Knowing Home
Braiding Indigenous Science with Western Science

Book Two

Edited by

Gloria Snively and Wanosts'a7 Lorna Williams

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We gratefully acknowledge and honour the territory and the lands
on which the project originated:
the Lekwungen (Songhees), SXIMEŁEŁ (Esquimalt), and W̱SÁNEĆ (Saanich)

XAXE TŦE SȻÁ, ŁTE TEN̲EW̱. XAXE TŦE SȻÁ, ŁTE SḰÁL – Our land is sacred. Our language is sacred. Artwork by David Underwood (2018).

About the artwork

SÁMI EṮ XÁLS. U, SDOYEMs TŦE SWEȻEŁ I, TŦE ŚẈKITES. NIŁ ȻE,ĆÁ, XAXE ŦIŦEŁ SIÁM. SU JIJEŁ ŁTE TŦU, NIŁ XÁLS.

LÁ,TEṈ TŦU MEQ STÁṈ EṮ XÁLS. LÁ,E TŦU MEQ E TŦE TOŦELṈEẈ I, TŦE SĆƛNEẈ I, TŦE ƮÁLEƮEM. LÁ,E U, LÁ,E TŦE TEṈEẈ I, TŦE SȻÁCEL I, TŦE ŚḰENO, TŦU MEQ. TÍYELs TŦE SĆƛNEẈ YÁ, ĆSE LÁ,E TŦE ŚḰENO,. QELEṈSEN TŦU, NIŁ ŚẈKITES. STES ȻE,ĆÁ, E TŦE SḰEL,ḰELs EṮ XÁLs. I, SWEȻEŁ TŦU, NIŁ SȻÁĆEL I, TŦE TEṈEẈ I, TŦE ŚḰENO,. LÁ,TEṈ ȻE,ĆÁ, TŦU MEQ STÁN EṮ XÁLS. ṈOS TŦE ŚẈ,LÁLEs E TŦE SḰE,ḰEL. ṈES,ÁNẈ ȻE,ĆÁ, ŚẈ,LÁ,Es TŦU NIŁ SḰE,ḰEL. I,ḰE,ḰELEṈ TŦE SȻÁĆEL I, U, SOSESs EṮ XÁLS E TŦE SḰE,ḰEL. TÁ,ȻIṈEŁ TŦU, MEQ STÁṈ EȻs ḰO,ḰELs EṮ XÁLS. SȻÁ,TEṈ ŁTE TIÁ, SḰAL.

SÁMI EṮ XÁLS. I, SDOYEMs TŦE ŚẈKITES. NIŁ ȻE,ĆÁ, ŚẈJIJEŁ ŁTE TŦE XAXE.

The creator wears a blanket, a wool blanket and a ẈSÁNEĆ head dress. It is because the creator is sacred, high up and honourable. So we give thanks to the creator.

The creator made everything here: the animals, the fish and the birds. There they all are on the land, in the sky and in the sea. The salmon go upstream from the ocean. Eagle is the creators head dress. It is because eagle is close to the messages from the creator. The wool blanket is everything. It is the land, the sky and the sea. The creator made it all. There are four places of the sun, because the sun moves along the horizons of the rising and setting suns across the four seasons. The sun is the face of the creator, shining light on everything with sacred words. We are gifted this language.

The creator wears a blanket and a ẈSÁNEĆ head dress. This is because we give thanks to sacredness.

Foreword

It is a thrill for me to see *Knowing Home: Braiding Indigenous Science with Western Science Books 1 and 2*, and to know that they will be a readily available reference for learners and educators alike. At a time when Canadians are finally embarking on a journey of Truth and Reconciliation with Indigenous Peoples, these insightful edited volumes are both timely and critically important. Together, the co-editors and authors, almost all of them Indigenous, present multiple useful paths towards identifying and recognizing two huge shortfalls in the Canadian educational system to date. One is the abysmal failure of many schools to provide quality education for Indigenous children and youth, particularly in the areas of science, technology and health. This situation is reflected today in the marked underrepresentation of Indigenous students participating in university level programs in these areas, and, further, in the dearth of professional scientists from Indigenous communities across the country. The second gap, equally lamentable, is that students of mainstream western science and technology have been deprived of learning about the immense body of Indigenous scientific knowledge, perspectives and applications acquired and built over generations of dwelling in particular places. The *Knowing Home* books are a wonderful resource that will bring all Canadians to a higher level of understanding in these two areas.

Nancy Turner, CM, OBC, PhD, FRSC, FLS
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School of Environmental Studies
University of Victoria

Preface

The "Aboriginal Knowledge and Science Education Research Project" was a collaborative venture between the Aboriginal Education Enhancements Branch of the British Columbia Ministry of Education (Canada) and the University of Victoria (Canada), and was created to address issues associated with the under-representation of Indigenous peoples in the sciences. The project had a three-fold purpose: (1) to broadly describe why Indigenous l students are under-represented in high school science biology, chemistry, and physics classrooms, (2) to find ways to improve significantly their involvement and achievement in both elementary and high school science leading to post-secondary, and (3) encourage Indigenous people to consider science and health related occupations.

According to Cajete (1999), "Native science evolved in relation to places and is therefore instilled with a 'sense of place'. Therefore, the first frame of reference for Native science curriculum is reflective of their place" (p. 47). Thus, a key component of the research project was to document the Indigenous 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 Indigenous community.

It is anticipated that the project will contribute to the realization of increased participation of Indigenous peoples in the sciences by generating: (a) understanding of the underlying reasons for the lack of participation in upper level sciences courses, (b) knowledge about the lack of participation of Indigenous people in science and health related careers, (c) knowledge of the Indigenous Science of British Columbia Indigenous peoples, (d) knowledge about how children of Indigenous ancestry have a worldview other than the Western scientific worldview, (e) significant research opportunities for Indigenous graduate students, (f) research partnerships amongst Indigenous and non- Indigenous teachers and scholars, (g) directions for leadership and career opportunities in science for Indigenous graduate students, and (h) more effective science education curricula and programs by and with Indigenous scholars and Indigenous communities to be developed, implemented and evaluated.

With the aging population of the Elders in the community, Indigenous Science (IS) knowledge is vulnerable and the urgency to research and document this knowledge is vital to Indigenous peoples and to the global society. We take the view that unless IS is acknowledged as science, Western Science (WS) will continue to completely dominate the science curriculum, and IS will continue to be excluded or given tokenistic inclusion at best. Thus, we take the view that IS and WS can co-exist side by side in the science classroom.

Building a Community of Researchers

By working with Indigenous graduate students, rather than with practiced researchers, this project was unique in that it was designed to provide opportunities for Indigenous peoples to participate in a research project. Although this was an important key element of the research project, it had challenges of working with a cadre of inexperienced graduate students, many of whom were at the beginning 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) build culturally appropriate research skills amongst graduate students; (b) collect and analyze what Indigenous knowledge based curriculum materials and programs already exist; (c) design a graduate level program of courses to teach basic research techniques and concepts associated with the project; and (d) locate and encourage networks with and amongst researchers and research centres focusing on Indigenous knowledge and science education projects. Six Indigenous graduate students and three non-Indigenous graduate students volunteered to research specific components of the project deemed relevant to their personal career goals and the needs and goals of their home communities.

During the summer of 2004, an off-campus Graduate Program in Environmental and First Nations Education was offered to both Indigenous and non- Indigenous students in 'Yalis (Alert Bay), British Columbia, home of the Kwakwaka'wakw people. The Kwakwaka'wakw, against enormous pressures, have remained close to the essence of their traditional and still viable life-ways. Like other Indigenous peoples who retain their traditional identity, they are in a position to share many of their beliefs and values. They teach through a wide range of means and expressions, and their relationship to the larger society. A key tenet was that environment and culture could not be considered separately, there could be no course on Kwagu'ł culture that was not also about the Kwagu'ł environment. Common experiences included direct experiences with Elders and scientists, and conducting archival and research associated with historical events related to colonization and decolonization.

The aim of this graduate program was to bring together Indigenous and non-Indigenous persons to work together in learning about the forest and ocean environments, respecting the cultures of Indigenous people, and educating future citizens to make wise decisions regarding long-term sustainable communities and environments. The design of the program and courses followed Indigenous ways of learning; learning by being on the land; learning together by forging a sense of community within the program; learning from the expertise of First Nations communities and the university community. Because the majority of graduate students were full-time teachers, the program was developed to take place in three summer sessions (Snively, 2006; Snively & Williams, 2006). (See Appendix D for a more elaborated description of the research project and graduate program).

Walking Forward

Since Indigenous peoples have developed time-proven approaches to sustaining both community and environment, Elders and young people are concerned that this rich legacy of Indigenous Science with its wealth of environmental knowledge and the wisdom of previous generations could disappear if it is not respected, studied and understood by today's children and youth. A perspective where relationships between home place and all other beings that inhabit the earth is vitally important to all residents—both inheritors of ancient Indigenous Knowledge and wisdom, and newcomers who can experience the engagement, joy and promise of science instilled with a sense of place. The two volumes take a step forward toward preserving and actively using the knowledge, stories, and lessons for today and future generations, and with it a worldview that informs everyday attitudes toward the earth.

Over the past two decades many jurisdictions worldwide have placed Indigenous Knowledge in their science curricula, for example: New Zealand, Australia, and in the United States, Alaska, Hawai'i, New Mexico and Washington. In the spirit of reconciliation, a number of ministries of education and departments of education in Canada have increasingly recognized Indigenous Knowledge as fundamental content in school science.

Indigenous Science encourages a welcoming and interested attitude toward the local, the timeless, and the emotional. All science educators must strive to design new curriculum that represents a balanced perspective, exposing students to multiple ways of understanding science. Indigenous perspectives have the potential to give 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.

Knowing Home: Books 1 and 2

Knowing Home: Braiding Indigenous Science with Western Science is far more than a set of research papers or curriculum studies. The project outputs include both, but they are incorporated into a theoretical structure that can provide the methodological basis for future efforts that attempt to develop culturally responsive Indigenous Science curricula in home places. It is not just one or two angels to organize, but multiple interwoven approaches and cases that give this project its exceptional importance. Thus, the project outputs have been organized into two books.

Book 1 provides an overview of why traditional knowledge and wisdom should be included in the science curriculum, a window into the science and technologies of the Indigenous peoples who live in Northwestern North America, Indigenous worldview, culturally responsive teaching strategies and curriculum models, and evaluative techniques. It is intended that the rich examples and cases, combined with the

resources listed in the appendices, will enable teachers and students to explore Indigenous Science examples in the classroom; and in addition, support the development of culturally appropriate curriculum projects.

Book 2 provides supportive research, case studies, curriculum projects and commentary that extends and enriches the chapters presented in Book 1. The chapters provide rich descriptions related to Indigenous cultural beliefs and values; teacher thinking about Indigenous Science; the perceptions and experiences of successful Indigenous students in secondary science; a metaphorical study of Indigenous students' orientations (scientific, spiritual, utilitarian, aesthetic, and recreational) to the seashore and their adult orientations 19 years later; the use of digital video as a learning tool for secondary Indigenous students; a cross-cultural marine education program involving an exploration of WS and IS related to the local Indigenous culture; and a W̱SÁNEĆ immersion school program focused on language revitalization and the concept of "knowledge of most worth."

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We also thank guest speakers Dr. Budd Hall (then Dean of the Faculty of Education) and Dr. Rajesh Tandan (Society for Participatory Action Research in Asia, New Delhi) for travelling to 'Yalis (Alert Bay) and delivering an inspiring talk and workshop giving new meaning to academic research by redefining relationships between the researcher and the researched subjects.

The collaboration also included Ed McMillan (Sim'oogit W'ii T'axgenx), past Director of Instruction, School District 92, Nisga'a. Project affiliates include the 'Namgis First Nation (Alert Bay), Kwakiutl Band Council (Fort Rupert), the West Shore Centre for Learning and Training (Victoria), the First Nations Education Division of the Victoria School District, the Bulkley Valley School District, the W̱SÁNEĆ (Saanich) School Board, and the Alert Bay Marine Research Laboratory Society.

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Our acknowledgements would not be complete without paying tribute to the late Yup'ik science educator and scholar, Dr. Angayuqaq Oscar Kawagley, who taught one of the graduate courses in 'Yalis. Kawagley asserts that strong bridges are built by examining the collective ways people in Eurocentric and Indigenous cultures experience and make sense of their natural worlds. Words cannot capture his inspired teachings and gentle spirit, but the wisdom of his stories will be with us always as we strive to find new approaches to science education that invite all students to participate by articulating a cultural approach to science.

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Contributing Authors

Dr. Gloria Snively is Professor Emeritus at the University of Victoria where she taught science methods, environmental/marine education, and culture courses. She was Director of the Graduate Program in Environmental Education. For 12 years, she was involved with the Asia Pacific Network whose purpose is to strengthen links between the research community and school-based environmental education in the Asia-Pacific region. Her work with Indigenous education spans 4 decades and has always been inspired by Indigenous leaders. She enjoys giving natural history talks and walks to students, teachers, park interpreters, First Nations and community groups for 50 years; she prefers to explore forest, ponds and seashores first-hand.

Dr. Wanosts'a7 Lorna Williams OBC *walking in peace* is Lil'wat of the St'at'yem'c First Nation. Her life has been devoted to promoting and restoring Indigenous culture and language. She worked as an Indigenous educator and language specialist for more than 50 years in diverse settings, including Indigenous communities, public schools, and adult education settings. Dr. Williams recently retired from the University of Victoria as Canada Research Chair in Indigenous Knowledge and Learning (co-appointment with Faculty of Education and Department of Linguistics) and an associate professor, where she developed and delivered an innovative series of courses on learning and teaching in an Indigenous world.

David Ashurst has been a secondary science teacher in Victoria for 15 years where he currently teaches senior biology, chemistry and Jr. science at Oak Bay High School. He earned an MA in First Nations and Environmental Education through UVic in 2009 where his thesis research focused on cross-cultural science education in a marine context. Central to his professional practice is the weaving of traditional knowledge into the existing curricular framework, bringing the topics to life and building a bridge between traditional and western science cultures. Dave has a passion for the outdoors, particularly the coastal environment, and feels that the understanding of traditional ways of knowing is central to connection with and the conservation of this vital environment.

Nan Kendy has lived and worked in Northern BC for 30 years on Witsuwit'en and L'heidli Tenneh territories. She taught elementary school in Moricetown and Smithers. Nan completed an MA from the University of Victoria in Environmental and First Nations Studies in 2007 and worked as a sessional instructor in the School of Education at the University of Northern BC in Prince George until 2012. Retired, she lives outside Prince George on Nadsilnich Lake where she is president of her community association and actively involved in protecting the quality of the lake water for her grandchildren. Nan ran as a candidate for the Green Party for her riding of Prince George-Valemount in the 2017 Provincial Election.

Dr. Rick Kool is a transplanted Bostonian who has been a teacher for a long time: science teacher at Ucluelet Secondary School in the mid-1970s, biology and ecology instructor at Douglas College, educator and interpreter at the Royal BC Museum and BC Parks, and co-creator of the MA program in Environmental Education and Communication at Royal Roads University. His research interests have ranged from the ecology of single-cell animals living in sand and mud to the walking speed of dinosaurs, from the errors anthropologists made in understanding Nuuchanulth whaling practices to an examination of various forms of environmental violence.

Mupenkin John Lyall is from Gwa'yasdam's on Gilford Island and is Kwakwa̱ka̱'wakw. John received his BSc (physics/math) in 1998, his MA in 2009, both from UVic. John has taught for 16 years including Kingcome Inlet and Vancouver Island, with a strong focus on Indigenous education. John has had two articles published as a co-author. He was a vice principal at Spencer Middle School, Victoria, where he developed an Aboriginal Awareness class in order to increase awareness and understanding of Indigenous ways of knowing for all students. He is currently a vice principal at Edward Milne Community School in SD 62 Sooke.

Dr. Ted Riecken is a professor in the Department of Curriculum and Instruction in the Faculty of Education at the University of Victoria. During his career as an educator he has worked as an elementary school teacher, a university teacher and researcher, and as a dean of education. His co-authored chapter in this book with Mupenkin John Lyall grew out of a collaborative research project that engaged Indigenous youth in making digital videos about their community, culture, and environment. It was this project that opened Ted's eyes to the importance of two-eyed seeing. His current research interests include educational change and innovation, Indigenous pedagogies, and alternative forms of teaching and learning.

Tye Swallow completed his BEd, secondary program, in 1998 and MA in Curriculum and Instruction in 2005. He has taught in the Saanich and Central Coast School Districts. Since 2001, Tye has worked at the Saanich Adult Education Centre, part of the W̱SÁNEĆ School Board (W̱SB) near Victoria B.C., and has taught senior biology, geography and science to adult learners. He co-created *ÁLEN̲ENEȻ: Learning From Homeland* with the W̱SÁNEĆ community in 2005, which has since seen several iterations and is now part of the core curriculum of the SENĆOŦEN LENON̲ET SCUL,ÁUTW̱ preschool, Kindergarten to Grade 4 SENĆOŦEN Immersion school. Since 2009 he continues to help facilitate Language Revitalization at the W̱SB through the SX̱Á,SEN TŦE SENĆOŦEN language apprenticeship program with Elders, current and future teachers of W̱SÁNEĆ.

Cathleen Anne Tenning is a member of the Stz'uminus First Nation on Vancouver Island. She has a BA and a BEd from UBC, and an MA from UVic. She has been an educator for 17 years, working as a secondary teacher, an academic counselor for Indigenous students, and currently as the District Vice Principal of Aboriginal Education in School District 68 Nanaimo Ladysmith. Anne is passionate about increasing Indigenous perspectives and understandings in education, particularly the lasting legacy of residential schools. Anne's mother, Elizabeth Tenning, is a survivor of the Kuper Island Indian Residential School. In 2008, Anne was a recipient of the Governor General's History Award for Excellence in Teaching and in 2015 the recipient of the UVic Distinguished Alumni Award for the Faculty of Education.

Contributing Artists

Laura Corsiglia is an artist working in drawing, painting, books and ephemeral practices. Her work considers people and animals, dreams, mountains and wild thoughts. Born in Vancouver, she was raised in Gitlaxt'aamiks, a Nisga'a First Nation community in the Nass Valley of northern BC, attending Nisg̲a'a Elementary Secondary School. She graduated with an MFA degree from the École des Beaux-Arts in Paris. Currently based in California, she co-founded Bird Ally X, a nonprofit rescuing and rehabilitating injured wild animals and releasing them back to the wild.

Trevor Isaac is a Kwakwa̲ka̲'wakw artist specializing in two dimensional design. As a child, Isaac always loved traditional art but didn't practice the art form until he was in high school. Today, most of Isaac's art is dedicated to ceremonial purposes in his home community of Alert Bay. While creating the crest figures, Isaac feels his cultural knowledge assists his depiction of the unique crest of his peoples. Since birth, Isaac has been immersed into the cultural practices of his peoples. Although born and raised in Kwakwa̲ka̲'wakw territory, Isaac has ties to many other language groups from the Pacific Northwest Coast. In addition to being a traditional artist, Isaac is also a traditional Singer and Dancer during potlatch ceremonies. He is a Hereditary Chief within his family and has been a valued member of the U'mista Cultural Centre staff in Alert Bay, BC since 2010.

Una-Ann is a Tahltan/Tlingit West Coast artist, from northern British Columbia. She presently is living in Langley, BC. Una-Ann has worked as a Cultural Presenter and an Aboriginal Support Worker in the Langley School District for the past twenty-five years. Una-Ann has established herself as an artist and clothing designer. Incorporating her traditional designs with a contemporary flair, she works in various mediums. Una-Ann enjoys sharing her knowledge of Indigenous culture and West Coast art with others. Her artwork, clothing and accessories can be seen at Indigenous art exhibitions, conferences, arts & craft shows and cultural festivals.

PENÁĆ – G. David Underwood

PENÁĆ TŦE NE SNÁ, I, U, ĆSE LÁ,E SEN EṮ W̱SÁNEĆ. I, ĆX̱I SEN ǾEĆÁ, TŦE SENĆOŦEN SḴÁL ǾE SṮI,ENs TW̱E HELISET.PENÁĆ is my ancestral W̱SÁNEĆ name. I am from W̱SÁNEĆ. I work with the SENĆOŦEN language because I want it to live. I have taught SENĆOŦEN from nursery to grades 11, in both immersion and language exposure settings. I currently teach SENĆOŦEN with the University of Victoria (UVic) in the W̱SENĆOŦEN,IST Program and I am a partner in the NEX̱OLN̲EW̱ research project. I received a Bachelor of Fine Arts (B.F.A., 2011), majoring in Visual Arts and a minor in Film Studies. I also have a Masters of Education in Indigenous Language Revitalization (M.Ed., 2017) – both of which are from UVic. My masters project is an auto-ethnographic account of my SENĆOŦEN learning, which asks, "SX̱ENI,EN̲ YEW̱ ǾNES TW̱E SENĆOŦEN? – How is that I have come to speak SENĆOŦEN?