The Aboriginal Knowledge and Science Education Research Project

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In British Columbia schools, students of Aboriginal ancestry are underrepresented in science courses and in the sciences (Ministry of Education, 2002). For most Aboriginal students, this low participation is a barrier to postsecondary education and limits career opportunities. The Aboriginal Knowledge and Science Education Research Project is a collaborative venture between the Aboriginal Education Enhancements Branch of the Ministry of Education and the University of Victoria. It was created to address issues associated with the underrepresentation of Aboriginal peoples in the sciences. The main purpose of the project is to determine why Aboriginal students are underrepresented in high school biology, chemistry, and physics classrooms, to find ways to improve their involvement and achievement significantly in both elementary and high school science leading to postsecondary education, and to encourage Aboriginal people to consider science-related occupations.

Background of the Study

An examination of Aboriginal performance and participation patterns in British Columbia over the last five years (Ministry of Education, 2002) indicates that 36% to 42% of Aboriginal students graduate from grade 12. Of the Aboriginal students who graduated, 8% to 14% have taken Biology 12; 5% to 8% took Chemistry 12; and 2% took Physics 12. It is important to acknowledge that the average test scores in these three courses range from 63% to 73%, which indicates a high level of achievement for students who participate (unpublished Ministry of Education performance data). Of all the students province-wide who take Science 11, 15.1% of Aboriginal students and 7% of non-Aboriginal students take Science and Technology 11. The rest of the Aboriginal students who take Science 11 are in Forestry 11 or Earth Science 11. None of these courses fulfills the requirement to be admitted into a postsecondary institution (Ministry of Education, 2003). This low participation rate in approved science courses for most Aboriginal students creates barriers to postsecondary education and limits career opportunities, especially with respect to science-based careers. We need a better understanding of the career paths chosen by Aboriginal students and of how Aboriginal students' experience with science education influences these career paths.

This situation arises from a type of science education in which Aboriginal knowledge and wisdom are rarely acknowledged and Aboriginal content is seldom if ever legitimized or is considered a token

addition. Unless science classrooms and teaching materials provide a meaningful context for Aboriginal students (as defined by their local communities), and unless Aboriginal knowledge coexists with Western science in the science classroom, many Aboriginal students will continue to find the science curriculum inaccessible and culturally irrelevant. At this level the lack of participation in the science graduation courses limits their options to pursue careers founded on science and mathematics.

It is clear that there is a real need for Aboriginal peoples to gain expertise in the sciences. Science education has been promoted by the Science Council of Canada (1991) as a critical aspect of every student's education. It contributes to intellectual growth, facilitates informed decision-making, provides a foundation for further scientific and technological growth, and prepares students for employment in an increasingly technological world. According to Aboriginal scholar Cajete (1999), "Indigenous science is a broad category that includes everything from metaphysics to philosophy to various practical technologies practiced by Indigenous peoples past and present" (p. 83), and like Western science, "has models which are highly contextual to tribal experience, representational and focused on higher order thinking and understanding" (p. 85). The need for Aboriginal peoples to gain expertise in the sciences is echoed by Aboriginal science educator McIvor (1995), who points to the fact that land claims settlements are resulting in increased Aboriginal control over the management, development, use, and conservation of lands and resources, which makes the need for teaching scientific and technical literacy and skills among Aboriginal peoples a pressing issue.

With the aging population of the Elders in the community, traditional science knowledge is quickly slipping away, and the urgency to research and document this knowledge is vital to Aboriginal peoples and to our global society. It is urgent that the youth of Aboriginal communities participate in science-related careers.

Traditional Ecological Knowledge and Wisdom and Science Education

Ogawa (1995) proposes that every culture has its own science and refers to the science of a given culture as its "indigenous science." Ogawa stresses that all science students must work through both individual and Indigenous science understandings in the course of constructing their knowledge of modern Western science.

Aboriginal science has been described as "the study of systems of knowledge developed by a given culture to classify the objects, activities, and events of its universe" (Hardesty, 1977). Traditional ecological knowledge (TEK) is a subset of traditional science and is considered a branch of biological and ecological science (Berkes, 1993). According to Aboriginal educator McGregor (2002), Aboriginal understandings of TEK tend to focus on relationships between knowledge, people, and all Creation (the natural world as well as the spiritual). Traditional ecological knowledge

and wisdom (TEKW) brings the concept of wisdom to the discussion of science and technology and requires the sustaining of both community and environment. This knowledge, with its characteristic respect for sustaining community and environment, offers proven conceptual approaches that are becoming increasingly important to all BC residents, to Canada, and indeed globally. Examples of TEK science may be accessed through living Elders and specialists of various kinds or found in the burgeoning literature of TEK anthropology, ethnology, ecology, biology, botany, ethnobiology, medicine, horticulture, agriculture, astronomy, geology, climatology, architecture, navigation, nautical science, engineering, and mathematics (Weatherford, 1988, 1991; Corsiglia & Snively, 1997; Snively & Corsiglia, 2000).

What would an Aboriginal science program look like? According to Cajete (1999), "Native science evolved in relationship to places and is therefore instilled with a 'sense of place.' Therefore, the first frame of reference for a Native science curriculum is reflective of their place." (p. 47). The work of Kawagley (1995) in developing creative science curriculum materials for the Yupia'q people attempts to form bridges between Western science and Aboriginal knowledge systems by including the use of traditional stories as exemplars from Native traditions to illustrate conventional scientific principles and to highlight the complementary nature of some traditional teachings and conventional science.

Thus a key component of the current research project is to document the Aboriginal science knowledge of specific home communities and to construct an epistemological framework and pedagogical orientation for developing school science programs pertaining to the learning and use of scientific knowledge in the local community.

By sharing the ecological knowledge and wisdom of the Elders and the perspective of Western science with the research and education communities, the long-term hope is to develop educational materials and programs that will encourage and support responsible and accountable decisions that sustain communities and environments.

Team-Building

The project was initiated by Lorna Williams in September 2003 when she was Director of the Aboriginal Education Enhancements Branch of the Ministry of Education in British Columbia. As science and environmental educator at the University of Victoria, Gloria Snively accepted an invitation to serve as principal investigator for the project. In July 2004, Williams began a tenure-track position at the University of Victoria and is Director of Aboriginal Teacher Education. Since then Williams and Snively have co-directed a graduate program in Environmental and First Nations Education with a focus on the identification of graduate-level MA theses to address specific areas of study associated with the project. Other members of the research team include David Blades (science education) and Ted

Riecken (social studies education). Twelve Aboriginal graduate students and four non-Aboriginal students have been chosen to research specific components of the project.

The Vision

In January 2003 a group of invited University of Victoria faculty, graduate students, Ministry officials, non-Aboriginal resource persons, and Aboriginal leaders and Elders from around the province met at Dunsmuire Lodge, Victoria, to generate a vision statement and to identify possible research directions. The following vision statement reflects the ideas, concerns, and vision of those in attendance.

Programs and curricula need to be developed that:

- Teach Aboriginal children that their culture has contributed to scientific knowledge and will continue to do so;
- Link science instruction to local Aboriginal knowledge and wisdom;
- Recognize and engage the expertise of local Aboriginal people and link their current observations and understandings to a vast historical and cultural database gained from observation and experience;
- Enable Aboriginal students to understand the importance of science in their daily lives and its relationship to themselves, their community, and the world in which they live;
- Celebrate equity and diversity and recognize equity and diversity as essential;
- Instill concepts such as giving back to the earth, prayer, offerings, and stream restoration;
- Where possible, locate science concepts and practices in First Nations languages to provide a better understanding from a First Nations perspective;
- Enable Aboriginal students to be successful in school and not lose their cultural identity.

Purpose

The main purposes of the project are to determine why Aboriginal students are underrepresented in high school biology, chemistry, and physics classrooms; to find ways to improve their involvement and achievement significantly in both elementary and high school science leading to postsecondary; and to encourage Aboriginal people to consider science-related occupations.

The Research Projects

Twelve interrelated topics have been identified as key focus areas for graduate students to conduct research projects. Specifically, individual projects will attempt:

1. to determine the current state of participation and achievement of Aboriginal students in all science-related courses at the elementary, middle, and high school levels;
2. to analyze Ministry of Education policies, school textbooks, and resource materials and programs to determine the prescribed content and learning outcomes and to determine how science is taught in schools;
3. to explore the experiences of Aboriginal students in school science, their ideas and beliefs about science, and if they did not stay in science the reasons;
4. to find out of the 5-13% of Aboriginal students who are successful in school science who is successful and why? Has success in school science led to science careers for these students?
5. to describe the views and teaching practices of science teachers at the elementary and secondary levels;
6. to describe the views of Aboriginal parents and Elders about how science is taught in schools, what is taught in science content, and what Aboriginal knowledge can be integrated into the science curriculum;
7. to identify with Aboriginal communities examples of Indigenous knowledge that can be incorporated into an Aboriginal science curriculum;
8. to determine with Aboriginal communities what an Aboriginal science curriculum might look like;
9. to examine how science is being taught in BC university science courses, examine course syllabi, interview science professors, and interview Aboriginal science students;
10. to explore teaching strategies that enable science concepts to be related to First Nations concepts (traditional stories, science camps, problem-solving inquiries, and digital cameras to document TEK, etc.);
11. to explore how Aboriginal science programs can be developed for urban centers;
12. to determine the career goals of Aboriginal youth; what science careers are available and could be made available for Aboriginal youth; and how Aboriginal youth might be encouraged to seek science-related careers in their home communities.

We intend that information obtained from the above research efforts will be used to develop culturally sensitive teaching strategies, materials, and programs for Aboriginal students in home communities and eventually to guide the development of culturally informed science materials for use in science classes across the province.

The above research projects will draw on the wisdom, knowledge, and experience of First Nations, Metis, and Inuit Elders and community

leaders in order to identify both science content elements of Aboriginal knowledge and culturally appropriate and effective ways of teaching and learning science knowledge. The intent is to strengthen the connection of Aboriginal children to their land through the Elders as a means to improve their science knowledge.

The results of the study will be used to provide the Ministry of Education, superintendents, postsecondary institutions, parents, and students with important information; and to guide teachers, curriculum developers, and program planners in developing culturally sensitive learning experiences.

Sample Research Projects

Because of the volume and complexity of specific research projects, we are unable to provide descriptions of each project in this article. We instead include abstracts of some projects that allow a glimpse into the depth and richness of the projects involved in the overall project.

Digital Cameras and Learning Traditional Science Knowledge

This project will research high school students' use of digital video as a learning tool for retaining and transferring Aboriginal knowledge. As part of the learning for their science course, students will use digital video to record cultural knowledge and practices and to conduct interviews with Elders and others in the community about science knowledge. Based on the knowledge they acquire through their research, students will produce short educational films about Aboriginal science. Data yielded from this project will be in two forms. First, the materials produced will comprise a kind of cultural archive generated through the students' own research efforts. A second data corpus will consist of the students' descriptions and reflections of what they learned through the process of planning their research projects and creating their films. (John Lyall, Mupenkin)

Teaching Science Through Traditional Storytelling

Storytelling has always been an important aspect of Indigenous cultures throughout the world. Most of the songs and dances that are performed in the Big House tell a special story of life: and this is the science of the Kwakwaka'wakw people. Most science textbooks are designed to meet the Ministry of Education requirements, but reflect Western world views and orientations, so it becomes difficult to integrate the Kwakwaka'wakw ways of knowing. Yet in the natural sense, the Kwakwala-speaking people practice science all year long in their traditional knowledge of the Potlatch, salmon fishing, and the art of how to care for a cedar tree when gathering bark. Kwakwaka'wakw stories often incorporate Euro-American scientific terms and concepts that can be teased out and understood in the context of Indigenous language systems. This project will examine selected traditional stories, songs, and dances and develop science units of study that guide

students into a process of approaching stories for study with a view to understanding the implications of Kwakwaka'wakw traditional science and applying stories to science instruction. The goal is to find innovative ways to encourage more 'Namgis youth to be interested in science so that they are able to connect the traditional science in which many of them are already involved with Western science concepts and processes. (Irene Issac)

Laxwe gila la xans—Let us all gain strength.
This project will share the knowledge and respect for the land and resources that our old people and community leaders learned from their old people among the Kwakwaka'wakw in Alert Bay. It will also share how this knowledge was handed down from one generation to another. TKEK Traditional Kwakwaka'wakw ecological knowledge in the past was *our way of life*, and by gathering the experiences of the old people and community leaders we can begin to share and incorporate TKEK and the varying possible ways of handing down this information in new science programs offered to our children. The method of gaining the information is through interviews with old people in the community and community leaders. The following questions will be discussed with individuals and in group meetings; also old people sharing their life experiences will be another way of gathering information. Questions will be asked such as: How was knowledge passed down from your parents/grandparents to you? What are some examples of TKEK that can be used in our school science program? What traditional Kwakwaka'wakw ecological knowledge would you like to see taught to our students in our school? The goal of this project is to begin to develop a database of TEKW so that future curriculum developers will include it to show our children that our old people lived for thousands of years on this land and took care of the land that made them strong. This knowledge will give the children pride in our culture, improve self-esteem, and give them finally a strong connection to the land. (Donna Cranmer, Nugwa'am Nalaga gayutlan 'Namgis)

First Nations Ways of Knowing, Learning, and Teaching: Identifying How Elders Transmit Traditional Ecological Knowledge and Wisdom.
This project will draw on the wisdom and experience of Elders, educators, and youth in two BC First Nations communities, Hartley Bay and Telegraph Creek, in order to identify both science content elements of traditional ecological knowledge and wisdom (TEKW) and culturally appropriate and effective ways of transmitting this knowledge. From this research it is hoped that a better understanding of effective ways that Indigenous learning and teaching can be facilitated and that it will lead to the creation of collaborative experiential learning opportunities and meaningful science curriculum content for Aboriginal youth. The methodology of the proposed project will incorporate narrative inquiry, participatory

research, and community action research, three approaches that are compatible with Indigenous ways of knowing and acquisition of knowledge and skills. A series of comprehensive lifetime and focus group interviews with Elders, educators, and youth will identify elements of TEKW, as well as how to transfer this knowledge and wisdom. Research questions will include: How did First Nations people acquire knowledge about their environment? How did they learn about the underlying cultural values of this knowledge? What elements of this knowledge have been most important? How is such knowledge and wisdom passed on between generations? What changes have occurred in these processes, and what elements still exist? How important is it that this knowledge be learned by youth today, and what opportunities can be identified for this knowledge transfer to occur at present? The ultimate goal of this project is to facilitate and strengthen the connection of First Nations youth to their land and culture through their Elders as a means of improving their self-identity (Edōsdi, Judith C. Thompson).

Toward Place-Based Curriculum for the First Nations Community of the Saanich Peninsula

This research focuses its effort on creating meaningful and relevant curriculum based on a question of what knowledge is of most worth to the people of WSANEC and attempts to bridge these themes into a place-based science curriculum. As a school subject Western science tends to be compartmentalized and decontextualized, taught in classrooms and labs. For First Nations people this perspective and method of teaching science conflicts with their cultural views and ways of learning and does little to connect them with their home place. This thesis will argue that at the heart of WSANEC ways of knowing place is the concept of an ecologically grounded sense of place. Cajete (2000) says that Indigenous science is a metaphor for a wide range of tribal processes of perceiving, thinking, acting, and coming to know that have evolved through human experience in the natural world, their territories, and home place. The primary purpose of this research is to investigate ways of knowing and caring for place of a First Nations community of the Saanich Peninsula (WSANEC) in order to develop meaningful and relevant place-based science curriculum. Elders, community leaders, and adult students are interviewed about what this place-based science curriculum would look like and how it could be used in their communities. (Tye Swallow)

Decolonizing Research: Traditional Knowledge of Coming-of-Age (Puberty Rites) for Girls in the Lil'wat Nation

Because First Nations students during the residential school period were removed from their community and forced to learn Western knowledge, they were stripped not only of their culture, but of their rightful coming-of-age ceremonies that signified their transition from childhood to adult-

hood. In most First Nations cultures the passage into adulthood was an intense guided program culminating in a celebration, and youth were empowered to make this transition. In today's context, First Nation youth are taught the anatomy and physiology of these changes in school courses, but the cultural celebration that links them to their community, culture, and family is absent. Using decolonizing research protocol and methodology, this research project will explore the First Nations traditional knowledge of coming of age (puberty rites) for girls in the Lil'wat Nation. The focus will be on understanding traditional knowledge and the transmission of knowledge related to the cyclical nature of life (human body) and the reproductive system. In a collaborative process, the researcher will work with the Lil'wat Nation using participatory action research to document the traditional knowledge associated with coming of age for girls through intergenerational interviews and discussions. With the approval of the Elders and community members, a joint development of a model for practice will be created for teachers on how to develop a grade 7 life science unit that will incorporate traditional knowledge of puberty rites in their community. The model will address decolonizing protocol and teaching methodology and how to work with the local First Nation community to bridge the gap between First Nations world view and traditional knowledge and the Western science approach to life science. (Winnie Chow)

Methodology

We often hear of mistrust from Aboriginal Elders when researchers enter the community (Menzies, 2004; Smith, 1999). Hence this project will use a range of qualitative methodologies including case studies, informal interviews, participant observation, participatory action research, stories, and self-reflection: approaches that are compatible with Indigenous ways of knowing. In addition, surveys and statistical analyses will be used to describe the state of Aboriginal science teachers and students province-wide.

A key methodology will be participatory action research (PAR), a dynamic methodology that is contingent on authentic participation (Brydon-Miller, 1993). Tandon and Fernandes (1984) identified several determinants of authentic participation in research: (a) people's role in setting the agenda of the inquiry; (b) people's participation in the data collection and analysis; and (c) people's control over the use of outcomes and the whole process. It is research through which people work toward the improvement of their practice (and only secondarily to the improvement of the other people's practices). The focus of PAR is on groups whose issues include inaccessibility, colonization, marginalization, exploitation, racism, sexism, and cultural disaffection (Hall, 1981). As such PAR research characteristically strengthens people's awareness of their own capabilities, attempts to improve the lives of those involved through

structural transformation, and provides a process for the people themselves to participate fully in determining what needs to be changed.

A case study is "an empirical investigation that is defined by interest in a specific phenomenon, within its real-life context, such as a school, community, event or curriculum project. It is a qualitative form of inquiry that relies on multiple sources of information" (Anderson, 1998, p. 249). The case study methodology allows the researcher to "retain the holistic and meaningful characteristics of real life events" (Yin, 1994, p. 14). The form of the research is more explanatory, does not require the researcher to have control over events, and focuses on contemporary events (Stake, 1995; Yin). Case study and community action research allows Aboriginal researchers to conduct research in their own communities or other Aboriginal communities.

When doing qualitative research, the process of the researcher interacting with participants in a social context results in the researcher unavoidably becoming a participant observer. Hence the researcher is a participant in the field and also a product of that participation, and this state requires the researcher to self-reflect (Stake, 1995). It requires a defining of relationships between the researcher and the participants and engagement in a personal process of finding meaning and growing from the research project. Smith (1999) states, "Indigenous research approaches problemitize the insider and outsider different ways because there are multiple ways of both being an insider and outsider in indigenous contexts" (p. 137). Because the insider-outsider label is so complex, both Aboriginal and non-Aboriginal researchers must be clear in defining themselves and their relationship with the community.

The research question drives the need to collect illustrative data and hence determines the nature of the design. Thus the Current State of Aboriginal Students in Science project will also use descriptive statistics and nonexperimental relational approaches to address some of the research questions (Sowell, 2001). Quantifying the strength of the relationship between Aboriginal students' performance in science-related courses and various background factors will complement the knowledge obtained through PAR and help identify factors that may affect Aboriginal students' participation in science. The Aboriginal Knowledge and Science Education Flow Chart (Figure 1) highlights some of the emerging questions and research projects, sources of data and research methodologies, and project outcomes.

Capacity-Building

Working with Aboriginal graduate students rather than with experienced researchers, this project is designed to promote capacity-building among Aboriginal peoples. Although this is an important key element of the current research project, it has the difficulties of attempting to work with a

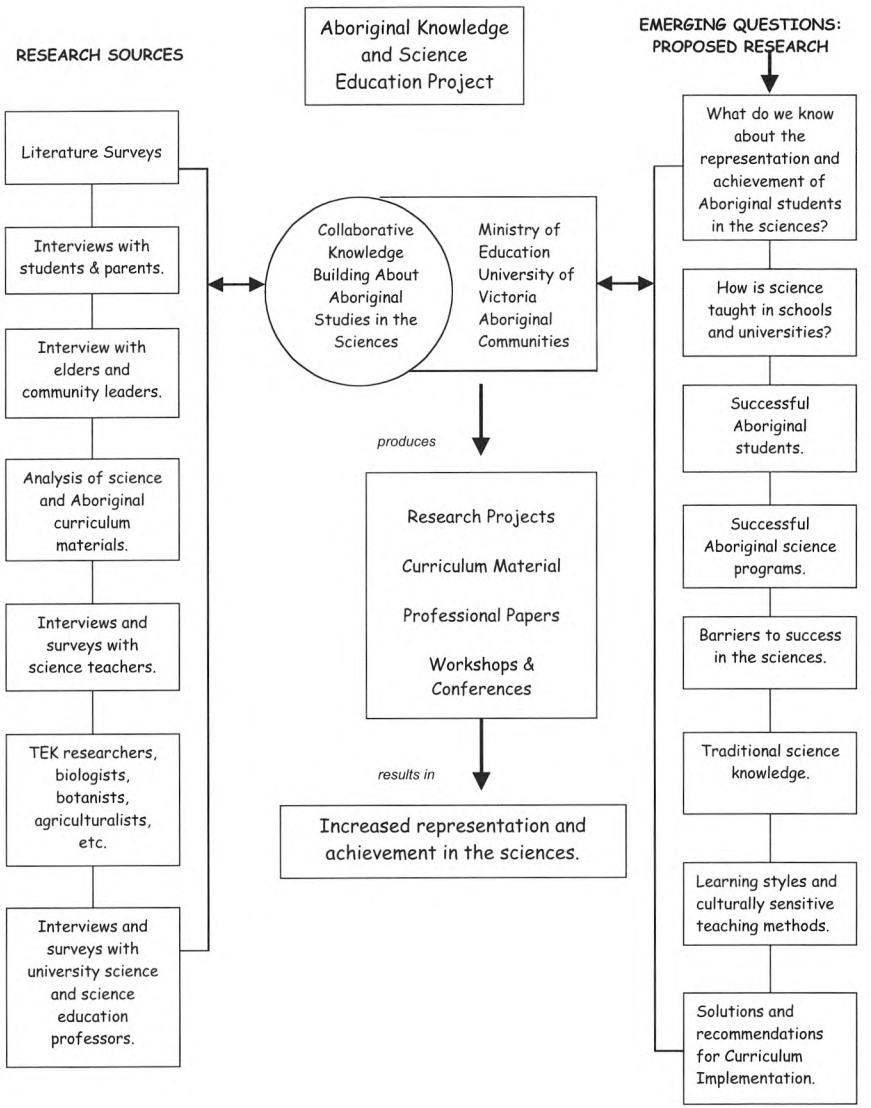

Figure 1.

cadre of inexperienced graduate students, many of whom are in the early stages of taking graduate-level research courses.

In an attempt to address the stated purpose of this research, the research team developed an implementation strategy consisting of the following elements: (a) to build research skills among Aboriginal graduate students; (b) to conduct literature surveys to determine what is already known about Aboriginal knowledge and science education; (c) to collect

and analyze what Aboriginal knowledge-based curriculum materials and programs already exist; (d) to conduct mini-workshops/conferences that bring together graduate students, Elders, and faculty to create a common vision statement and provide ongoing guidance; (d) to design a graduate-level program of courses to teach basic research techniques and concepts associated with the project; and (e) to locate and encourage networks among researchers and research centers focusing on Aboriginal knowledge and science education projects.

A Graduate Program of Studies

During July 2003 the University of Victoria offered a summer graduate-level course for the specific purpose of bringing together a team of graduate students who would become involved in conducting the necessary research to answer our key questions. This first course (EDCI 591 Aboriginal Knowledge and Science Education) was co-taught by Gloria Snively and Ed McMillan (Sim'oogit W'ii T'axgenx), Director of Instruction for School District 92, Nisga'a. The course was designed to help the students begin to think about their research proposals, to become familiar with relevant literature, and to write their first draft research proposal.

Then during summer 2004, an off-campus graduate program in environmental and First Nations education was offered to both Aboriginal and non-Aboriginal students in Alert Bay, BC, home of the Kwakwaka'wakw people. The aim of this program was "to bring together Aboriginal and non-Aboriginal persons to work together in learning about the forest and ocean environments, respecting the cultures of Aboriginal people, and educating future citizens to make wise decisions regarding long-term sustainable communities and environments" (Snively, 2004).

The first summer session combined a variety of experiences with the natural environment with primary historical documents on BC First Nations history and culture with input from First Nations Elders and other resource persons. Courses focused largely on topics dealing with the traditional ecological knowledge and wisdom of several First Nations of BC; current educational issues relevant to Aboriginal peoples; the knowledge and skills of Western modern science; community-environment relationships; and the contributions of both Western science and traditional knowledge to environmental knowledge and the resolution of environmental and resource problems. Courses included:

EDCI 591	Ethnobiology for Educators	Brian Compton
EDCI 591	Community, Culture and Environment	John Corsiglia
EDCI 591	Environmental Education	Gloria Snively
EDCI 591	Mythology, Stories and Science	Oscar Kawagley

Common experiences included direct experience with the Elders and conducting archival and museum research associated with historic events related to colonization and decolonization. The Mythology, Stories and Science course taught by Aboriginal scholar Oscar Kawagley provided a

theoretical and practical framework for using traditional stories as a focus for teaching science and traditional knowledge concepts in the classroom.

Experiences with Elders and community leaders were coordinated by Gloria Snively and Vera Neuman, a Kwakwaka'wakw language and culture teacher, and included informative and inspiring presentations by Chief Bill Cranmer, Chief Edwin Neuman, 93-year-old Auntie Ethel Alfred, Bill White, Flora Cook, and William Wasden. Day hikes and extended boat trips were led by Christine Wata Joseph, Vera Neuman, and Pauline Alfred. Topics included the use of Kwakwaka'wakw traditional herbs, traditional medicines, the ethnobiology of marine resources, principles associated with language and culture, and historic cultural events. Western science specialists gave presentations including whale researcher Paul Spong, marine biologist Michael Berry, ethnobiologist Brian Compton, and anthropologist David Garrick.

One example of intensive experiential learning involved a four-day boat and camping trip that brought students to Hansen Island where they were introduced to David Garrick, who led day hikes and introduced the astonishing wealth of information about Aboriginal culture that can be gained by studying culturally modified trees (CMTs). This field of research celebrates both the cedar forests of Hansen Island and the Aboriginal people whose historic record is preserved in the living trees. The study of CMT's pioneers ways to push back the parameters for dating activities to over 1,200 years ago. These ancient forests turn out to be tended forests, the result of centuries of traditional First Nations sustainable forestry practice. According to Garrick (1998), "these activities, carried out primarily by women foresters, were coordinated on a transgenerational basis with future generations—including this one—in mind" (p. 7). The study cast light on a model of traditional sustainable forest use deserving scientific attention and respect. It was hoped that such experiences would provide students with historical insights, clear examples of traditional ecological knowledge and wisdom, and rich data for potential research efforts and/or science-related curriculum development.

From their field experiences; archival research; input from First Nations' Elders, scientists, and other non-Native resource persons; and seminars, the graduate students were asked to analyze, discuss, and attempt to solve complex issues relating to community, culture, and environment. By bringing together Elders and acknowledged specialists in the key interrelated disciplines, the program provided a unique interdisciplinary starting point for designing research projects and developing educational programs and curriculum materials.

During summer 2005 graduate students took courses designed to provide additional research skills and focus on concepts associated with the current project:

EDCI 591	Aboriginal Ways of Knowing	Lorna Williams
EDCI 580	Interpretive Inquiry	Ted Riecken

The Aboriginal Ways of Knowing course introduces First Nations epistemology in the context of forms of knowledge, traditional pedagogy, and origins of traditional values and world view about First Nations in Canada. It also observes Western frames of knowledge and pedagogy, how knowledge claims are validated, and how it has contributed to the marginalization of First Nation cultures and knowledge. The Interpretive Inquiry course is an introduction to the philosophical, theoretical, and methodological frameworks that guide interpretive inquiry: specifically biography, phenomenology, grounded theory, ethnography, and case study.

Research Phases, Dissemination, and Output

This research will be conducted in three phases over six years: (a) research training phase (2002-2003); (b) data collection phase (2004-2005); and (c) analysis of the data and writing the report 2006-2007. Project outputs will take a variety of forms including: (a) a final report to the Ministry of Education; (b) an academic volume; (c) a video shot at specific locations; (d) a Web site; (e) a science camp and curriculum units; (f) numerous academic papers, presentations, and workshops; and (g) an Aboriginal Knowledge and Science Education Conference to be held at the University in 2007.

The Aboriginal Knowledge and Science Education Network

The Aboriginal Knowledge and Science Education Network consisting of representatives from the Ministry of Education, the University of Victoria, other universities, school districts, Elders, community resource persons, and graduate students provides insights and feedback to researchers on their progress during the project. The network includes Vera Neuman (off-campus Elder and resource person coordinator), a representative from the Ministry of Education, Oscar Kawagley (University of Fairbanks, Alaska), Brian Compton (ethnobiologist, Lummi Community College, Washington), Rick Kool (Royal Roads University), Tim Michel (Aboriginal science liaison officer, University of British Columbia), and Ed McMillan (past Director of Instruction, School District 92, Nisga'a). Project affiliates include the 'Namgis First Nation (Alert Bay), the Kwakiutl Band Council (Fort Rupert), the Mount Currie Band Council (Lil-wat Nation), the Cowichan Tribes, the West Shore Center for Learning and Training (Victoria), the First Nations Education Division of the Victoria School District, the Bulkley Valley School District, the Saanich First Nations Adult Education Center, the Inner Coast Natural Resource Center, and the Alert Bay Marine Research Laboratory Society.

Summary

The vision of the Aboriginal Knowledge and Science Education Research Project is to enable Aboriginal students to be successful in science and

related programs at the middle and secondary school levels; to encourage Aboriginal students to consider science-related occupations; and to provide a meaningful context that will enable curriculum developers at a later phase to develop culturally appropriate science curriculum materials and programs for Aboriginal students. It is anticipated that this research project will contribute to the realization of this vision by generating (a) new understanding of the underlying reasons for the lack of participation in the sciences and new knowledge about Aboriginal science; (b) new knowledge of the traditional ecological knowledge of BC Aboriginal peoples, (c) significant research opportunities for Aboriginal graduate students, (d) new research partnerships among Aboriginal and non-Aboriginal teachers and scholars, (e) directions for leadership and career opportunities in science for Aboriginal graduate students, and (f) inform how science education curricula and programs by and with Aboriginal scholars and Aboriginal communities can be developed.

Although the Science Education Council of Canada has promoted science education as a critical aspect of every student's education, it has failed to promote Aboriginal science knowledge as an integral component. Although the two perspectives often interpret the world differently, students should see that in many instances the two overlap and can reinforce one another and that communities frequently would be better served if a dual approach to problem-solving were employed. Whether Aboriginal science should be taught as a separate subject side by side with Western modern science or integrated into the science curriculum, or some combination of strategies, has yet to be determined.

However, Aboriginal science offers both challenges and opportunities for science education because its vast knowledge base and insights parallel what some of the most creative and reflective thinkers of our time are advocating. Aboriginal perspectives have the potential to give great insight and guidance to the kind of environmental ethics and deep understanding that we must gain as we attempt to solve the increasingly complex problems of the 21st century. Clearly new approaches to science education must be forged that invite all students to participate by articulating a cultural approach to science. The science research models in this project offer some possible approaches to exploring a range of issues associated with the underrepresentation of Aboriginal students in the sciences and the exploration of some potential solutions.

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