values and is at a concept at the heart of sustainability (Graham & Peters, 2002; Manitoba Education and Training, 1995, 2000; Western Canadian Protocol for Collaboration in Basic Education, 2000). Education should include traditional knowledge in order to help teachers and students understand the importance of an education towards a sustainable society (Manitoba Education and Training, 1995, 2000).

In light of these observations, the inclusion of traditional Indigenous cultural values within the Bridging the Gap Program was therefore considered highly appropriate. A new focus for improving the program evolved - finding ways to include traditional Indigenous cultural ideas in the existing program content. The challenge however, was finding a respectful and appropriate way to do this while ensuring this integration was is also meaningful and effectively supported student learning.

In 2006, year two of the program, a local Elder was invited to participate to provide traditional cultural teachings related to earth stewardship. This was seen to be an effective and respectful way to bring relevant traditional cultural values into the program, given that this knowledge was not something I could provide myself. In revising the program design to include an opportunity for the Elder to teach, it was decided that the existing program structure, objectives and learning activities would not change, but the itinerary for the day would be modified to include a half-hour "Elders Teaching" component before lunch. The Elder was provided with specific background on the program goals and structure and also familiar with the setting where the teaching took place.

Modified Program

Itinerary

> **9:30 - 9:45** Introduction and orientation
> **9:45 -10:15** Review of Habitat components, types and student data collection booklets
> **10:15 - 10:45** Prairie habitat study and data collection
> **10:45 - 11:30** Elders teaching
> **11:30 - 12:00** Forest habitat study a data collection
> **12:00 - 12:45** Lunch
> **12:45 - 2:00** Wetland habitat study and data collection
> **2:00 - 2:30** Trail building and/or planting
> **2:00 - 2:30** Wrap-up

This photo depicts one of the "Elders Teaching" components of the Program. The teaching topic was "Friends with Relations" in which the Elder described to the students the principle of humans as being of "one-blood" with the animals. Like animals people, were described as also relying on plants and Mother Earth for our survival, resulting in a need to be mindful of our responsibility to respect Earth/Mother and our fellow relations/animals. As shown in the photo, students were fully engaged throughout the teaching. They demonstrated appropriate listening behaviours, asked questions and provided thoughtful responses. With these signals, as the program developer and one of the educators, I was thrilled to see what I thought was an effective means of including the cultural ideas within the program.

Unfortunately, later on in the day my initial excitement and perceived "success" was replaced with a sense of disappointment and confusion while engaging in a casual conversation with one of the partcipating students.

Educator: What did we learn about today?

Boy 1: Habitats… and plants and animals in them

Educator: Right. And what else can you tell me about these habitats?

Boy 1: Animals need food, water, shelter and space in them.

Educator: Right on. And what about people, what are we supposed to do?

Boy 1: Um… (no response)

Educator: What was the (Elders name) talking about?

Boy 1: Who's (Elders name)?

Boy 2: That lady that was talking about blood and stuff

Boy 1: Oh ya…

Educator: What did she say about respect?

Boy 1: It's important?

Educator: Yes it is. So what does this mean for this habitat we're in?

Boy 1: Um… (no response)

Although I inevitably was able to guide the boy, along with some of his classmates around him to provide a suitable response (need for humans to be respectful for the animals habitat as part of the earth that we share with them), this was not a natural connection for the boy or his other classmates when talking about what was "learned" during the day.

This disconnected was apparent as well for other students from other classrooms involved in the program on subsequent days. Clearly, although the students listened captively throughout the Elders teaching, there was disconnection between what was addressed in the program content based on the science curriculum. Based on my own reflection on the program structure itself, I now feel dismayed for having involved the

Elder in what seems to have been an artificial way…as a token Elder rather than as a fellow teacher within the program. Her teachings seemed disconnected form the science content, presented not only in a different form, but also including as a separate "piece" of the overall program. The ideas found in her teaching and those from the science curriculum seemed connected and related in theory and quite a logical fit for me, but my attempts to include both and help students make the connection seemed ineffective.

Including Indigenous knowledge in the program is not something that I myself have sufficient expertise and ability to do. An Elder was brought in as the "expert" in this area but my attempts to connect this with the science concepts didn't seem to work. While trying to support students in learning to understand science ideas and concepts from both worldviews, I did not feel I was able to support them in making natural connections between the two. Recognizing that I need to avoid trying to "integrate" the cultural ideas, is there a better way to involve Elders in this program? A way that is not only respectful, but also meaningful, relevant, and helps support students see the related science concepts from both a western and Indigenous worldview?

RESPONSES

N.S. Case Author

Environmental Educator, MEd Candidate

There are several issues involved here.

First of all, the program goals are too ambitious and unrealistic within the context a one-day program where the student population is unknown. Having realistic goals for the program in light of the non-formal setting is important. Consider the challenges faced in dealing with and unknown group of students for one-day, who are likely to be concerned with many things other than what I am trying to teach…the students are of course in a new setting, on a field trip, perceive me as a stranger etc.! To expect the tackle the challenging issue at hand of teaching students to "walk in both worlds comfortably" can not be accomplished in one-day or through one program.

As a teacher I know that existing knowledge is considered valuable and essential to the learning process and should be the starting point in planning - the present, existential, concrete situation. We should try to facilitate development of surrounding conditions conducive to experiences leading to growth, but in this case there is limited ability to use in-depth knowledge and sympathetic understanding of learners or insight into their past experiences to ensure that the learning experiences are developmentally appropriate, while providing variety and focusing on relevant, familiar topics.

The Elder could also be engaged in a more meaningful way, with the teaching not presented as a "stand alone" piece but fully involved with the rest of the program. In addition there may not be enough connection between the conceptual areas addressed in the program content (meeting habitats needs) and the focus of the Elders teaching

(respect for our fellow animals). There is perhaps a need to consider the focus SLOs for the program and related activities students are involved in during the day. Rather than focusing on habitat needs, some of the other objectives from the science curriculum e.g. (Sci) 4-1-09 Recognize that plant and animal populations interact within a community (Sci) 4-1-13 Predict, based on their investigations, how the removal of a plant or animal population may affect the rest of the community (Sci) 4-1-14 Investigate natural and human-caused changes to habitats, and identify resulting effects on plant and animal populations. Sci) 4-1-15 Describe how their actions can help conserve plant and animal populations and their habitats (Sci) 4-1-17 Recognize and appreciate how traditional knowledge contributes to our understanding of plant and animal populations and interactions (Sci) 4-4-15 Identify natural phenomena and human activities that cause significant changes in the landscape. These SLOs might provide more logical or suitable connections to the Elders teachings. Some changes to the program itself should be considered. Recognizing the limitations of a one-day program, there would ideally be suitable pre/post learning activities for both the students and teachers and opportunity to do follow-up activities with the students. This would allow more opportunity to build on previous learning and more provide more room for meaningful assessment.

Finally, it is important also to recognize that all learning is ongoing and takes a long time to evolve. Within this continuum learning has no "ultimate destination" or end point. Particularly in this context of a non-formal program, with limited prior knowledge of students, fewer opportunities to engage in assessment etc., I can only hope to at least support students learning along this journey. When I consider for example that my own understanding of the "habitat concept" from a Western science view, it rooted in an

academic background in environmental sciences. My own sense of appreciation and respect for our natural habitats was borne out of regular childhood exposure to the natural world. My own commitments to environmental stewardship and sense of connection to the land developed over time and required extensive nurturing – it did not take place because of a one-day field trip.

As the educator in this setting it is also important to acknowledge my own limitations and process of learning. I am someone still developing both my own pedagogical practice but also my own understanding traditional Indigenous worldviews. It is therefore imperative that part of the process of addressing this dilemma includes a commitment to ongoing professional development as the program developer, both in the traditional "training" sense but also in the form of learning more about my cultural background, developing closer relationships with local Elders.

A continued process of meaningful reflection is also important. I should not expect that the program will ever reach a point of "perfection", rather recognize that it will continue to evolve to address current problems and new ones as they arise while I myself improve my understanding of the various issues involved.

RESPONDER #2

Retired Teacher, Author

The challenge you raise is an important one. I don't really have a good answer, but it occurs to me that you might be trying to accomplish too much in one day.   For kids to visit two different sites that they have never seen before, and meet and listen to several adults, most of whom they have never met before, it is asking a lot that are able, at the end of the day, to make the connections you want them to make.

Your program and the day's itinerary sound fine. What is needed are subsequent days spent with the kids that help them reflect and digest what they learned at the Museum and the Forest. Those subsequent days would include further environmental learning, including opportunities for kids to do something with the knowledge that they have developed.

Your own reflection points at another solution: engage the Elder as a full partner in the program. Make them aware of the shortcomings of the program, and ask for their suggestions. Becoming aware of the challenge you face should enable them to focus their presentation(s) to address the challenge or the previous disconnect that your students exhibited.

RESPONDER #3

Professor, Faculty of Education

The challenge in this incident is to develop some valuable learning experiences for inner city programming for Aboriginal students that includes the perspectives of Elders. The question that I would have is do you think that a one-day program can

succeed in meeting all the objectives you may have for the program?

I don't think that a passive exposure to one Elder will change many children's perspective or impact them in the long-term. I think that the student needs on-going exposure to Elders and Aboriginal perspective. One way could be to have contact with the students before and after the Bridging the Gap day and during the pre session lay out some of the expectations you have regarding the incorporation of Aboriginal knowledge – what do you expect them to learn.

One program cannot do it all and so part of the issue is to figure out what are some viable outcomes for a program that is one day in length-especially when the Bridging the Gap program is trying to introduce children to so many things all at once – stewardship, Aboriginal perspective in science etc. So maybe expecting them to absorb all this information so quickly is too much.

My solution or something like it recognizes that there needs to be more time devoted to the program so students can interact with the Elders in their investigations of the environment and so they can establish a relationship with the Elder. As well the Elder needs to be involved in the development of the program so that the incorporation of the Indigenous knowledge is not an add-on but is woven into the whole program.

I think that the place-based literature is quite relevant in this challenge – just as you and I have been talking about the "resident" vs. "inhabitant" idea in Gruenwald's work and how that plays out in the development of a program for children who are 'residents'. You cannot expect the disconnect inner-city students have in general with the environment to be "fixed" in one day.

RESPONDER #4

Teacher, MEd Candidate

I am reminded of my Nokum and Nimosome teaching my brothers and I about how to show respect for where we live. It was a process with no beginning and no end. Each time we went out fishing, berry picking, walking, hunting, trapping, or just in the course of talking there was always dialogue about the way in which things are carried out and why. My knowledge about how to respect our home came as naturally as my knowledge of how to exist with others. It happened without my realizing it or having to formally learn it. I just grew understanding that we are as one with the land and the animals the same way that I learned it is unkind to laugh at people.

While I realize that it is not possible to spend the same amount of time with Elders as I did with my grandparents perhaps you could consider allowing the students and the Elder to interact the same way I did with my grandparents. Perhaps the Elders teaching could take place over the course of the day. This would negate the separation of knowledge acquisition and the practicing of that knowledge, allow for a more traditional form of sharing and would also allow Elders to model what respect looks like as my grandparents did for me.

RESPONDER #5

Teacher, Environmental Project Officer

I understand the dilemma to be whether the well-intentioned involvement of the respected Elder reduced to something trivial and maybe even disrespectful. I do not believe a solution is necessary. I believe a broader analysis of the event and impacts could provide guidance. Learning from this experience can provide ways of enhancing the integration of Indigenous knowledge into western science instruction.

On a very broad educational level, we know that singular experiences rarely result in quantifiable changes in behaviour (the exception being those experiences that are very unpleasant and are driven by fear like being bitten by a dog leads to avoidance of dogs). Drawing parallels to a much more commonplace educational situation, place value as an important foundation piece for numeracy, is a recurrent theme beginning in early years education and continuing into high school. Even after such a long period of exposure, some students never achieve a functional understanding of place value. In the dilemma that is presented in this case, there is a question of reasonable expectations that I commonly observe amongst environmental educators in particular, in both the formal and non-formal sectors. I theorize that the impatience to affect positive change for the environment in the face of pressing environmental issues has such a great influence on the educators that they lose perspective of what a reasonable learning outcome would be in this context. This is compounded by the emotional engagement that the educator quite likely has to the environment and the cause (a very different level of personal investment than place value or some other learning objective). As a result, there is also an impatience to have students internalize and act upon new learning in an unreasonable length of time.

Students move along the continuum by way of repeated and varied exposures and experiences over time that are respectful of their cognitive and moral stages of development.

In evaluation, it is not reasonable to isolate a particular incident and form a judgment on the value of the overall experience. When setting expectations for an environmental learning event or program, as with any educational endeavours, there must be reasonable expectations for outcomes. According to Piaget's stages of cognitive development, it is unreasonable to expect that a learner in the Concrete Operations stage would be able to effectively transfer the learning from the context of the Elder's conversation to a practical application for which he cannot make a direct link. My eleven year old still thinks that the proper way to dispose of a gum wrapper is to give it to Mom even when there is a garbage receptacle nearby. This is not to suggest that the activity with the Elder was unsuccessful since Piaget also says that children move from egocentric thinking to beginning to pay attention to the point of view of others (http://easychild.com/kids-ages-and-child-development-charts.htm). The impact of the Elder's conversation on the learners could be measured using appropriate tools designed specifically for that purpose.

Again, referring to reasonable expectations, the home is the place that values are established. Children generally adopt the value system without personal reflection. There should not be an expectation that the value system can be significantly altered, diverging from the established value system until the individual has reached a developmental stage that they have the confidence and maturity to hold a different belief than the one established through the home or in adolescence, through the peer group.

The effectiveness of that particular contact with the Elder can only be evaluated by gathering information from all of the individuals using appropriate evaluation tools. I can imagine that some students would report how much they enjoyed the stories or how beautiful the ideas were. Some may comment on how pretty the beaded hair barrette was. Although observing the pretty barrette was not part of the expected results, it is an indication that there was an impact coming from the experience and other benefits may simply be beyond the learner's awareness and ability to articulate. The culmination of all experiences contributes to the student's education. Looking at each one in isolation can give a false impression of what progress is being achieved.

From my own background and experience, I came to a situation that favoured a greater awareness of the environment in 2001 after leaving the public school system. Over a period of just over six years, I have implemented ways to change my behaviour, attempted to mold and change behaviours in my household and influence behaviours of those around me. I am now imagining how I would design an educational course around sustainability. I will use myself as a benchmark. I am a shameless 'early adopter' meaning that I am easily influenced to go along with change. Some less malleable people might criticize that people like me impetuously jump on and off bandwagons. I am passionate about the role of education in society. I am a trained educator with many years of classroom experience. I have an appreciation for continuous and lifelong learning. I am an adult who has independent will; less likely to be influenced by my upbringing and societal norms than children. Given this pre-disposition to altering my own behaviours, attitudes, beliefs and values, I observe that there was no moment of epiphany; no identifiable turning point. Understanding this non-event in my environmental learning

may be helpful in setting reasonable expectations for environmental education. Educators should not expect that a single event would lead to an observable change. The process must be continually nurtured. It has taken me these many years to arrive at a place on the continuum that I can have some degree of confidence in moving my learning outside of myself.

It was not a mistake to include the Elder and the teachings. In fact, it is possible that the exposure to that traditional belief system may be a very rare and unique opportunity for some of those students. In its absence, some may move forward with a gap in their attitude toward the environment and on a broader level, a healthy exposure to the culture. Especially with this target group of students in which being distanced from their traditional lifestyle is a concern, they have a living example that this notion is not something of the past, this is a real, contemporary approach that has an important role in society. In fact there is a resurgence and adoption of these traditional approaches within and beyond the aboriginal population (example below). Feedback from the Elder on the success and other possible extension activities could be integrated to add value to the role of the Elder.

RESPONDER #6

Retired Teacher, Environmental Educator

The situation as described in the case study brings back similar feelings of disappointment and frustration when bringing in speakers from the "outside". Perhaps therein lies part of the problem. Our educational system seems to teach kids that learning only happens in the classroom, sitting at their desk, and putting pencil to paper. Students

somehow have the notion that anything that happens beyond that is superfluous, and may not even "count" (as in "Teacher, does this count for the test?). As teachers we must continuously demonstrate that learning can take place anywhere, at anytime, and that we must be careful not to imply in our teachings that the textbook is our only source of knowledge. We can learn from "Princes and/or Paupers"…and we must strive to embody that in our daily lesson plans.

One lesson that I learned from a co-worker in the early days of my teaching career was how to demonstrate that idea in a very dramatic way. The teacher walked in to his history class, looked up at the students who sat there quietly, like mice in their first maze, and loudly clicked open his briefcase. He then took out several copies of history books, and proceeded to toss them one by one out of the second story window. The students looked at each other, some snickering, and some astounded at what just took place. The teacher's point: A text is fine, but they are not using it. Rather, the students would be using role-playing, research, class presentations, a variety of handouts and publications to learn about history.

Bringing in Elders or others into class or on a field trip must be preceded by some serious "homework" for the teacher. Have they discussed the context of why the person is coming in? Have they demonstrated ways that students can treat the person as a guest? Have they appointed someone to introduce the person to the class, and of course done the necessary research to do this properly. Have they talked about relating to people in general? People of different ages, races, and cultures? Have they taught students to focus on details and really pay attention?

Elders do have a tremendous amount of knowledge, as pointed out in the case study. There is an old saying that "when an Elder dies, a library burns". It is very important that students spend time thinking about how that knowledge came to be. Whenever I have an Elder speak to my groups I try to prepare them by asking some questions:

1. Were you born in a hospital? I then point out that most of humanity was not born in a hospital, and that the risky business of giving birth must therefore have been "natural"…and then I go on to draw on the analogy that First Nations people, like all Indigenous people, relied on knowledge from their Elders, and some simple materials from their environment to get the job done. How would they (the students) survive with only simple materials gathered from their surroundings?

2. The harsh winters of the Canadian Boreal would challenge even the most qualified survival experts in the world if they had to live there for even one season. How would you, as students, survive? We then talk about food, shelter, and clothing, and how difficult it would be to obtain them. Could they (the students) survive the long cold winter nights without an X-Box, Gameboy, Computer, or Cell Phone? It is these very distractions that make it difficult to imagine the body of knowledge it would have required for First Nations People to survive.

The whole point of the conversation is not to "widen the gap" between the speaker and the students. It hopefully would garnish some respect for the Elder. Adolescent psychological theory once again teaches us that this is easier said than done, when so much energy is spent on the students' image, and how their peers perceive them.

We must also allow the students to see the world through the eyes of the Elder. Is the Elder the Gaurdian of knowledge? If so, then how are they supposed to protect this knowledge? How do the pass it on to the next generation? How do they protect the knowledge that certain plants may fight cancer or strengthen our immune system? How do they protect that plant from exploitation? How does one person fight to keep a culture alive? This must take place before the Elder comes to the field trip or classroom.

Finally, contemporary educational theory states that students learn more by doing, rather than hearing or seeing. To fully engage the class, I would ask the Elder to perhaps involve the class, or a portion of the class, for example, in a Sweet Grass Ceremony, or to have a sharing session with them. This would help in setting the context, and help them see the special guest, rather than just a guest speaker. Then, after the session, an appropriate gift or honorarium could be given to the Elder as a sign of respect.

SYNTHESIS

The individuals who offered to respond to the case came from a variety of backgrounds. Each responder also had a different degree of prior connection to and understanding of the both the program and also the author. Subsequently, each response was unique - some highly personal and others based largely on professional or academic background experiences. Despite this, there were very similar emergent themes both in the interpretation of the perceived problem and the recommendations to address the problems. In summary, the challenge presented in this case appears to involve both pragmatic and theoretical issues, which suggests there may be a need to reconsider the current program objectives, structure and approach to integrating Indigenous and Western science.

Unrealistic Goals

Several of the responders including myself, noted that what was trying to be accomplished in the program was not realistic.

"The question that I would have is do you think that a one-day program can succeed in meeting all the objectives you may have for the program? One program cannot do it all and so part of the issue is to figure out what are some viable outcomes for a program that is one day in length." RESPONDER #3

"...it occurs to me that you might be trying to accomplish too much in one day. For kids to visit two different sites that they have never seen before, and meet and listen to several adults, most of whom they have never met before, it is asking a lot that are able, at the end of the day, to make the connections you want them to make." RESPONDER #2

"...there is a question of reasonable expectations...the impatience to affect

positive change for the environment in the face of pressing environmental issues

has such a great influence on the educators that they lose perspective of what a

reasonable learning outcome would be in this context...impatience to have

students internalize and act upon new learning in an unreasonable length of

time. When setting expectations for an environmental learning event or

program, as with any educational endeavours, there must be reasonable

expectations for outcomes." RESPONDER #5

Having realistic goals for the program in light of the non-formal setting is important. In light of the various challenges faced, limited time, dealing with and unknown group of students who are in a new setting, both the program goals and expected learning outcomes need to be revisited. The current goals clearly cannot all be accomplished in one-day or through one program.

Revised Goals and Learning Outcomes

In addition to concerns raised about unrealistic program goals in this context, the goals are noted on one occasion as being too broad in scope:

"Bridging the Gap program is trying to introduce children to so many

things all at once-stewardship, Aboriginal perspective in science etc. So

maybe expecting them to absorb all this information so quickly is too much."

RESPONDER #3

There is also a suggested need to reconsider the focus SLOs for the program focusing on other objectives from the science curriculum that might provide more logical or suitable connections to the Elders teachings.

"...there is not enough connection between the conceptual areas addressed in the program content (meeting habitats needs) and the focus of the Elders teaching (respect for our fellow animals)." N.S.

Overall Learning Experience Undervalued

Although the program goals were seen as too broad and expected learning outcomes unrealistic, many of the responders suggested that it should not be dismissed as a failed attempt. Rather because the perceived dilemma was based on informal discussions with students only, this alone provides and inadequate and perhaps ineffective means of assessing the overall value of the learning experience.

"The culmination of all experiences contributes to the student's education. Looking at each one in isolation can give a false impression of what progress is being achieved. Evidence of learning may emerge that was not part of the expected results. In evaluation, it is not reasonable to isolate a particular incident and form a judgment on the value of the overall experience (and) educators should not expect that a single event will lead to an observable change...can a negative or positive outcome be attributed to the one time event with the Elder?"
RESPONDER #5

One responder also suggested that new forms of assessment should be considered.

"The impact of the Elder's conversation on the learners could be measured

using appropriate tools designed specifically for that purpose. It is an

indication that there was an impact coming from the experience and other

benefits may simply be beyond the learner's awareness and ability to

articulate." RESPONDER #5

One additional consideration mentioned it the importance of acknowledging that
learning is an ongoing process. The notion of a learning continuum was described, one
with no final destination or end point but a continuous journey. Each learning experience
is a stage along this continuum, one which teachers are also on.

"Like literacy, numeracy, music appreciation, healthy lifestyles, citizenship

and so many other big educational goals, environmental literacy exists on a

continuum. Students move along the continuum by way of repeated and varied

exposures and experiences over time that are respectful of their cognitive and

moral stages of development. It is possible (to move) along the continuum for a

stage of absolutely no awareness of environmental concerns to a position of

some understanding…it has taken me these many years to arrive at a place on

the continuum that I can have some degree of confidence in moving my learning

outside of myself. The process must be continually nurtured." RESPONDER #5

The notion of a continuum has particular relevance to the teaching content, and
traditional ways of learning to respect the natural world.

"It was a process with no beginning and no end. My knowledge about

how to respect our home came as naturally as my knowledge of how to exist

with others. It happened without my realizing it or having to formally learn

it." RESPONDER #3

<u>*Extended Learning Experiences*</u>

Responders suggest other program modifications including pre/post activities and
opportunity for additional assessment.

"...there would ideally be suitable pre/post learning activities for both the

students and teachers and opportunity to do follow-up activities with the

students. This would allow more opportunity to build on previous learning

and more provide more room for meaningful assessment." N.S.

""…students needs on-going exposure to Elders and Aboriginal

perspectives …I don't think that a passive exposure to one Elder will change

many children's perspective or impact them in the long-term. My solution or

something like it recognizes that there needs to be more time devoted to the

program so students can interact with the Elders in their investigations of the

environment and so they can establish a relationship with the Elder."

RESPONDER #3

"...what is needed are subsequent days spent with the kids that help them

reflect and digest what they learned at the Museum and the Forest…including

opportunities for kids to do something with the knowledge that they have

developed." RESPONDER #2

"...have contact with the students before and after the Bridging the gap

day and during the pre session lay out some of the expectations you have

regarding the incorporation of Aboriginal knowledge. RESPONDER #3

"...bringing in Elders or others into class or on a field trip must be

preceded by some serious "homework" for the teacher. Have they discussed

the context of why the person is coming in? Have they demonstrated ways that

students can treat the person as a guest? Have they appointed someone to

introduce the person to the class, and of course done the necessary research

to do this properly. Have they talked about relating to people in genera?

People of different ages, races, and cultures? Have they taught students to

focus on details and really pay attention? ...Elders do have a tremendous

amount of knowledge...there is an old saying that 'when an Elder dies, a

library burns'...it is very important that students spend time thinking about

how that knowledge came to be. Whenever I have an Elder speak to my

group, I try to prepare them by asking some questions...we must also allow

the students to see the world through the eyes of the Elder." RESPONDER #6

Developing pre/post-learning activities also supports notions of supporting student

developing along a learning continuum. Extending the program beyond a one-day isolated

activity suggests there is a need to develop closer partnerships with participating schools

and teachers and other relevant individuals/groups from the school communities.

<u>*More Meaningful Elder Engagement*</u>

All of the responders made some comment related to how the Elder was involved in the program and many suggested some ways of making the experience more meaningful.

"...engage the Elder as a full partner in the program. Make them aware of the shortcomings of the program, and ask for their suggestions. Becoming aware of the challenge you face, should enable them to focus their presentation(s) to address the challenge or the previous disconnect that your students exhibited." RESPONDER #2

"...consider allowing the students and the Elder to interact the same way I did with my grandparents. Perhaps the Elders teaching could take place over the course of the day. This would negate the separation of knowledge acquisition and the practicing of that knowledge, allow for a more traditional form of sharing and would also allow Elders to model what respect looks like as my grandparents did for me." RESPONDER #4

"...the Elder needs to be involved in the development of the program so that the incorporation of the Indigenous knowledge is not an add-on but is woven into the whole program." RESPONDER #3

"...contemporary educational theory states that students learn more by doing, rather than hearing or seeing. To fully engage the class, I would ask the Elder to perhaps involve the class, or a portion of the class, for example, in a Sweet Grass Ceremony, or to have a sharing session with them. This would help in setting the context, and help them see the special guest, rather than just a guest speaker." RESPONDER #6

"...possible extension activities could be integrated to add value to the

role of the Elder" RESPONDER #4

The suggestions in the responses provide tremendous insight into possible ways in

which the Elder could be involved in a more meaningful way in the program.

Honoring Diversity of Indigenous Peoples and The Importance of Local Relevance

"...the place-based literature is quite relevant in this challenge...the

"resident" vs. "inhabitant" idea in Gruenwald's work and how that plays

out in the development of a program for children who are 'inhabitants'.

You cannot expect the disconnect inner city students have in general with

the environment to be "fixed" in one day." RESPONDER #3

This issue of disconnection, drawing on place-based theories is important. Winnipeg

is home to the largest urban Aboriginal population in Canada (Hanselmann, 2001; Mays,

2005; Statistics Canada, 2000, 2005) and the percentage of Aboriginal students within the

Inner-city school district is particularly high. However this fact alone does not provide

any insight on student prior knowledge, exposure to traditional cultural worldviews or

understanding personal lived experience of each learner. For urban Aboriginal

populations, affected by historical issues related to colonialism (disruption of culture and

loss of connection of land) traditional cultural values should be rekindled (Aikenhead,

1999, 2000; Cajete, 1999, 2000) but the challenge remains to overcome exists lengthy

histories of European colonization. In this inner-city context, the participating students

may have little existing connection or affinity to traditional cultural views that are

relevant to them by ethnicity alone and not a reality of their everyday lived experience.

This displacement is an important feature of the participating student population adding

an additional layer of complexity when trying to integrate traditional and western science worldviews (McKinley, 2007).

Indigenous educational contexts can be in First Nations reserve communities or as in this case an urban inner city. Each context may require distinct methods of facilitating "cultural-border crossings" may vary from place-to-place as indicated by studies associated with place-based education. Gruenwald (2003) distinguishes between inhabiting and residing in a place. An *inhabitant* has detailed knowledge of, and an intimate connection to a place, and has developed a deep sense of care as someone who "dwells" in that place. In contrast, the *resident*, largely as a result of displacement and/or urbanization, has little connection to a place beyond its ability to gratify. In this case, it could be speculated that the majority of the students will be at the "resident" end of the this inhabitant-resident continuum, highly removed from a sense of what Heidegger (1962) called "being-in-the-world" experiencing places as holding culture and even identity.

Due caution must also be given creating generalized strategies for any student population. Although knowledge about group patterns offers important insights about what is typical (Eisenhart, 2001) intragroup and/or individual variation exists, and not all students are Aboriginal. The participating students, Aboriginal and non-Aboriginal are culturally and linguistically diverse students, have a range of proficiency levels, personal history, distinct socioeconomic status and degree of acculturation within mainstream society. Knowledge of group patterns therefore serves as a guideline only, not as a prescription (Okhee, 2005).

SEEKING RESOLUTION

In today's world, we are faced with significant struggles and pressing challenges. Acts of terrorism, war, economic disparities, obliteration of distinctive cultures, and destruction of the earth's biosphere are some of the pressing issues requiring urgent attention. Education plays a critical role in seeking to resolve the root causes of these problems. It has the power to strengthen human capacity for non-violence, trust, empathy and respect. However, the field of education is complex and within this multifaceted discipline, issues that presents itself in teaching and learning often requires equally complex approaches to determining appropriate solutions. The issue presented in this case in one such example.

The dilemma presented in this case clearly deals with urgent issues in science education (Aikenhead 2006, 2007; Cajete, 1999) and in society in general (Manitoba Education and Training, 2000**;** Haigh 2006**;** Hautecour, 2002; Kellert, 2005; Louv, 2005; Stapp, 1996). Effective integration of western and Indigenous is also a complex, and newer subject compared to other topics in science teaching and learning and prior research in this area is more limited. This complexity is compounded because of the unique demographic of the participant students – inner-city, urban, aboriginal and non- aboriginal – and because it takes place in a non-formal setting where prior knowledge of students and there past learning experiences is limited. Not surprisingly, attempting to resolve the issue and identify possible courses of action is not easy and in this case, a "solution" was not realized. What was realized through the process was a means to move forward building on an improved understanding of the dilemma and the issues at hand. The subsequent success of any attempted improvement will require ongoing monitoring and evaluation. No approach will ever be perfect or universal, but should be subject

ongoing investigation, debate and critique and viewed as a part of a continually evolving process of improvement.

In analyzing the responses to the case and attempting to seek a resolution to the dilemma at hand, two very different approaches have presented themselves as outlined below. It is important to note that although the words, "dilemma", "issues", "problems" are used all of these could and should be considered as "opportunities" or "invitations". The following are therefore presented as ways to take advantage of these opportunities.

<u>Option A: Accept Limitations – Modify Expected Learning Outcomes</u>

This option would involve modest changes to the structure of the program itself. It would accept the practical limitations of what students would be expected to learn. This acknowledges the limited prior knowledge of students, the need for the program to address the current curriculum to meet funding requirements and teacher/school expectation, and the limited amount of time available. Option A would also accept that although the topics of program deal with urgent matters, there are no quick or simple solutions to addressing the complex underlying issues i.e. no "quick fix solutions" to any such deep-seated issues. This of course requires that as the educator and program developer I must acknowledge my own bias to the subject at hand and sense of urgency and impatience, derived from a close personal connection to the teaching topics, student population and setting. This program would be considered a starting point in developing students appreciation of the natural world and facilitating student ability to view relevant science concepts from both and Western and Indigenous worldviews – one stage in supporting learning along a developmental continuum. The objectives would be to have

the Elder's teaching introduced in the context of the program. The expectations of students would be limited to demonstrating respect for an Elder.

Option B: Challenge Limitations – A Vision of Change

This option recognizing that facilitating student ability to view relevant science concepts from both and Western and Indigenous worldview requires not only revised content but also new pedagogical and curriculum development strategies. Option B is therefore presented here as the vision, the broader approach to achieving the underlying goals of the program. It acknowledges the limits of what can be realistically accomplished within the one day program, placing it in the context of an educational sector "one-step" removed from the formal education system, but highly dependant both on the existing science curriculum, the current educational structure and the established notions of who the educational "experts" are and how science teaching and learning occurs.

The suggestions in the responses provided tremendous insights into ways to in which and Elder could be involved in a more meaningful way in the program. However, program modifications must also consider that effectively including traditional cultural perspectives in the must mean more that having an Elder present. Rather, consideration must be given to the overall pedagogical approach, teaching strategies, resources used, modes of conveying and assessing knowledge, and how the Elder is involved in the process (Kanu, 2007). Some have suggested that it demands broader societal support and collaborative efforts (Aikenhead, 2006) and the challenge for science educators is to decolonize the pan-Canadian science framework (Aikenhead, 2006, Battiste, 2002), engaging Aboriginal communities as prime stakeholders and full partners, able to use

their experience and local wisdom to work collaboratively in the education system and

reclaim control over their ways of knowing (Lomawaima & McCarty, 2002, Stringer,

2004; Weber-Pillwax, 2001). This is consistent with recommendations from several

responders that the Elder be involved not only in the program, but also involved in the

program development stage.

Responders also recommended that the program be extended beyond the one-day

structure to include pre/post activities. This further supports the idea that a new, more

locally relevant educational structure is required which supports collaboration from

multiple educational sectors, or as others have recommended a new conceptual,

imaginative innovative model (Denzin & Lincoln, 2005; Orr, 2003; Sharp, 2002). Indeed,

the field of education is on coming to a new point in time. With new and emerging

understandings education must evolve. New approaches that are culturally

accommodating, inclusive, democratic, participatory, and empowering are required.

Educational structures must acknowledge differences between "professional knowledge"

of classroom teachers and other relevant forms of knowledge, extending understanding

and linking educational objectives to community needs and local contexts. An education

for the purposes of cultural decolonization and ecological reinhabitation (Gruenewald,

2003) requires support for community-based learning activities aimed at reinhabitation,

enabling school leaders need to work with the community to develop alliances that

nurture the conditions which permit classroom teachers to engage in more place-based

learning strategies (Gruenewald, 2004). This requires redefining relationships in

education and curriculum development, developing of appropriate consultation

mechanisms to support community based decision-making and opportunities to engage in reciprocal exchange of information, dialogue, and joint analysis between all stakeholders.

From A to B

Clearly, the vision presented in Option B is not something that can be achieved by the Bridging the Gap Program itself and Option A provides a practical starting point for moving forward. However, these two Options need not be mutually exclusive. In fact they could be considered two ends of a developmental continuum. Option A is a practical starting point for this particular program as a first phase in moving toward the overall vision outlined in Option B. Interim phases for the program could include for example working more closely with the Elder, revisiting stated learning outcomes and program goals, developing pre/post activities etc. – all acknowledging the constraints of the existing curriculum and educational structure. Bridging the Gap alone can not in itself attempt to "do it all" but is ideally situated to play a part of a longer-term, more collaborative and comprehensive approach.

As alluded to by several of the responders who know me well enough to point it out, I have personal visions for change that some times interfere with the ability to take a step back, see things from the outside and take a more practical approach. However, this vision, which deals with urgent issues for society and science education, essentially the broad goals for the Bridging the Gap program remain unchanged. I can perhaps aspire to be part of larger solutions, akin to environmental mantras of think global act local.

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