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Integrative Science and Two-Eyed Seeing: Enriching the Discussion Framework for Healthy Communities

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Abstract

This chapter draws upon an ongoing co-learning journey called “Integrative Science” that has been guided by the principle of Two-Eyed Seeing and that has involved university scientists and researchers, a poet, and Aboriginal Elders, scientists, educators, students and other community members. Within this journey, many understandings have emerged that we share in an effort to help foster the collaborations of others in cross-cultural settings, especially those involving the mainstream and Aboriginal Canada. These include our understandings about the conduct of integrative, transcultural research through co-learning, our view of science as “dynamic, pattern-based knowledges about our interactions with and within nature” and as knowledges that are transmitted by stories, and our “big pictures” (texts and visuals) about the dimensions of our knowledges as tools to help facilitate multiple perspective engagement and empowerment. Such are extremely important because all efforts that seek collaboration of the Western sciences with those of other cultures or worldviews need to be constantly mindful of the cognitive imperialism (sensu Battiste 2005) within Western-based approaches and knowledges.

Outline

- Towards collaboration for healthy communities: insights from a co-learning journey of Elders and academics
- Our origins in post-secondary science: welcoming the Indigenous sciences
- Our guiding principles: listening to the Elders
 - Trees Holding Hands
 - Two-Eyed Seeing
 - The Healing Tense
- Our culturally inclusive view of science: telling dynamic pattern-based stories
 - “Pattern smarts” and “pattern view of science”
 - “Story” for pattern-based knowledges
- Our key visual and more: explaining the vision and expanding the journey
- Our tools: patterns ... seeing “big pictures” and using “organics”

Towards collaboration for healthy communities: insights from a co-learning journey of Elders and academics

How can we begin to implement the wisdom of Aboriginal Elders who readily and passionately share their knowledge in hopes for a better future for their children and communities, those around the world, and the Earth herself? In other words, how might the mainstream become more welcoming of “outside the academy” perspectives within discussion frameworks intended to promote healthier communities? Furthermore, recognizing that discussions of healthy communities extend to ecosystems, i.e. that discussions must include the understanding that humans are members of the natural world, and this in conjunction with the acknowledgement that both Indigenous and Western scientific knowledges are based in observations of the natural world ... what view of science can be adapted to foster transcultural collaboration?

In an effort to help answer the above questions, this chapter is a partial telling of a particular story of the meeting of Indigenous and Western perspectives and the understandings emergent therein. It is about Integrative Science (an initiative designed to bring together different worldviews) and Two-Eyed Seeing (a guiding principle in bringing together different perspectives) within a co-learning journey involving a small group of people on the island of Cape Breton (Unama’ki) in northeastern Nova Scotia in the traditional territory of the Mi’kmaq Nation, plus a few individuals from elsewhere in Canada. In sharing our understandings, we concur with those (e.g. Ambler 2003; CCL 2007) who maintain that traditional Indigenous knowledges and ways of knowing have profound and long-established understandings about the value of multiple perspectives and collaboration. We further believe that the academic mainstream should become more involved in creating and nurturing opportunities for meaningful engagement with perspectives beyond its walls, as per the urging of others pursuing integrative and/or transdisciplinary research (e.g. McGregor 2010). But, participants need to find ways to engage with each other and the diverse knowledges they bring – engage in ways that are accessible, meaningful, and respectful for both expert and non-expert while also being conducive to problem framing, to problem solving, to new learning, and to delivering on expectations for productive outcomes.

The “we” voice used in telling our story denotes group understandings and/or achievements although the words are those of Cheryl, the lead university scientist involved in Integrative Science. In strategic places, the direct words or paraphrased thoughts of co-authors Murdena, Albert, or Marilyn are provided. Our co-learning journey started in the early to mid 1990’s and is on-going; our position is that the journey has been and continues to be the living laboratory in which participants from different sectors and communities are coming to understand how to talk and walk together in an ethical, respectful, and productive manner ... as per the millions of people around the world who desire healthier communities and a healthy Earth Mother.

The first three co-authors are the conceptual parents for Integrative Science and remain its “core journey participants”. Murdena and Albert are Elders of the Mi’kmaq Nation and have devoted themselves to the protection, preservation, and promotion of their Mi’kmaq culture while also advocating the need for transcultural work and thus, the need to take down the boundaries between the academy and the community. The fourth co-author and our poet, Marilyn, has been involved in the co-learning journey of Integrative Science since January 2004.

We have chosen to use a story genre herein, i.e. to tell about our experiences, and, moreover, to configure this as a journey – journey is the way in which experiences unfold. This format aligns with Aboriginal approaches while breaking with the academic convention of an argumentative format. In regards Aboriginal approaches, co-author Elder Albert further encourages the understanding that “the foundational basis for any relationship is an exchange of stories.” This is most appropriate as our journey sprang from a vision for relationship, one in which there would be a “bringing together of the scientific knowledges and ways of knowing from Indigenous and Western worldviews.” Indeed, this is now our definition for “Integrative Science” and its arenas have expanded beyond post-secondary science education where it started to include science research, applications, and outreach to youth and communities. Our journey has also determinedly sought to help humans reconnect with the earth and our story approach in that respect sits comfortably with the thoughts of Gregory Bateson (1979, p. 13) as highlighted by Goodwin (2008, p. 149): “Now I want to show you that whatever the word “story” means ..., the fact of thinking in terms of stories does not isolate human beings as something separate from the starfish and the sea anemones, the coconut palms and the primroses. Rather, if the world be connected, if I am at all fundamentally right in what I am saying, then *thinking in terms of stories* must be shared by all mind or minds whether ours or those of redwood forests and sea anemones.”

Our co-learning journey has involved dialogues, workshops, projects, conversations, and storytelling within the overall intent that both common ground and differences can be recognized and called upon. The diversity of the people on our journey is rich; over time it has always included Aboriginal Elders, educators, and scientists plus mainstream-educated university scientists and researchers. As opportunities have arisen, Aboriginal and non-Aboriginal post-secondary science students and graduates as well as interested others have also been important fellow travelers. Within our journey, we have come to understand very well what Indigenous scholar Jo-ann Archibald clearly articulates in her 2008 book “Indigenous Storywork; educating the heart, mind, body and spirit”, namely, that research informed by an Indigenous paradigm may start off with a research question but later such becomes conversation becomes chat becomes storytelling. The guiding principle for our journey is “Two-Eyed Seeing, as brought forward by Elder Albert. This is explained later; briefly, it encourages that we learn to see from one eye with the best in the Indigenous ways of knowing, and from the other eye with the best in the Western (or mainstream) ways of knowing ... and, moreover, that we learn to use both these eyes together, for the benefit of all.

We use “Aboriginal” herein following Section 35 of the Canadian Constitution Act of 1982 where “Aboriginal Peoples” is the collective name for the original peoples of Canada and it is specified that the Aboriginal Peoples in Canada consist of three groups – Indian (First Nations), Inuit and Métis. We use “Indigenous” to refer to knowledge or ways of knowing inherently tied to the natural world (i.e., ecosystems and particular landscapes and landforms within them, plus skies overhead) in traditionally occupied territories. The main Aboriginal participants in our co-learning journey have been Mi’kmaq people, who are First Nations (we use “Mi’kmaq” to denote the adjective and “Mi’kmaq” the noun). However, other Aboriginal peoples and non-aboriginal peoples have also helped ponder and explore Integrative Science and Two-Eyed Seeing, as, for example, Inuit Elders and educators with respect to land-based camps for youth (Anonymous 2009), diverse workshop participants looking to advance the Species At Risk Act (Williams 2009), attendees at a national science conference (namely, the Canadian Aboriginal

Science and Technology Society 2005; see Canadian-universities.net website), and participants in global science celebrations (namely, International Year of Astronomy 2009; see IYA 2009 Canada website).

At all times, the goal for our co-learning journey has been to encourage improved cross- and transcultural understanding, participation and innovation in science in its various arenas of relevancy. We use “cross-cultural” to mean individuals from different cultures interacting, perhaps collaboratively. By “transcultural” we mean individuals from different cultures working together – or imagining to – in a way that respects differences, acknowledges common ground, and seeks to co-create new knowledge. We use “integrative” to mean individuals from different cultures recognizing and working with the ontologies, epistemologies, axiologies, and methodologies in their different worldviews (especially those in the academia working with those outside the academy). It is equally necessary to specify how “integrative” is not being used herein or in Integrative Science. We acknowledge the historical record in Canada of injustice towards Aboriginal peoples and societies; it is our desire to avoid contributing new misunderstandings. “Integrative” is not used in the sense of two knowledge systems merged into one. The latter is not our intent and, moreover, would hold open the door to knowledge domination and assimilation, an undesirable new form of hegemony. “Integrative” is not used in the sense of only taking bits and pieces from Indigenous knowledges and ways of knowing and then appending them to Western knowledges and approaches. Unfortunately, this easily results when timeframes are hurried and/or when co-learning has not been part of the process. In addition, we do not use “integrated”. This past tense implies a finished product whereas our co-learning journey is envisioned as on-going. Indeed, Newhouse (2004) indicates the work of grappling with each other’s cognitive universes and learning to see through the minds of others is the work of generations to come.

In developing our understandings and sharing them herein, we concur with Watson and Huntington (2008, p. 276) that the “intellectual traditions we assemble, ‘Western’ and ‘Indigenous,’ are not entirely separable into our individual selves, who are instead a ‘multiplicity of multiplicities’.” We particularly emphasize that our “big picture” approach (explained later) is intended to help orient within “our place of beginnings” for collaborative work that is integrative and transcultural. As Elder Albert indicates “we need to know who we are and where it is we come from, if we are to envision where we want to go.” We need a place of beginnings. Our Integrative Science journey has shown us that more sophisticated understandings, articulations, and instantiations can and will emerge as participants develop relationships of mutual trust and respect. On the other hand, we have also experienced that when co-learning is not acknowledged or implemented, a collaboration intended to be integrative and transcultural can easily falter and in dramatic ways.

Winder (2005, p. 299) indicates that “integrative research (i) involves two or more epistemic communities, often with mutually irreconcilable beliefs and (ii) requires small, well-managed, ephemeral groups and sympathetic regulation.” In this regard, our experience shows there is great need, at the outset but continuing throughout the journey of integrative research, to acknowledge and affirm the need to engage in co-learning. Later, we explain how we came to realize that this co-learning requires participants to be able to place the actions, values, and knowledges of their own culture in front of themselves like an object, to take ownership over them, and to be able to say “that’s me”. And, as guided by Two-Eyed Seeing, we need these

“objects” for both the Indigenous and Western worldviews so that participants can learn both “that’s me” and “that’s you” to foster working together. Thus, “co-learning” involves learning from each other, learning together, learning our commonalities and differences, and learning to see how to weave back and forth between our cultures’ actions, values, and knowledges as circumstances require. Moreover, we have learned that for integrative research to succeed there is great value in having continued involvement from the same core group of participants until new understandings are strongly rooted or the seeds for such broadly planted. Nonetheless, this core must welcome the participation of others plus nurture their “catch up learning” while continuing to tend to the new learning needs of the group as a whole. Key visuals can assist in this regard, and later we explain some we have developed to convey concepts and enable on-going and appropriate awareness and application in shifting, evolving, and diverse contexts.

Willie Ermine, Professor at the First Nations University who is Cree and from north central Saskatchewan, Canada, speaks passionately to the need for different perspectives and cultures to enter into dialogue for the good of all humanity, although he has particular interest in dialogue involving Indigenous cultures and “the West”. He (2007, p. 201) explains that the fundamental question of cultural encounters is “How do we reconcile worldviews?” and suggests this can occur with implementation of the concept of “ethical space”, a term coined by Poole (1972), in which we make “a venue to step out of our allegiances, to detach from the cages of our mental worlds and assume a position where human-to-human dialogue can occur.” Ethical space is created when two societies, with disparate worldviews, are poised to engage each other. Ermine believes that in this way channels can be opened for new ways of thinking and understanding. Ermine (2007, pp. 202-203) also suggests that “recognizing that the Indigenous-West encounter is about thought worlds may also remind us that frameworks or paradigms are required to reconcile these solitudes” ... “but attentive work on these issues has not occurred.” The overall context of Ermine’s (2007) article was law and the legal system although the relevant horizon is broad and inclusive of science. Ermine et al. (2004, p. 21) indicate that “As a process, the fundamental requirements of the ethical space include an affirmation of its existence. The ethical space cannot exist without this affirmation. The affirmation of the space indicates that there is an acceptance of a cultural divide and a direct statement of cultural jurisdictions at play. The ethical space also requires dialogue about intentions, values, and assumptions of the entities towards the research process.”

As already mentioned, within our co-learning journey of Integrative Science and Two-Eyed Seeing, we have developed a big picture approach (described later) for our knowledges; we believe this is congruent with the dialogue Ermine et al. (2004) encourage. The understandings we use align well with what Schmidt (2008) refers to as the interdisciplinary interaction of several knowledge “dimensions” and for which he then advocates plurality in a philosophy of interdisciplinarity. Pluralism is increasingly acknowledged and advocated for interdisciplinarity (e.g. Miller et al. 2008) but spirituality is seldom if ever included. In contrast, our big picture understandings recognize spirituality as central within Indigenous ways of knowing. Elder Albert is adamant that spirituality cannot be separated from the physical within the Mi’kmaw worldview, an understanding reinforced and broadened in the following statement from Ermine (1999, p. 108) and highlighted by the Aboriginal Education Research Centre (see AERC website): “Aboriginal epistemology is grounded in the self, the spirit, the unknown. Understanding of the universe must be grounded in the spirit. Knowledge must be sought

through the stream of the inner space in unison with all instruments of knowing and conditions that make individuals receptive to knowing.”

In addition to the understandings that the remainder of this chapter will expound upon, there are others that can help the discussion framework for healthy communities to become open to Indigenous knowledges and ways of knowing. We realize it is beyond the scope of our chapter to explain them at length, but want to mention them nonetheless. First, we emphasize the richness of knowledge and wisdom embedded in Aboriginal languages. In this regard, co-author Marilyn has explored Two-Eyed Seeing and the language of healing based on taped conversations over tea with Elders Murdena and Albert in their home. She (Iwama et al. in press) writes: In Unama’ki, the English language has so supplanted Mi’kmaq that [the] knowledge Mi’kmaq youth have acquired amounts to, as Elder Albert Marshall explains, “everything from the mainstream and precious little from the Mi’kmaq.” Diminished fluency threatens the linguistic matrix that creates and sustains the health of individuals in community, an optimal state that includes, says Elder Murdena Marshall, “the capacity to be healed in a way that you’re back.”

Second, Elder Murdena points to the traditional understandings below. These are her words:

- Love is the main ingredient in wellness. It is the one and only Sacred Gift with which we are born and thus as humans have no choice but to accept. Whether we choose to manifest it, however, is up to each one of us.
- We need to relearn how to talk with and listen to the trees. Such are normal, healthy human capabilities in the Mi’kmaq worldview; trees are part of my family, my living identity ... Msit No’kmaq (all my relations).

Elder Albert, who speaks passionately at meetings, conferences, dialogues, and workshops, points to the need to (re)awaken our human consciousness to the understanding that the health of humans is tied to the well-being of our Earth Mother. These are his words:

- If the environment is not healthy, how can we expect to be healthy? If we continue to think the pharmaceutical and biotechnology companies can fix all our problems, we simply continue to foster a dependency on entities external to ourselves. We must acknowledge that each individual has responsibility and we must act upon this to attain collective health and wellness.
- Furthermore, we must acknowledge this in a holistic way – all domains must be included in order to be healthy: physical, emotional, cognitional, and spiritual ... and the individual, yes, but also the collective.
- We keep expecting the pharmaceutical and biotechnology companies to come up with a magic pill to relieve us of our health problems ... what we need to come to better realize is that we are the magic.
- Schools need to put “natural science” back into the forefront of curricula at all levels as only this will ultimately give us our good health back ... because only when we come to realize that everything that we do to the water, the air, and the earth, we also ultimately do to ourselves ... will we treat our environment and ourselves with equal reverence ... and only with the understanding that all must be maintained and that all must be equal, will we be healthy. This is the path of understanding that will lead us to good health and wellness – for humans and all others in our environment and the Earth herself.

With respect to (re)learning interconnectiveness with the land, Elder Albert has long said: “it is important to realize that the Mi’kmaw language comes from the land and that if a person speaks their [Aboriginal] language, their spirit can never be captured. Moreover, our language teaches us that everything alive is both physical and spiritual ... that everything is interdependent and interconnective ... and that humans are only a small part of the whole ... and thus, that everything we do our Earth Mother, we also do to ourselves.” In this regard, there is increasing research to show how the Indigenous Sciences are place-based (e.g. Michell et al. 2008). In the mid-1990’s Elder Murdena was already encouraging “sense of place, emergence, and participation” for understandings of Indigenous science, congruent with the interconnectiveness and interdependence explained in Cajete (1995, 2000a), a long time friend of Elders Murdena and Albert.

To the above, Marilyn adds: “When we in Integrative Science get impatient for ‘results,’ when we are asked to prove that Two-Eyed Seeing is working, or that Two-Eyed Seeing is ‘Science,’ Elder Albert likes to tell us about the ash tree. Every year, the ash tree drops its seeds on the ground. Sometimes those seeds do not germinate for two, three or even four cycles of seasons. If the conditions are not right, the seeds will not germinate. Sometimes, Elder Marshall says, you have to be content to plant seeds and wait for them to germinate. You have to wait out the period of dormancy. Which we shouldn’t confuse with death. We should trust this process.”

Our origins in post-secondary science: welcoming the Indigenous sciences

Integrative Science (English) or “Toqwa’tu’kl Kjjitaqnn” (Mi’kmaq) began as a globally unique undergraduate science program created in the mid-1990s at Cape Breton University (CBU) in Sydney, Nova Scotia, Canada. The overall vision was and still is to bring together scientific knowledges and ways of knowing from Indigenous (or Aboriginal) and Western (or Eurocentric, conventional, or mainstream) worldviews. Indeed, the dream that one day the educational mainstream might recognize the Indigenous sciences alongside the Western sciences has been, for Elder Murdena, a long held, important life aspiration (Hunter 2001). In that Murdena is a Spiritual Leader for the Mi’kmaw Nation, it is not surprising that the Integrative Science program came into existence at CBU, the institution where Murdena worked for many years, retiring as an Associate Professor of Mi’kmaw Studies in the late 1990s. CBU is also home to more Mi’kmaw students than any other post-secondary institution in the traditional territory of the Mi’kmaw people. This ancestral territory is known as Mi’kma’ki and includes the present day provinces of Nova Scotia, Prince Edward Island, most of New Brunswick, the Gaspé of Quebec, and the southwestern region of Newfoundland, as well as parts of the State of Maine in the United States of America (NCNS website).

The creation of Integrative Science can be traced to specific interest expressed by Murdena plus a few other key representatives from the Mi’kmaw First Nation community of Eskasoni. They requested university-level innovation and action that would begin to reverse two situations:

- 1) the almost total absence of Mi’kmaw students in CBU’s science and science-related programs, including the failure or drop-out within a few months by those who did begin [a common situation across Canada among other Aboriginal peoples and universities], and
- 2) the failure within the mainstream science and science educational communities to acknowledge Indigenous knowledges in science and science-related curricula.

Mi'kmaw proponents felt that action towards reversing the second of the above could serve as an essential, concurrent step to reverse the first. I.e., it was felt that culturally inclusive curricula would help attract and retain Mi'kmaw students into and within post-secondary science. Community members found the (then) low to non-existent participation in university level science by Mi'kmaw students worrisome in the face of the increasing needs in all Mi'kmaw communities for scientifically educated personnel in sectors such as health and medical services, natural resource planning and management, and elementary through high school education. Furthermore, this low to non-existent participation in science was vexing in that for thousands of years prior to the arrival of Europeans, the Mi'kmaw people were the scientists of Atlantic Canada – they had rich and complex knowledge about the medicines, plants, and animals in their waters, lands, and skies and they transmitted and enriched this knowledge, generation to generation, via highly effective, traditional modes of teaching and learning within stories, ceremonies, and mentoring (Murdena Marshall, personal communication, 1996).

A major challenge immediately faced in the creation of CBU's Integrative Science program was the "how" in bringing together Indigenous and Western scientific knowledges. With no other Integrative Science models to learn from, we found inspiration in the "Spirit of the East" (in Mi'kmaq: "Wjipenuk Etek Lnuimlkikno'ti") wherein, as stated by Calliou (1995) "the East is seen, through its association with the sunrise, as a place of beginnings and enlightenment, and a place where new knowledge can be created or received to bring about harmony or right relations." A commissioned painting (Fig. 1) by Integrative Science journey participant and artist Basma Kavanagh complements these words. Proponents of Integrative Science also found strength in knowing that science as a "way of knowing" (regardless of the culture) is dependent upon transformational consciousness towards thinking in new ways. Further, transformation is a key component in the Indigenous research paradigm (Wilson 2003; Archibald 2008).

Thus, with the first students in the Fall of 1999 we took heart from Dr. Gregory Cajete's personal advice (1997) to "just start, have the courage to learn by doing, and emphasize creativity". Dr. Cajete is one of North America's leading proponents of Indigenous / Native Science, and has published many of his understandings (1995, 1999a, 1999b, 2000a, 2000b). He is Tewa from the Santa Clara Pueblo in New Mexico, a scientist and educator, and currently the Director of the Native American Studies Department at the University of New Mexico, Albuquerque. In his doctoral thesis, Cajete (1986, p. 221) had stated: "The teaching of science from only one cultural perspective and in the partialistic manner that dominates science education continues to be the central dilemma of science education today." It was apparent from the outset that Integrative Science needed to address this broad situation and its entailments.

Even though Integrative Science was pioneered within the post-secondary science arena, the Indigenous-West encounter in the context of science education has been on-going in a formal and growing way for a few decades. The encounter is enriching understandings, approaches, debates, and developments (e.g. Battiste 2005, 2008; Aikenhead 2002; Aikenhead and Ogawa 2007; Hatcher et al. 2009; see also the entire 2008 Issue 3 of "Cultural Studies of Science Education" as well as the "Aboriginal Learning Knowledge Centre" on the CCL website).

Our guiding principles: listening to the Elders

As the preceding sections indicate, the Integrative Science co-learning journey has always included Aboriginal Elders. Their words have guided the overall venture and the projects within it. Three key examples (with accompanying visuals for two) are provided below.

Trees Holding Hands

When the Integrative Science co-learning journey first expanded from its birthing arena of post-secondary science education into the arena of science research, we realized a guiding principle was needed to encourage manifestation of the understanding that “only when knowledge is conditioned by respect can it be truly shared.” We chose wisdom from the late Mi’kmaw Spiritual Leader, Healer, and Chief Charles Labrador of Acadia First Nation, Nova Scotia: “Go into the forest, you see the birch, maple, pine. Look underground and all those trees are holding hands. We as people have to do the same.” Our wording comes via an interview (Kierans 2003) with the Chief’s son Todd in which he quotes his Father’s wisdom and also says: “Everything I do, I do with respect. Father used to say, believe in all people. It’s not we and them. It’s us.”

The Integrative Science research project in question was an Aboriginal community-based, participatory action, health research project funded by the Canadian Institutes of Health Research – Institute of Aboriginal Peoples’ Health (CIHR-IAPH). It was launched at a workshop in Eskasoni First Nation in January 2004 (Paul 2004) and encompassed many additional workshops, numerous sub-projects, and countless conversations over the next four years. The project’s title was “Integrative Health and Healing: co-learning our way to expanding wholeness through restoration of relationships with the land” and the overall project objective was to create a co-learning journey for different perspectives about health. The steering committee felt that Chief Labrador’s wisdom was ideal for the project and we continue to highlight it today at conferences and workshops.

An iconic visual (Fig. 2) was developed to portray “Trees Holding Hands”. Response among youth audiences suggested, however, that this visual was not helping to convey the intended message. We speculated that this failure may relate to the life styles of many young people today, in that they have not had the personal experience of walking in the woods and seeing for themselves how roots of different trees often entangle such that, metaphorically speaking, the trees do hold hands. Upon complementing the iconic visual with a photograph (Fig. 3), we felt that audiences were better able to grasp the intended message.

Two-Eyed Seeing

Two-Eyed Seeing was introduced earlier in this chapter as the guiding principle for our co-learning journey; more explanation is provided here. By Fall 2004, Elder Albert felt that participants within the above-mentioned Integrative Health and Healing project could benefit from additional encouragement towards the “it’s us” consciousness of Trees Holding Hands. With this understanding, he offered Two-Eyed Seeing, indicating that it is the gift of multiple perspective treasured by many Aboriginal peoples. Albert explains that for Integrative Science, Two-Eyed Seeing refers to learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing, and to using both these eyes together, for the benefit of all. Two-Eyed Seeing adamantly, respectfully, and passionately asks that we bring together our different ways of knowing to motivate people, Aboriginal and non-Aboriginal alike, to use all our understandings so we can leave the world a better place and not comprise the opportunities for our youth (in the sense of Seven Generations) through our own inaction. More recently, on the basis of six years experience in explaining the principle, Albert adds: “Two-Eyed Seeing is hard to convey to academics as it does not fit into any particular subject area or discipline. Rather, it is about life: what you do, what kind of responsibilities you have, how you should live

while on Earth ... i.e., a guiding principle that covers all aspects of our lives: social, economic, environmental, etc. The advantage of Two-Eyed Seeing is that you are always fine tuning your mind into different places at once, you are always looking for another perspective and better way of doing things.”

In putting forward Two-Eyed Seeing, Elder Albert has passionate concerns for the well-being and future of Aboriginal peoples and Indigenous knowledges, as is evident when he states what happens in its absence: “When you force people to abandon their ways of knowing, their ways of seeing the world, you literally destroy their spirit and once that spirit is destroyed it is very, very difficult to embrace anything – academically or through sports or through arts or through anything – because that person is never complete. But to create a complete picture of a person, their spirit, their physical being, their emotions, and their intellectual being ... all have to be intact and work in a very harmonious way.”

Iconic visuals have been developed within the Integrative Science co-learning journey for the guiding principle of Two-Eyed Seeing. Initially we simply used two eyes (Fig. 4) but around 2007 we switched to a visual in which two eyes are positioned behind two connected pieces of a jig-saw puzzle (Fig. 5). This followed Elder Albert’s encouragement that we emphasize that Mi’kmaw First Nations’ understandings are but one view in a multitude of Aboriginal and Indigenous views ... and similarly that of the Western sciences ... and that all of the world’s cultures (which we take to include Western science) have understandings to contribute in addressing the local to global challenges faced in efforts to promote healthy communities. Thus, one might wish to talk about Four-Eyed Seeing, or Ten-Eyed Seeing, etc. Furthermore, Albert indicates “the two jig-saw puzzle pieces help remind us that, with respect to Aboriginal Traditional Knowledges [Indigenous knowledges], no one person ever has more than one small piece of the knowledge.” Thus, there is a need to recognize that Traditional Knowledges draw upon the community of Elders and other Knowledge Holders, as well as the collective consciousness of the people. So, here too, one might wish to talk about multiple-eyed seeing.

The guiding principle of Two-Eyed Seeing further helps us to acknowledge the distinct and whole nature of the Indigenous knowledges and ways of knowing (i.e., such is represented as a whole eye) and the distinct nature of the Western knowledges and ways of knowing (i.e., such is also represented as a whole eye), while asking that these two eyes work together (i.e., as they do in binocular vision). Nevertheless, it may be that in a particular set of circumstances we will choose to call upon the strengths within Indigenous sciences, whereas in another set of circumstances we might choose to call upon those within the Western sciences. Thus, Two-Eyed Seeing can require a “weaving back and forth” between knowledges, and this will draw upon abilities to meaningfully and respectfully engage in an informed manner in collaborative settings. Towards this, we have developed the four big pattern knowledge understandings (with visuals) as tools that are presented later in this chapter.

Two-Eyed Seeing, in that it speaks directly to the setting of collaborative, cross-cultural work, intentionally seeks to avoid the situation becoming a clash between knowledges, domination by one worldview, or assimilation by one worldview of the knowledge of another. At the same time, we acknowledge what Ermine et al. (2004) referred to as the precarious relationship between Indigenous peoples and the Western world. In the combined understandings and words of Elders Murdena and Albert “we recognize that the Indigenous Sciences draw upon Tribal

Consciousnesses, while we also recognize that the latter tend to be negated by too much formal education and that our times place an overwhelming emphasis on formal education. We must, therefore, be diligent in taking the best from our two worlds: Indigenous and Western. We recognize that Western Science privileges objectivity and de-emphasizes the human element, yet we depend heavily upon it and its technologies in our modern lives. Nevertheless, for the benefit of all humans, our times need to learn to factor the human element into science and to rediscover our humility as but one species on the planet” (see A. Marshall (2005) and M. Marshall (2005) for additional elaboration).

The Healing Tense

As mentioned previously, Ermine (2007, p. 201) indicates that “recognizing that the Indigenous-West encounter is about thought worlds may also remind us that frameworks or paradigms are required to reconcile these solitudes”. In this regard, we believe that the “healing tense” within the Mi’kmaq language provides insightful guidance. This tense has been brought forward by Elder Murdena who explains that it requires a person to put his/her deeds out in front of him/herself like an object, to take ownership over them, to be able to say “that’s me” within a consciousness of transformation. The healing tense is explored and explained in Iwama et al. (2007; in press) wherein Murdena’s words are found, including: “You have to take full responsibility of your actions. See, in the Mi’kmaq world you have to give recognition to everything. Misdeeds good deeds past deeds. You know? Anything. You have to give that acknowledgment. Everything that you do, you have to acknowledge it. And the listener, if he’s a Mi’kmaq speaker, will understand at which state of reality are you in. Healed in a way that you’re back. Reinstated into the family. If you don’t go into that tense you cannot heal, you will not have healed.” Murdena’s understandings as to what the Mi’kmaq language requires and provides via the healing tense resonate profoundly with what Ermine (2007) indicates is urgently required if reconciliation is to occur via inter-cultural dialogue and what he suggests can be provided by the concept of ethical space.

Our culturally inclusive view of science: telling dynamic pattern-based stories

Michell et al. (2008) discuss various ways the view of science has been broadened within Indigenous science educational initiatives. They refer to Integrative Science as welcoming the holistic sciences, although the approach we have developed is that and more. We have heeded the suggestion of Battiste (2002, p. 11) that “focussing on the similarities between the two systems of knowledge [Indigenous and Western] rather than on their differences may be a more useful place to start when considering how best to introduce educational reform.” In doing so, we recognized that the question “What is your view of the nature of science?” is immediately raised by any vision to bring together Indigenous and Western scientific knowledges and ways of knowing. Thus, we have chosen to emphasize that both Indigenous and Western scientific knowledges are based in observations and other experiences of the natural world and we have worked to develop the view of science as dynamic pattern-based knowledges about our interactions with and within nature. We suggest that a culturally inclusive view of science can then be developed. By “culturally inclusive” we mean including both the Indigenous sciences and the Western sciences, and dealing with the “mutually irreconcilable beliefs” that Winder (2005) identified as a challenge for integrative research and the “cultural mismatch” that CCL (2007) identified as the challenge in Aboriginal science education. In other words, being “culturally inclusive” means we acknowledge and understand that the Indigenous and Western sciences have different ontologies, epistemologies, methodologies, and goals. Moreover, we

choose to understand: (1) that our pattern-based knowledges take the form of “stories”, and (2) that variety in our stories emerges as different cultures assemble and transmit (i.e. shape and share) their stories in different ways depending upon which “human pattern smarts” are being privileged. The Native Knowledge Network of the University of Alaska – Fairbanks has worked for many years to develop culturally responsive science curricula. Within that initiative, Stephens (2000) created a concept map depicting the Indigenous and Western sciences in which “pattern recognition” is similarly considered as common ground between (i.e. similarities in) the knowledges. We suggest that to view science as “dynamic, pattern-based knowledges assembled and transmitted as stories” is a conceptual innovation that broadens (not misleads) educational understanding and therefore can also help address the concerns about cognitive imperialism forefronted by Battiste (2000, 2005, 2008).

“Pattern smarts” and “pattern view of science”

With respect to the culturally inclusive view of science developed within Integrative Science, we emphasize that our pattern-based knowledges draw upon “human pattern smarts”. These smarts are the “multiple intelligences” in Gardner’s (1983, 1993, 1998, 1999) Multiple Intelligences (MI) Theory. We acknowledge that MI Theory has been critiqued by authors who were initially drawn to it but then became disillusioned with the theory’s evolution (Kincheloe 2004). In responding to other critiques, Gardner (2006, p. 503) reminds us that it “is a synthesis of work in a number of disciplines, ranging from neuroscience to anthropology ... wherein each of the intelligences is seen as a computational capacity – the ability to process certain kinds of information in the process of solving problems or fashioning products.” We feel comfortable in using “pattern smarts” for the multiple intelligences, in that MI Theory is a brain-based theory and that an overall understanding within cognitive neuroscience is that the human brain is a highly specialized, pattern seeking organ (e.g. Wolfe 2006). “Science” as viewed by Integrative Science involves pattern recognition and pattern expression, and also pattern transformation given that we further attribute dynamism (adaptability and change) to these knowledge processes. Kavanagh et al. (2006) and Lefort et al. (2006) provide examples of Integrative Science work in this regard.

We readily acknowledge that our consideration of “pattern” should include a companion reference in Indigenous worldviews to that in cognitive neuroscience. The latter, although increasingly advocated to address issues of learning and instruction (e.g. Varma et al. 2008), does not include the spiritual along with the cognitive, emotional, and physical domains of being human. Thus, for a richer view towards the use of “pattern” as encouraged by Integrative Science, we recommend understandings in Sheridan and Longboat (2006). These authors speak to the sacred ecology of mind within the Haudenosaunee/Mohawk tradition. They explain that such is a consequence of long residence in traditional territory and enduring spiritual and intellectual relationships between people, clans, and landscape wherein animal and spiritual helpers manifest their presence in one’s life.

Our pattern-based view of science has been inspired and supported by many additional sources. For example, Douglas J. Cardinal (one of the world’s foremost architects who grew up in Alberta, Canada, and who draws insights from both his Blackfoot First Nation and European ancestry) indicates that a sensibility to the patterns of other creatures and the environments in which they lived was essential in the great challenge of survival for the Aboriginal hunters and gatherers on the Great Plains of North America (Cardinal, in Doyle 2001). Indeed, Cardinal

indicates that the Aboriginal “Spiritual Warrior” has to render his/her spirit pattern-less in order to be receptive to these patterns. Integrative Science refers to this receptivity as being “pattern-able”. Doyle’s (2001) overall report from the Millennium Conferences on Creativity in the Arts and Sciences emphasized the great need for new encouragement towards original thinking, innovation, and creativity in Canada while pointing to the importance of pattern recognition and pattern breaking. Rupert Ross (who spent many years interacting closely with First Nations people in northwestern Ontario, Canada, while working as a crown attorney) felt that “pattern-thought” was the way of thinking that hunter-gatherers in that remote area used in “doing their shopping in the natural world” (Ross 1992, p. 81). Gerald Gloade (a Mi’kmaw artist, storyteller, and scientist who once worked with the Department of Natural Resources in Nova Scotia, Canada, and who now works with the Mi’kmawey Debert Cultural Centre of the Confederacy of Mainland Mi’kmaq and interacts frequently with Integrative Science personnel) states that “pattern recognition” is a traditional Mi’kmaw way of knowing with respect to ecological knowledge (personal communication, 2008). Paula Underwood Spencer (a genealogist and writer with Oneida ancestry who lived in Virginia and California in the United States) wrote several works designed for educational use, basing them on Native-American oral traditions. She (1990) accords pattern a key role in her description of the Western and Indigenous sciences as Hawk and Eagle, respectively. Thater-Braan (2001) talks of a “pattern for understanding” in her article on Native American educational values, diversity and the need for cognitive pluralism. Further relevant to the consideration of a pattern-based view of science is the fact that mathematics, which is assigned a significant role in Western science (and a role that has roots dating to at least 500 BC (Wolfram 2002)), has long been referred to as the “language of science” and often today as a “science of patterns” (Devlin 1994). The Atlas of Science Literacy (Project 2061 2001, p. 27) states “mathematics is the study of any patterns or relationships, whereas natural science is concerned only with those patterns that are relevant to the observable world”. Finally, it is increasingly being realized that non-Eurocentric mathematical expressions of pattern abound in the world’s cultures (e.g. Zaslavsky 1973; Powell and Frankenstein 1997; Eglash 1999).

Pattern is the primary concern of science within the Western worldview of the nature of science referred to as conventionalism, according to Wisdom (1971, p. 273) who portrayed it as fairly simple: “Conventionalism does not deny reality but is, so to speak, agnostic about it; that is to say, all one can do is to make usable conventions about concepts. Its primary concern is pattern-making.” He argued that truth-value is indispensable to science and, regarding the conventionalist notion of truth, pointed to the early writings of Henri Poincaré in indicating that it is “a more sophisticated notion of truth than the prevailing one (which was of a realistic character or was a correspondence notion)” (p. 273). Wisdom (1971) further indicates that the conventionalist theory of truth is the representative of pragmatism in the philosophy of science. The interested reader is referred to further work on conventionalism by Wisdom (1975) plus the analysis of conventionalism by Ben-Menahem (2006) who, unfortunately, does not include the work of Wisdom nor mention “pattern-making” per se. Ben-Menahem (p. 1) maintains “that conventionalism does not purport to base truth on convention, but rather, seeks to forestall the conflation of truth and convention.”

Within Integrative Science, Elder Murdena encourages the understanding that for mainstream academic researchers “to prove [the truth] is desirable and skepticism is a virtue” whereas in the living knowledge that is Mi’kmaw Traditional Knowledge “to know is OK and trust is a gift.”

She also teaches that trust (which associates with truth) joins love, honesty, humility, respect, patience, and wisdom to become the Seven Sacred Mi'kmaw Gifts (Teachings) that one is offered over the course of his/her life journey. These seven are also found in the teachings held by many other Aboriginal peoples in Canada (courage sometimes replaces patience) and are to be understood within the larger understanding that Aboriginal epistemology is grounded in the self, the spirit, the unknown (Ermine 1999). Elder Murdena indicates that in the Mi'kmaw understanding, "unknown" means "spiritual interconnectiveness and interdependence." That Aboriginal Peoples have been present in Canada for millennia indicates such knowledge systems worked exceedingly well in the great challenge of survival wherein pattern sensibilities would have been vital. In addition, Mi'kmaw Elders who form the advisory group for the Mi'kmawey Debert Cultural Centre (under development by the Confederacy of Mainland Mi'kmaq, a First Nation Tribal Council in Nova Scotia) adamantly, passionately, and quite correctly indicate "we are still here; our communities are living places" in an assertion against the misconception in the dominant society that Mi'kmaq and other First Nation peoples are part of the distant past in Canadian history (The Confederacy of Mainland Mi'kmaq 2007). Indeed, this is one of the eight anchoring themes for the proposed Centre. Moreover, the Elders also say "we did more than just survive, my dear; we lived" (where survival might otherwise be interpreted to mean simply "a one dimensional existence of gathering food and making it through February [the winter]") (The Confederacy of Mainland Mi'kmaq 2007, p. 13). As the co-authors of this chapter, we maintain that in the above are found rich understandings for healthy communities today.

"Story" for pattern-based knowledges

With respect to the culturally inclusive view of science developed within Integrative Science, we emphasize that our pattern-based knowledges take the form of "stories". This is found as Part 1 within our simple, four part "integrative framework" (see IISH website); Part 1 points to the key role of the individual knower ("me", "you") in the generation of knowledge, i.e. the "agency" (the human consciousness) within knowledge. It further involves learning that this agency becomes contextualized within a larger community of knowers – the knowledge collective – eventually becoming the knowledge system, its stories. In this sense, agency is recognized as including that originating in subjects but also (and very importantly) that originating in relationships; such "relative being" is explored at length in Hoffmeyer (2008a). Parts 2, 3, and 4 in the integrative framework are, respectively, our common ground, our differences (and respect for them), and our co-learning journey. Parts 2 and 3 promote "Two-Eyed Seeing" but they can also help strengthen and feed Indigenous knowledge, this being what Ermine (EEAH Dialogue Circle 2007) indicates would most benefit Aboriginal peoples with respect to the relationship between Indigenous knowledge and the western scientific paradigm.

As indicated, we prefer "stories" because they embed acknowledgement of the agency within our knowledges. Integrative Science recognizes how Western sciences' stories evolve into a claimed context-free objectivity. Integrative Science also recognizes how Indigenous sciences retain the evidence of lived experience. For example, Watson and Huntington (2008, p. 274) show "how stories are embedded into the places and practices of hunting [as practiced by Koyukon Athabascans in northwestern Alaska] – and thus all part of the assemblage that informs IK [Indigenous Knowledge]." They emphasize how these assemblages become known within epistemic spaces and they discuss the differences this represents with respect to Western science, thereby also illustrating what is pointed to by Part 3 in our integrative framework, namely our

differences and respect for them. Our choice of “stories” was/is both inspired and supported by many other contexts and sources of understanding, a select few of which are shared below.

Indigenous scholar Jo-ann Archibald’s (2008) book “Indigenous Storywork; educating the heart, mind, body, and spirit” explains that she worked with Coast Salish and Stó:lō Elders in British Columbia to learn how Indigenous oral stories both nourish knowledge systems and are knowledge systems. She explores seven principles (respect, responsibility, reciprocity, reverence, holism, interrelatedness, and synergy) of “storywork” in her effort to find a respectful place for stories and storytelling in contemporary education. In Integrative Science, we recognized from the outset the need for an educational component for ourselves within our co-learning journey, and we have used Archibald’s (2001) work to inform our “big picture” with respect to Indigenous epistemology for Two-Eyed Seeing, as explained later.

Smylie (2004) indicates: “In Indigenous knowledge systems, generation of knowledge starts with ‘stories’ as the base units of knowledge, then proceeds to ‘knowledge’ as integration of the values and processes described in the stories, and finally culminates in ‘wisdom’, a distillation of experiential knowledge. This process can be viewed as cyclical, since keepers of ‘wisdom’ in turn generate new ‘stories’ as a way of disseminating what they know.”

“The truth about stories is that’s all we are”, says the Canadian writer Thomas King, whose father was Cherokee, and mother Greek and German. In his 2003 book “The Truth About Stories; a Native Narrative” he attributes the line “I will tell you something about stories” to Laguna storyteller Leslie Silko (1997) and then also “They aren’t just entertainment/Don’t be fooled/They are all we have, you see/All we have to fight off/Illness and death. You don’t have anything/If you don’t have the stories.”

Elder Albert encourages us to understand that when we work with Indigenous Sciences and Aboriginal Traditional Knowledges, it is essential to seek review by knowledgeable Elders and other Knowledge Holders (review, that is, of the stories being brought forward), as only they are able to speak to the validity and authenticity of such stories. This is akin to the peer-review process required of Western knowledges. It is what can address the concern that stories “might otherwise be simply made up and sold” which, Albert indicates, happens all too easily when the only roles afforded by the mainstream to Aboriginal Peoples and their knowledges are those of “Hollywood Indians” wherein someone else is providing your life script and/or relegating your understandings to entertainment status.

Chamberlin’s (2003) book “If this is your land, where are your stories?; finding common ground” encourages the broad understanding that it is not until we’ve come to understand each others’ stories that we can reimagine the “them” and “us” to find our common ground in a modern world beset with misunderstandings.

We acknowledge that Western science is not generally portrayed, especially in its educational and application arenas, as involving stories. Hoffmeyer (2008b, p. 2), for example, indicates: “In the post-postmodernist times of today the very term story may perhaps appear suspicious as it certainly was inside the natural sciences in Bateson’s own time – and still is of course.” Nevertheless, a peer-reviewed research paper with its subsections of introduction, materials and methods, results and discussion is but a highly standardized format for telling a particular type of story. And, from a different perspective, E. O. Wilson, the renowned biologist and Professor

Emeritus at Harvard University, has frequently spoken and written (e.g. Wilson 1998) of the scientist (involved in discovery research) as being more of a storyteller and a mythmaker than most scientists realize or at least care to admit.

Our key visual and more: explaining the vision and expanding the journey

From its origins in post-secondary education, Integrative Science expanded into the broad science arenas of research, applications, and outreach to Aboriginal youth and community (IISH website; Bartlett 2005). This broader (i.e. beyond the science educational arena) dimension for the Indigenous-West encounter has been the subject of considerable and increasing work since the 1999 World Conference on Science called for a new commitment by science to society for the 21st Century (UNESCO 1999, 2000; ICSU 2002). The challenge is huge in the societal nexus where academic expert knowledges come together with community knowledges, and where partners bring different life-world perceptions and perspectives. Moreover, there can be reluctance on the part of experts to become open to the new, to learn, and to transform. As Anuik (2008, p. 121) points out, in the natural and applied sciences “professional associations and their close counterparts ... steadfastly adhere to what they perceive as unbiased standards.” We believe Ermine’s (2007) suggestion of ethical space and thought frameworks for reconciliation are relevant in all science contexts and arenas. On the basis of our experience, we also point to the utility of approaches beyond thought frameworks, such as performative inquiry (Fels and McGivern 2002; Iwama et al. in press) and lyric inquiry (Neilsen 2008; Iwama et al. 2007).

Given the uniqueness of Integrative Science and its breadth of relevancy, we frequently are called to explain the Integrative Science vision to bring together scientific knowledges and ways of knowing from Indigenous and Western worldviews to many and diverse audiences. We have found that a second commissioned painting (Fig. 6) by Basma Kavanagh helps readily convey the understanding that “only when knowledge is conditioned by respect can it be truly shared” (in Mi’kmaq: “Ta’n tujiw kjijitaqn tela’tasik kepne’ktn ketloqo kisiktpi’tasitew”) (Mi’kmawey 1997). Ms. Kavanagh’s painting depicts a sacred fire beside which two people are kneeling, one directly across from the other. Kneeling places a person in a position that offers and invites trust because it is a position of extreme vulnerability. Trust, in turn, enables sharing and co-learning of deep level thoughts about actions, values, and knowledges. Through these mindful intentions, the two spheres of the respective worldviews of Indigenous and Western sciences are brought together to generate an expanding ground of common understanding and a deepening respect for differences. The whole of this effort may be seen as being held in the talons of Eagle, a spiritual messenger of great traditional significance for many Aboriginal peoples, and a guide for the journey of Integrative Science. We note that the “-ive” in “integrative” helpfully indicates the on-going (indeed, never-ending) nature of this co-learning journey and our mindful (indeed, spiritual) intent to talk and walk together in mutual respect to develop a living knowledge of collaboration for the 21st Century. In this sense one might think of two great rivers coming together – though they are a combined flow, their water molecules come from different watershed sources and although these same molecules freely and readily intermix, one molecule does not merge into another.

Given escalating needs and desires for multi-cultural collaborations in community settings, we wish to emphasize that Integrative Science has always considered mindful attention to the role of human consciousness as a fundamental part of our co-learning journey. This is a contributing

reason to why the word integrative was originally chosen and why “Sense of Place, Emergence, and Participation” was the title given many years ago to one of the entry level courses in the new Integrative Science post-secondary degree program. As Iwama et al. (in press) point out, citing “A Dictionary of Prefixes, Suffixes, and Combining Forms”, (2002): “the three letters, -ive, introduce the idea of action, of tending toward a state, especially in a regular or lasting way”. Further, with respect to consciousness and cognition, Maturana and Varela (1987) wrote “The tree of knowledge; the biological roots of human understanding”, a publication solicited by the Organization of American States as it sought ways to address the many difficulties confronted in social communication and knowledge transfer. These authors view human cognition as an on-going bringing forth of a world through the process of living itself (i.e. NOT cognition as a *representation* of the world “out there”), a view compatible with Aboriginal knowledge given the understanding that consciousness, spirituality, interconnectiveness, and interdependence are at the heart of Indigenous epistemology. This understanding is evidenced in the statement about Aboriginal epistemology by Ermine (1999, p. 108) that we pointed to earlier. Ermine (EEAH Dialogue Circle 2007, p. 4) further indicates that “ancestral knowledge contained the awareness that everything is energy, that everything is interconnected and that everything possesses consciousness.”

Our Integrative Science emphasis on mindful attention to consciousness is also one reason why “living knowledge” is one of the hoped for outcomes for students in the Integrative Science academic program (IISH website). Another reason is that “living knowledge” also embraces the understanding put forward by Elder Albert that knowledge from the Aboriginal perspective “is not a tool but rather it is spirit. It is a gift passed on through many people. It transforms the holder. It also reminds us that we Elders have responsibilities to the spirit of that knowledge. We must pass it on.” Blackstock (2007) presents an excellent visual that depicts this key understanding of passing on ancestral knowledge. Her article challenges us to examine Aboriginal and Western knowledges towards respectful co-existence; her context of concern is the disproportionate numbers of Aboriginal children who are either in government care or the care of non-aboriginal families.

Our tools: patterns ... seeing “big pictures” and using “organics”

In contemporary Canada, the words “healing” and “reconciliation” are words that frequently travel together in discussions configured by Aboriginal perspectives and contexts. Elder Murdena offers a key insight with respect to healing; Willie Ermine offers a key insight with respect to reconciliation. Integrative Science has adopted and adapted both. For Murdena’s insight, we realize that participants in the co-learning journey need to be able to place the actions, values, and knowledges of their own culture out in front of themselves like an object, to take ownership over them, and to be able to say “that’s me”. Furthermore, as guided by Two-Eyed Seeing, we need these “objects” for both the Indigenous and Western worldviews. In this way, participants can learn both “that’s me” and “that’s you” to foster working together. Thus, we have developed simple responses (in text and visual form) to four “big picture” philosophical questions. These depictions enable us to put these philosophical considerations for our knowledge systems out in front of ourselves like an object (tool). In the Spirit of the East, we believe such can help encourage “our place of beginnings” towards the thought frameworks that Ermine’s (2007) insight indicates are required to reconcile the solitudes of Indigenous and Western cultures. I.e., we suggest herein that the first phase of entering ethical space for the purpose of reconciling our scientific knowledges and ways of knowing – the ethical space

conceived within Ermine's insight – includes learning to appropriately, correctly, and respectfully acknowledge the “that's me” and the “that's you” of our worldviews, as they configure our sciences. Furthermore, in the overall Integrative Science journey we talk about “growing” rather than “going” forward and knowledge “gardening” more than knowledge translation or transfer. In the words of journey participant Marilyn Iwama: “We are learning to weave back and forth between our knowledges, our worldviews and our stories. We are learning to navigate that weaving by recognizing patterns that help us do that. Call those patterns knowledge orientations. Call them maps – maps for the garden. We have learned the importance of making our knowledges, our stories, visual.”

In regards this desire to “make our knowledges, our stories, visual”, we have developed four “big picture” understandings (which are patterns in their own right) that can be put, as “objects” of ourselves, in front of us, congruent with Murdena's explanation of the healing tense. These are explained below. In sharing them herein, we reiterate that our approach is intended to help orient within “our place of beginnings” and we also reiterate our concurrence with Watson and Huntington (2008, p. 276) that the “intellectual traditions we assemble, ‘Western’ and ‘Indigenous,’ are not entirely separable into our individual selves, who are instead a ‘multiplicity of multiplicities’ .”

1. Our World: This relates to *ontologies*, as we share a desire for our knowledges to have an overarching understanding of “how our world is”, albeit with differences as to what we deem these to be. The “big pattern” question here is: What do we believe the natural world to be?

- A possible response from within Indigenous science is: beings ... interconnective and animate ... spirit + energy + matter ... with constant change (flux) within balance and wholeness.
- A possible response from within Western science is: objects ... comprised of parts and wholes characterized by systems and emergences ... energy + matter ... with evolution.
- A visual that complements these words is provided in Fig. 7.

2. Our Key Concepts and Actions: This relates to *epistemologies*, as we share a desire for our knowledges to observe key values albeit with differences as to what we deem these to be. Our “big pattern” question here is: What do we value as “ways of coming to know” the natural world, i.e. what are our key concepts and actions?

- A possible response from within Indigenous science is: respect, relationship, reverence, reciprocity, ritual (ceremony), repetition, responsibility (*after* Archibald, J., 2001, Editorial: sharing Aboriginal knowledge and Aboriginal ways of knowing. Canadian Journal of Native Education, 25(1), 1-5).
- A possible response from within Western science is: hypothesis (making and testing), data collection, data analysis, model, and theory construction.
- A visual that complements these words is provided in Fig. 8.

3. Our Languages and Methodologies: We can focus on core concepts for the *languages and methodologies* that structure our knowledges, as we share a tendency to want such albeit with differences as to what we deem these to be. The “big pattern” question here is: What can remind us of the complexity within our ways of knowing?

- A possible response from within Indigenous science is: *weaving* of patterns within nature's patterns via creative relationships and reciprocities among *love, land, and life*

(*vigour*) that are constantly reinforced and nourished by *Aboriginal languages*.

- A possible response from within Western science is: *un-weaving* of nature's patterns (especially via *analytic logic and the use of instruments*) to cognitively reconstruct them, especially using *mathematical language (rigour)* and computer models.
- A visual that complements these words is provided in Fig. 9.

4. Our Overall Knowledge Objectives: We can focus on *objectives*, as we share a desire for our knowledges to have overall purpose albeit with differences as to what we deem these to be. The "big pattern" question here is: What overall goals do we have for our ways of knowing?

- A possible response from within the Indigenous sciences is: collective, living knowledge to enable nourishment of one's journey within expanding sense of "place, emergence and participation" for collective consciousness and interconnectiveness ... towards resonance of understanding within environment ... towards long-term sustainability for the people and natural environment (tested and found to work by the vigorous challenges of survival over millennia).
- A possible response from within the Western sciences is: dynamic, testable, published knowledge independent of personal experience that can enable prediction and control (and "progress") ... towards construction of understanding of environment ... towards eventual understanding of how the cosmos works (tested and found to work by the rigorous challenges of experimental design).
- A visual that complements these words is provided in Fig. 10.

We believe that our "big picture" or "big pattern" understandings for the dimensions of knowledge systems are representative of the kind of work that is essential in order to expand the discussion framework for healthy communities. They can help render the complexity and magnitude of issues into readily graspable (and remember-able) form and help ensure space for different worldviews. This facilitates partner empowerment, participation, and engagement, all of which is undoubtedly needed in cross- and transcultural research, as well as that which is integrative (e.g. Tress et al. 2006), interdisciplinary (e.g. Schmidt 2008), or transdisciplinary (e.g. Hadorn et al. 2008). We further suggest this is particularly true when, as in Integrative Science, a co-learning journey is used, an approach we believe is congruent with "common group learning" which Pohl et al. (2008) identified as one of the three basic ways (the other two being deliberation among experts, and via a subgroup or individual) that transdisciplinary research teams organize collaboration in order to reach integration. Pohl and Hadorn (2008) and Wiesmann et al. (2008), respectfully, emphasize common understandings of core terms and insightful propositions to enhance transdisciplinarity, with the latter authors (p. 433) indicating that the "debate is still fairly young and the processes still being developed." Yet this field is much advanced in comparison to that for the reconciliation of the Indigenous-West encounter (to use the words of Ermine (2007)).

Finally, our experience also suggests the utility, for work that is integrative, transcultural and seeks to encourage human reconnections with the earth, of organic (nature-based) and visual models rather than (or in addition to) the highly compartmentalized flowcharts so commonly used in collaborative initiatives. We similarly encourage organic metaphors and language (when English is being used) rather than mechanistic. Such "organics" can help remind us of our biological kinships with other species and the Earth, as do Aboriginal languages and the animal

characters in many Aboriginal stories. This can further help us begin to reverse the intellectual techniques, theories, and stories that Western people have used to distance, even remove, themselves from nature (for example discussion of this distancing and removal see Louv 2005; Johnson and Murton 2007; Watson and Huntington 2008). In addition, “organics” are naturally holistic and thus encourage innovative thinking and enriched understandings from the outset. Examples within Integrative Science include those for the guiding principles of Trees Holding Hands and Two-Eyed Seeing. We have herein also mentioned knowledge gardening, learning about success from the ash tree, and learning about knowledges coming together from a river. An excellent organic example outside of Integrative Science (and one that we promote extensively) is the tree model developed for First Nations’ Life Long Learning by the “Aboriginal Learning Knowledge Centre” within the Canadian Council on Learning – the model and explanation are available on-line (see CCL website); the model is also partially included in Fig. 10 herein.

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Figures (also available as high resolution jpg's)

Fig. 1. Spirit of the East, painting by Basma Kavanagh

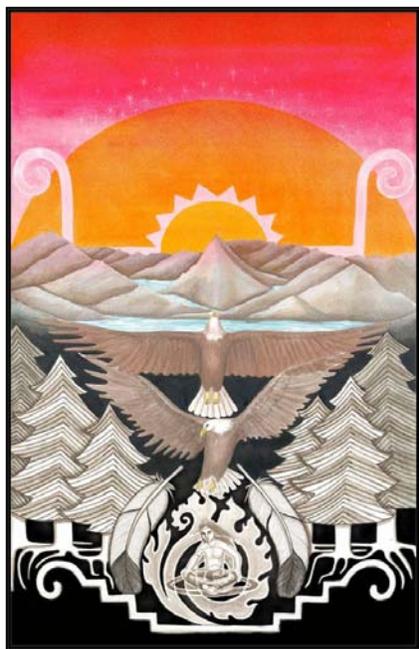


Fig. 2. Trees Holdings Hands, computer graphic by Integrative Science

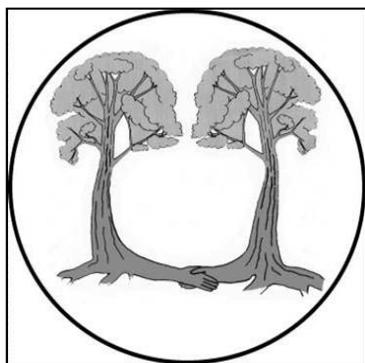


Fig. 3. Trees Holding Hands, photo by Integrative Science



Fig. 4. Two-Eyed Seeing “old”, computer graphic by Kristy Read



Fig. 5. Two-Eyed Seeing “new”, with jigsaw puzzle pieces, computer graphic by Kristy Read

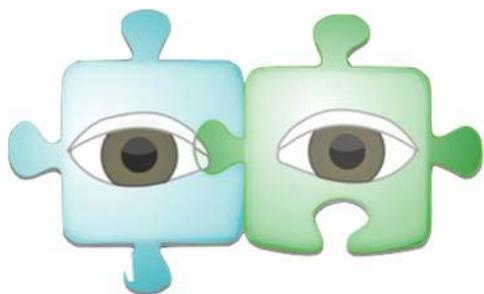


Fig. 6. Integrative Science vision, painting by Basma Kavanagh



Fig. 7. Two-Eyed Seeing – Big Pic #1, Ontologies, computer graphic by Integrative Science

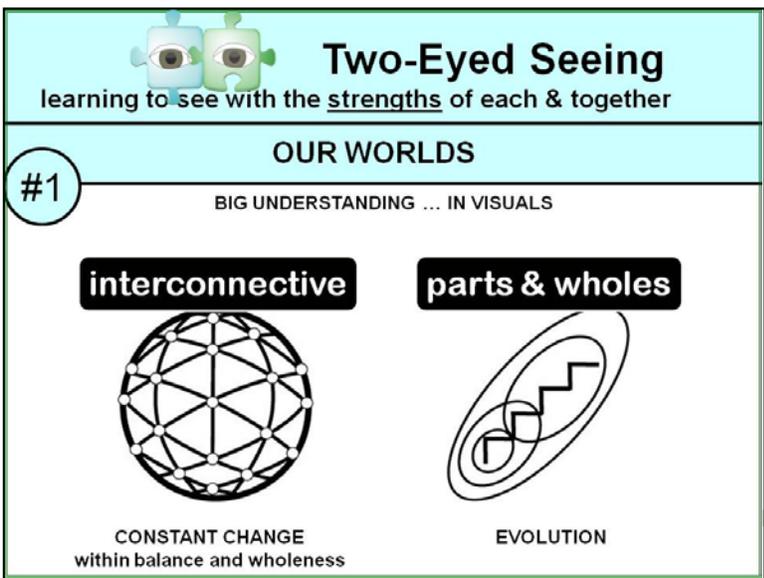


Fig. 8. Two Eyed Seeing – Big Pic #2, Epistemologies, computer graphic by Integrative Science

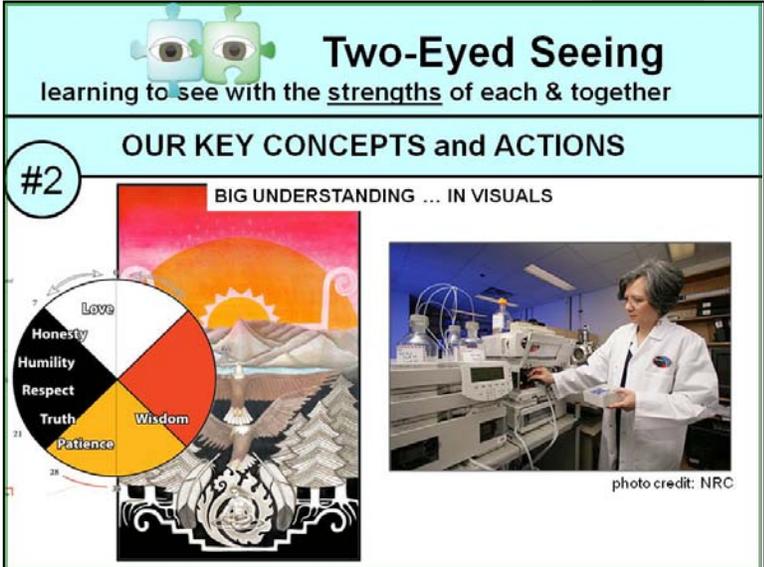


Fig. 9. Two-Eyed Seeing – Big Pic #3, Methodologies, computer graphic by Integrative Science

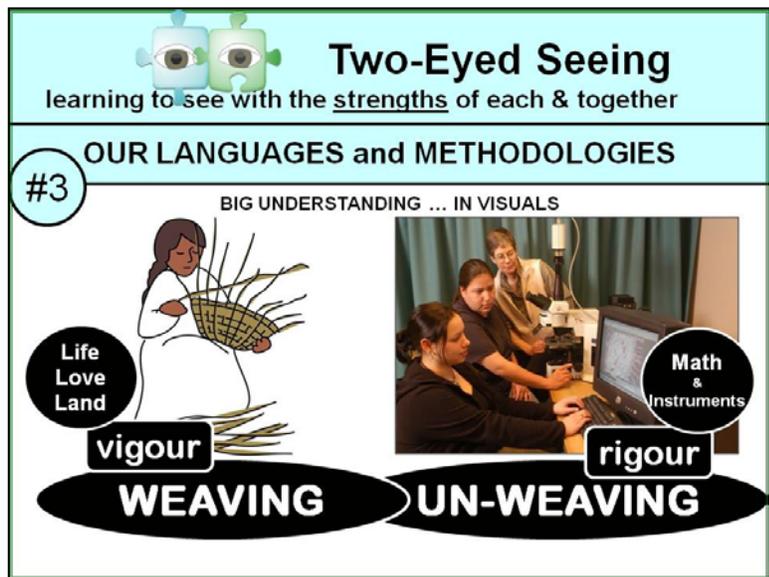


Fig. 10. Two-Eyed Seeing – Big Pic #4, Knowledge Objectives, computer graphic by Integrative Science, including part of the “First Nations Holistic Lifelong Learning Model” from the Canadian Council on Learning, Aboriginal Learning Knowledge Centre (<http://www.ccl-cca/CCL>).

