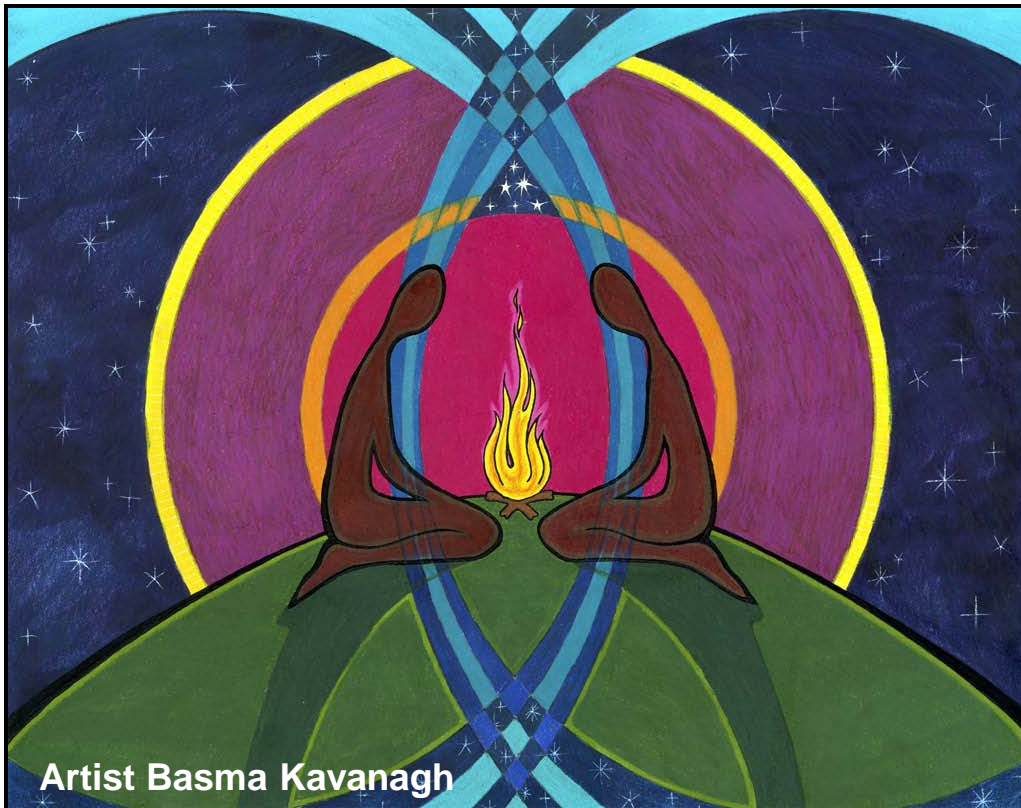


Integrative Science: transdisciplinarity in action



CAPE BRETON
UNIVERSITY

Institute for Integrative
Science & Health

**Cheryl
Bartlett, PhD**
and
**Marilyn
Iwama, PhD**

Graduate Student Seminar, Environmental Studies Program,
Dalhousie University; Halifax, NS; 4 April 2006

Toqwa'tu'kl Kjjitaqnn Integrative Science

Science: stories of our interactions with and within Nature

Indigenous

our knowledges
our world views

Western

“bringing

our stories

together”

Transdisciplinarity

- multi-referential
- multi-dimensional
- trans-historical (*can include*)

(1st World Congress of Transdisciplinarity 1994)

It is not enough to just value the links between the experiences, disciplines, creativity, and ideas ...

... one has to develop methods, strategies, and practices that will transform those links to the real connections.

[paraphrase of Ron Burnett at http://www.chocuk.net/troupe/isin_onol1.html]

Nunavut Food Guide

Enjoy a variety of foods from each food group everyday. Enjoy traditional foods.



For a healthy body, it is important to drink water everyday.

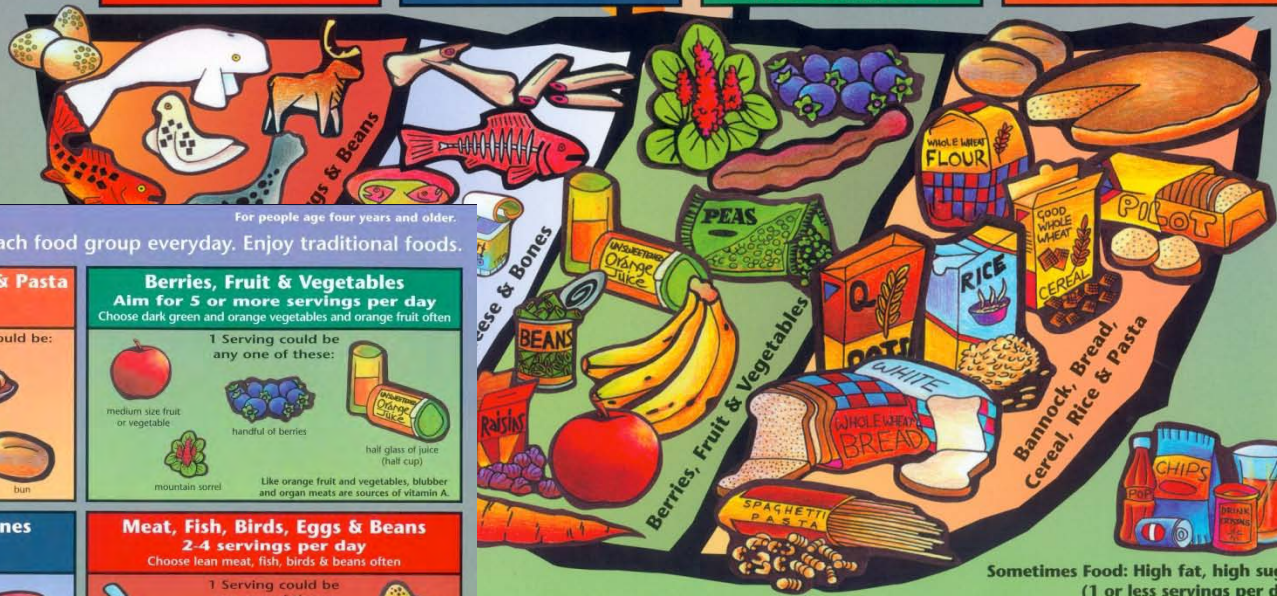


For Strong Muscles

For Strong Bones & Teeth

For Good Eyes, Skin & Less Infection

For Energy



For people age four years and older.

Enjoy a variety of foods from each food group everyday. Enjoy traditional foods.

What is a Serving?

- This side of the guide shows examples of what a serving size is for different foods.
- Knowing what a serving is can help you make sure you are getting enough servings per day from each food group.

How do I know how many servings I need?

- The amount of food you need everyday from the four food groups depends on your age, body size, activity level, whether you are male or female or if you are pregnant or breastfeeding.
- That is why this guide gives you a lower and a higher number of servings for most food groups.
- For example, young children can choose the lower number of servings, while male teenagers can choose the higher number. Most other people can choose somewhere in between.

Bannock, Bread, Cereal, Rice & Pasta 5-10 servings per day Choose whole grain products often

1 Serving could be any one of these:

- 2" x 2" piece of bannock
- bowl of cereal
- slice of bread

2 Servings could be:

- plate of pasta (1 cup)
- bun

Berries, Fruit & Vegetables Aim for 5 or more servings per day Choose dark green and orange vegetables and orange fruit often

1 Serving could be any one of these:

- medium size fruit or vegetable
- handful of berries
- mountain sorrel
- half glass of juice (half cup)

Like orange fruit and vegetables, blubber and organ meats are sources of vitamin A

Milk, Yogurt, Cheese & Bones 2-4 servings per day Choose low fat milk products often

1 Serving could be any one of these:

- glass of milk (1 cup)
- small container of yogurt (175g)
- fish head soup
- 3" x 1" x 1" piece of cheese

Meat, Fish, Birds, Eggs & Beans 2-4 servings per day Choose lean meat, fish, birds & beans often

1 Serving could be any one of these:

- large spoonful of peanut butter (2 Tbsp)
- piece of liver or kidney
- 3" x 1" piece of meat, fish or muktuk
- 2 eggs
- small bowl of beans (1 cup)

For good health, choose low-fat foods and cooking methods.

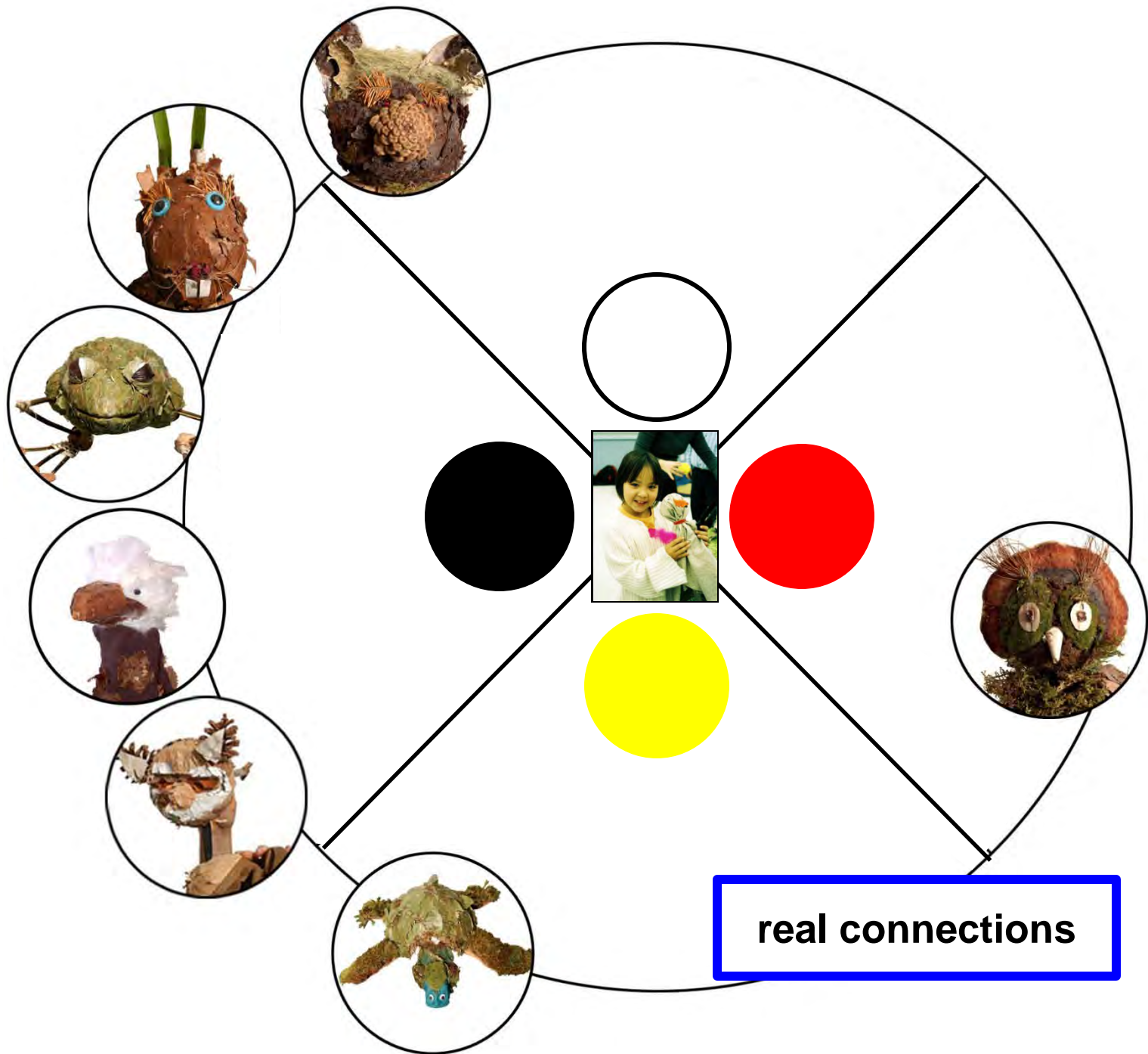


For good health, enjoy activity as part of your everyday life.

Sometimes Food: High fat, high sugar.
(1 or less servings per day)

real connections

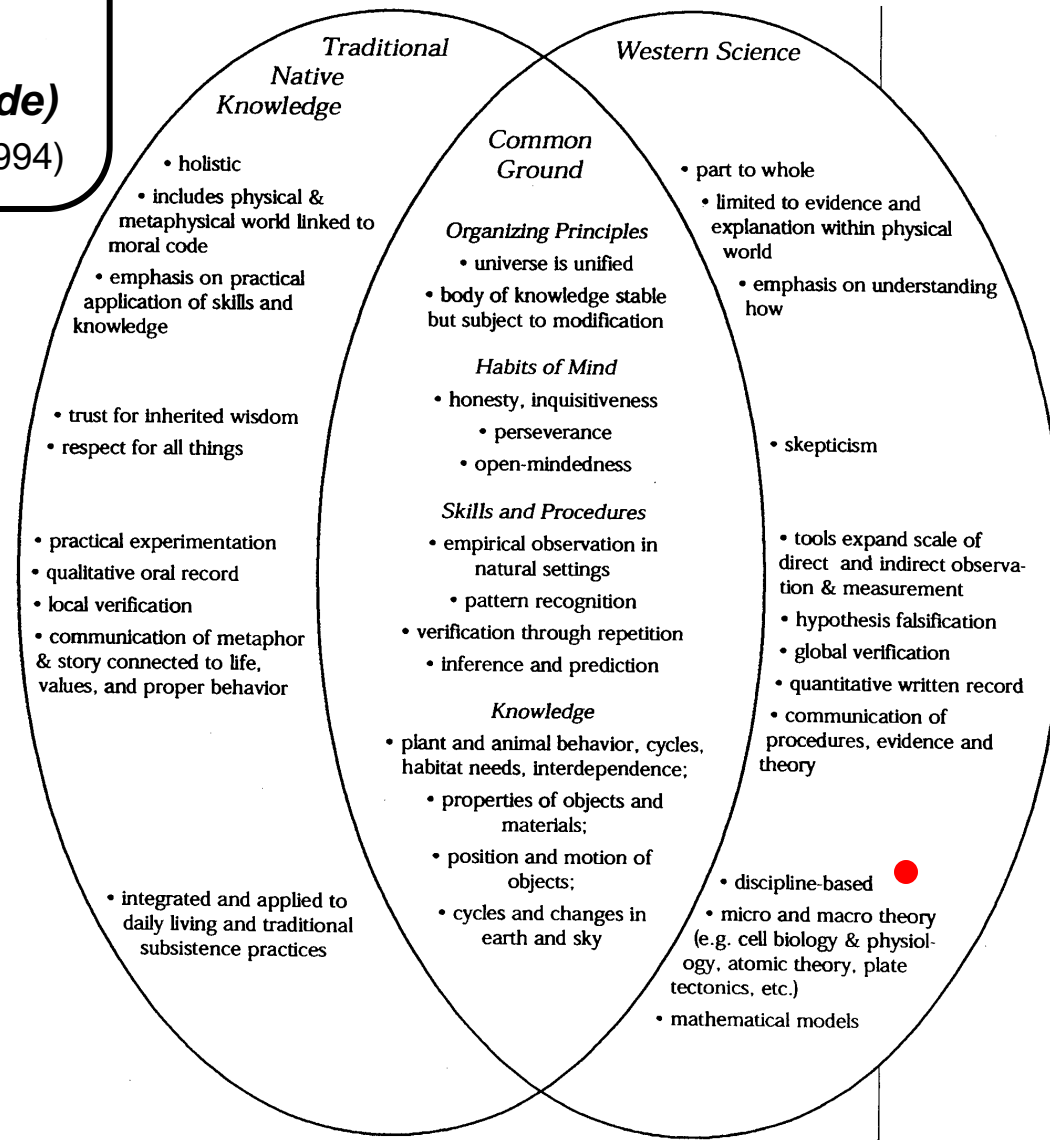




real connections

- multi-referential
- multi-dimensional
- trans-historical (*can include*)
(1st World Congress of Transdisciplinarity 1994)

SEEING COMMON GROUND Indigenous Knowledge & Western Science



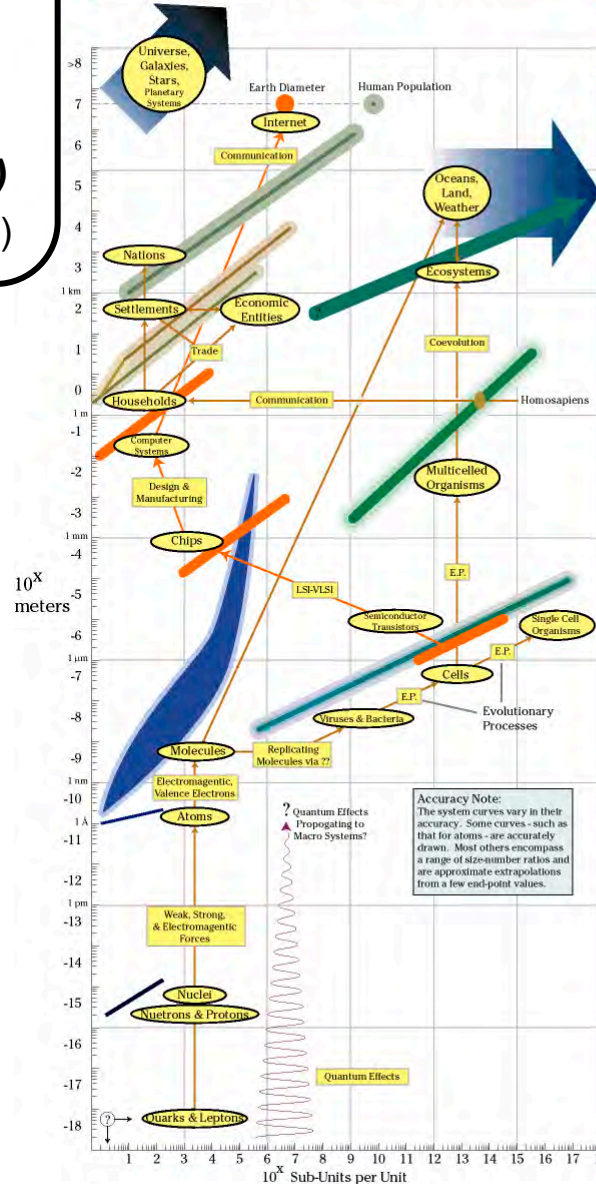
CONCEPT MAP

from: Handbook for Culturally Responsive Science Curriculum;
S. Stephens, 2000

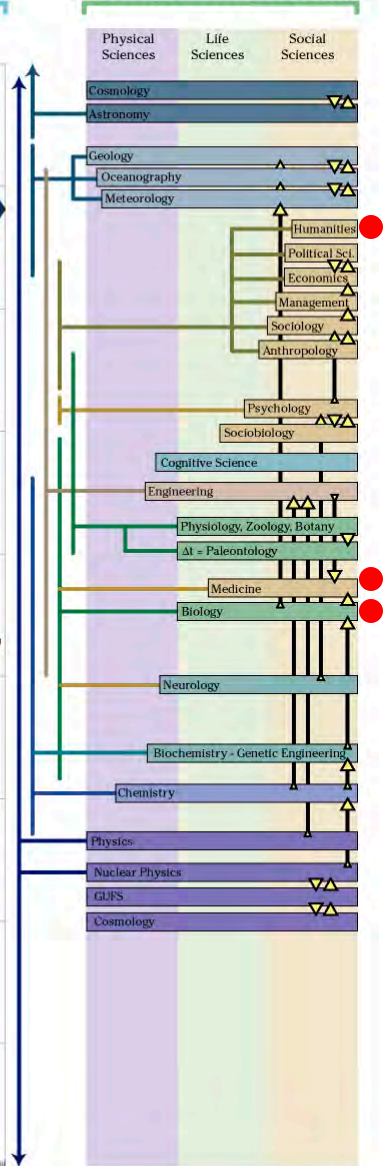
- multi-referential
- multi-dimensional
- trans-historical (*can include*)
(1st World Congress of Transdisciplinarity 1994)



Some Physical Systems



Some Systems of Human Knowledge



Co-Learning

Go into a forest, you see the birch, maple, pine.

Look underground and all those trees are holding hands. We as people must do the same.

(late Mi'kmaq Chief, Spiritual Elder, and Healer Charlie Labrador)



Co-Learning

Go into a forest, you see the birch, maple, pine.

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real connections

collaborative initiatives

CAPE BRETON
UNIVERSITY

#2



health research



#1

post-secondary
science
education

archaeological
interpretation

#4



Bras du Lac
CEPI

#3

environmental
planning



Mi'kmawey Debert

11 LESSONS LEARNED:

We need to learn to ...

- acknowledge we need each other
- acknowledge we are on a learning journey
- learn to “co-learn”:
 - simple **integrative framework**
- help institutions to help us “legitimize” TK in the minds of youth (and many others)
- work with “living agendas”
- use other “organic language”
- do ... in a creative “grow forward” manner

11 LESSONS LEARNED: (cont'd)

We need to learn to ...

- think “knowledge gardening” more than knowledge translation or knowledge transfer
- weave back and forth between our knowledges, our world views, our stories
- navigate our weaving via awareness of “big patterns” (knowledge orientations or maps)
- make our knowledges, i.e. our stories, visual



Indigenous



Western



Mr. Albert Marshall, Mi'kmaq Elder
Eskasoni First Nation

integrative framework



both Indigenous and Western, plus:

- role of me and you in “the knowing”
 - e.g. patterns: recognition & transformation
- our common ground
- our differences (and respect them)
- our journey ... forward & together

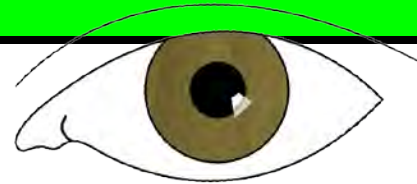
AVOID ... simply Western plus
bits and pieces of Indigenous

BIG pattern understanding

“two-eyed seeing”
our key concepts & actions

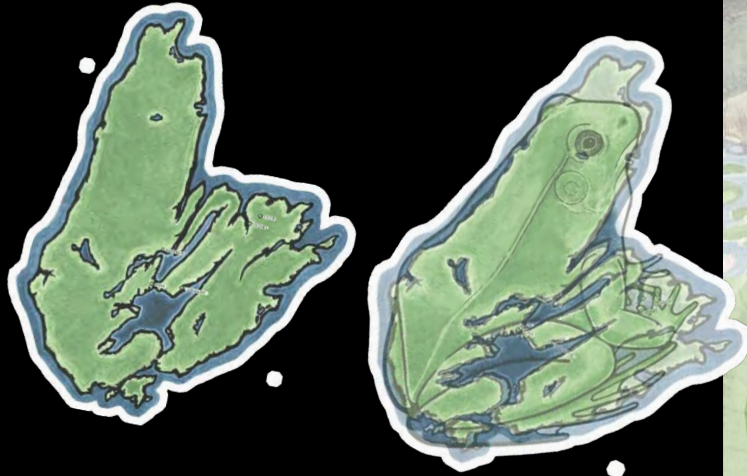


- respect
- relationship
- reverence
- reciprocity
- ritual
- repetition
- responsibility



- hypothesis
(making & testing)
- data collection
- data analysis
- model & theory
construction

... consider:



Spirit of the East

**gift of
newness**
(of transformation)

As a scientist, I want my imagination rekindled. I want to be shown how to look at things in new ways; I believe my capacity for innovation and creativity in my own discipline will grow as a result.

(Arthur J. Carty, then President NRC, now National Science Advisor to PM)

(2000 Conference on Creativity in the Arts and Sciences)

... consider:

conceptual space shifting



KNOW

VALUE

DO

human

mindful consciousness

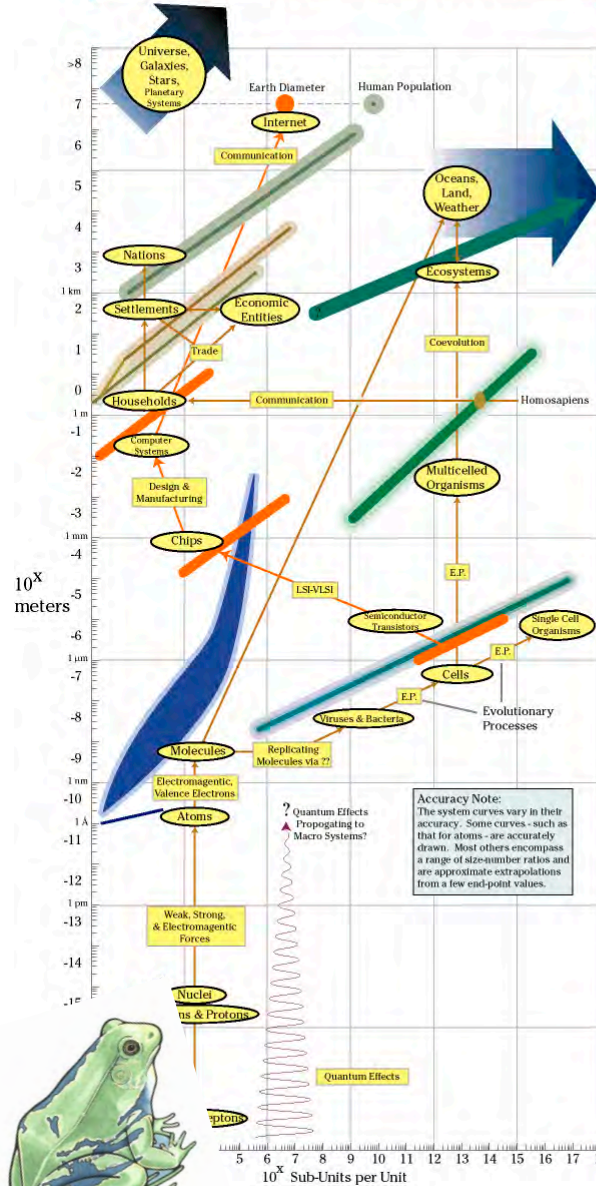
... consider:



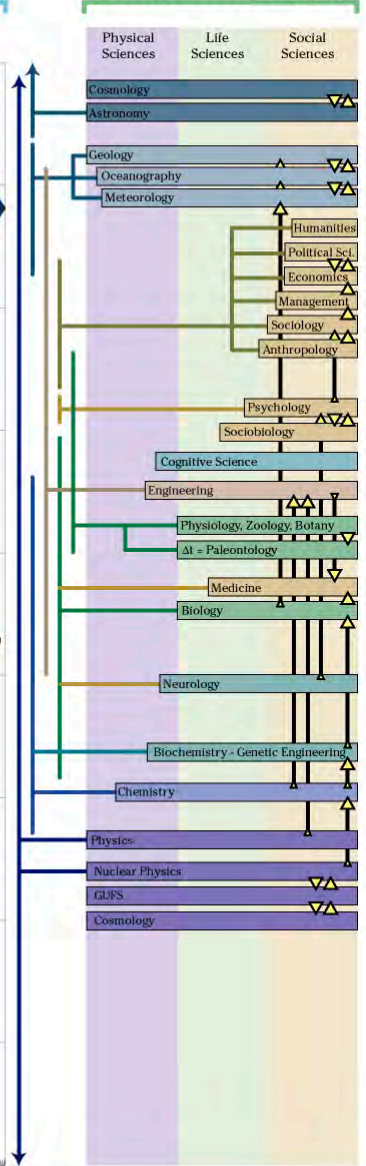
image from
Aboriginal Policy Research Conference
Ottawa, March 2006



Some Physical Systems



Some Systems of Human Knowledge



... consider:

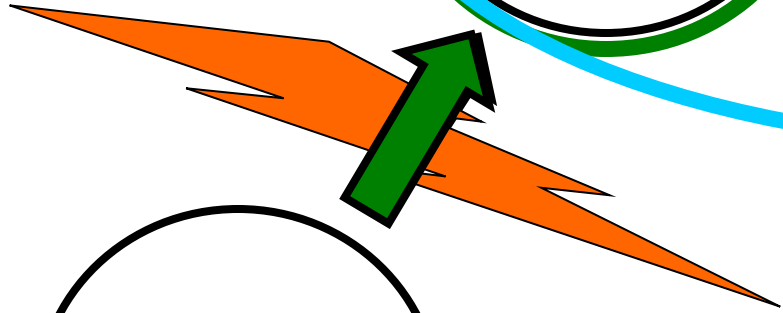
Land of Eagle



ONE WHO SEES BIG PATTERNS

domain of the
unknown

FEAR



domain of the
known

human consciousness
“must become
PATTERN-able”
(Douglas J. Cardinal)
world renown architect

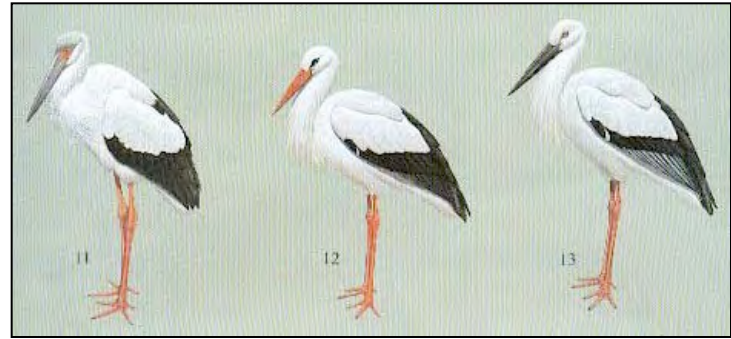
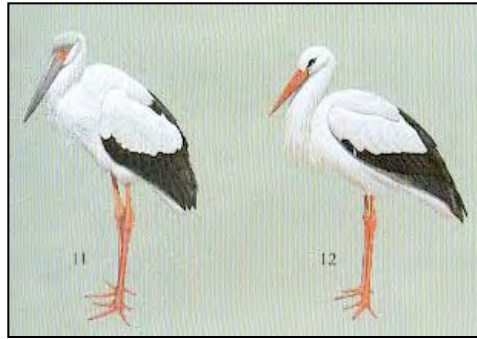


must learn:
“conceptual

space shifting”

(2000 Conference on Creativity in the Arts and Sciences)

PATTERN RECOGNITION & TRANSFORMATION



human
consciousness



“pattern smarts”

multiple intelligences theory

(H. Gardner, Harvard Univ.)

sanctioned
world view or methodology

KNOW

VALUE

DO



- ◇ numbers (logical-mathematical)
- ◇ language (linguistic)
- ◇ music (musical)
- ◇ body (body-kinesthetic)
- ◇ spatial (spatial)
- ◇ other people (interpersonal)
- ◇ self (intrapersonal)
- ◇ naturalist (naturalist)
- ◇ spiritual / existential *



PATTERN RECOGNITION & TRANSFORMATION

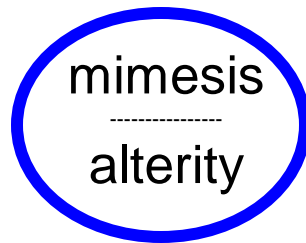
conceptual space shifting

three piece iterative approach
for Integrative Science-implicated research

natural

ideal

abstract



poiesis



kinesis



Co-learning our way to expanding wholeness through restoration of relationships with the land



1. Key phrases & words

2. Biodiversity literacy



4. Mi'kmaq biocultural expression

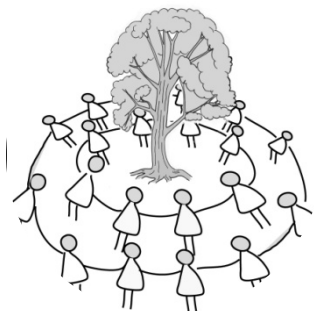
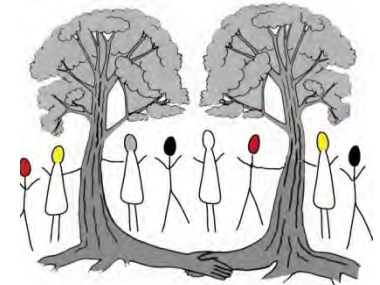


5. Spiritual connectedness with the land

3. Ecosystem health literacy

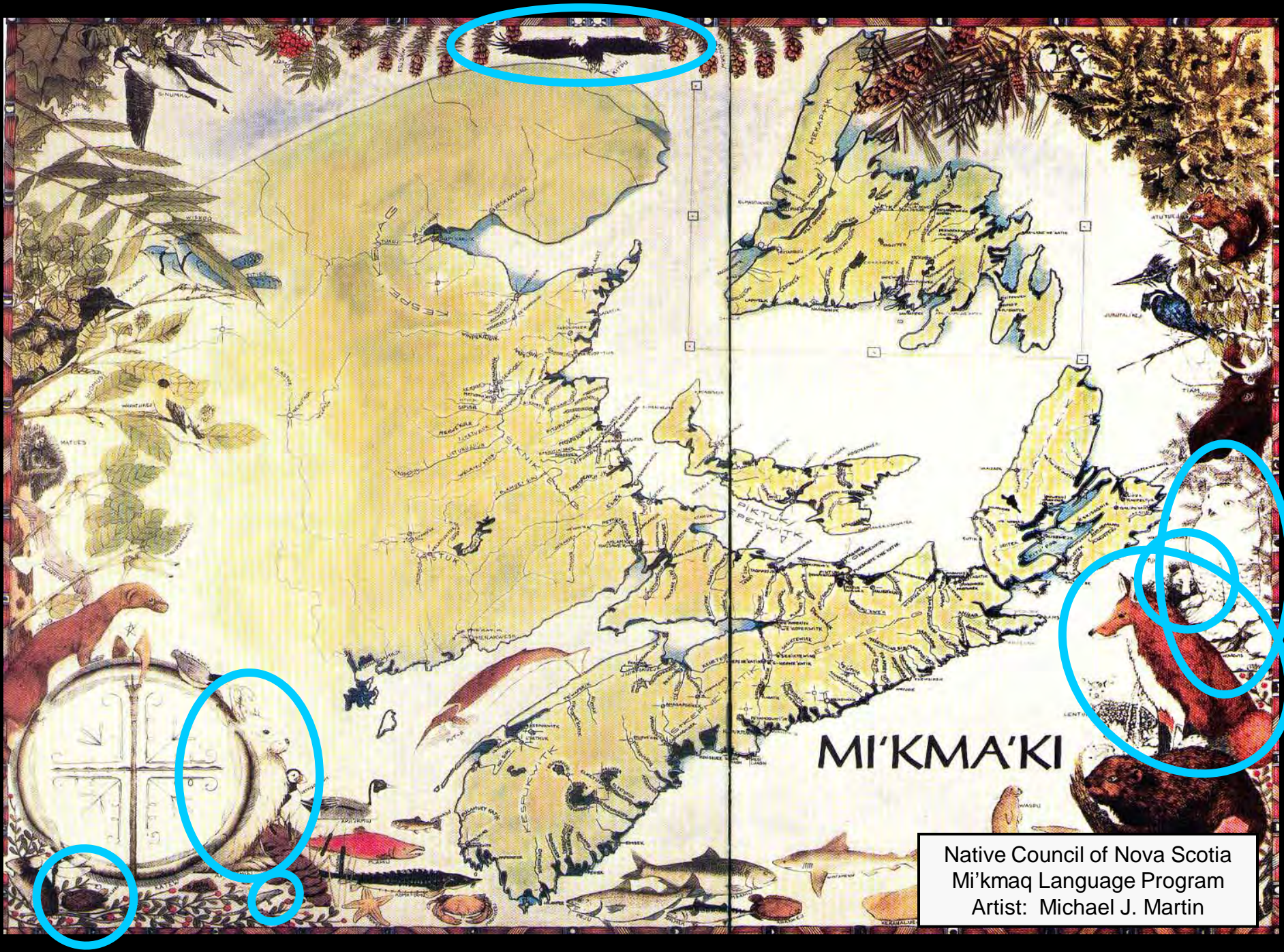


6. Integration of co-learnings into health care delivery systems

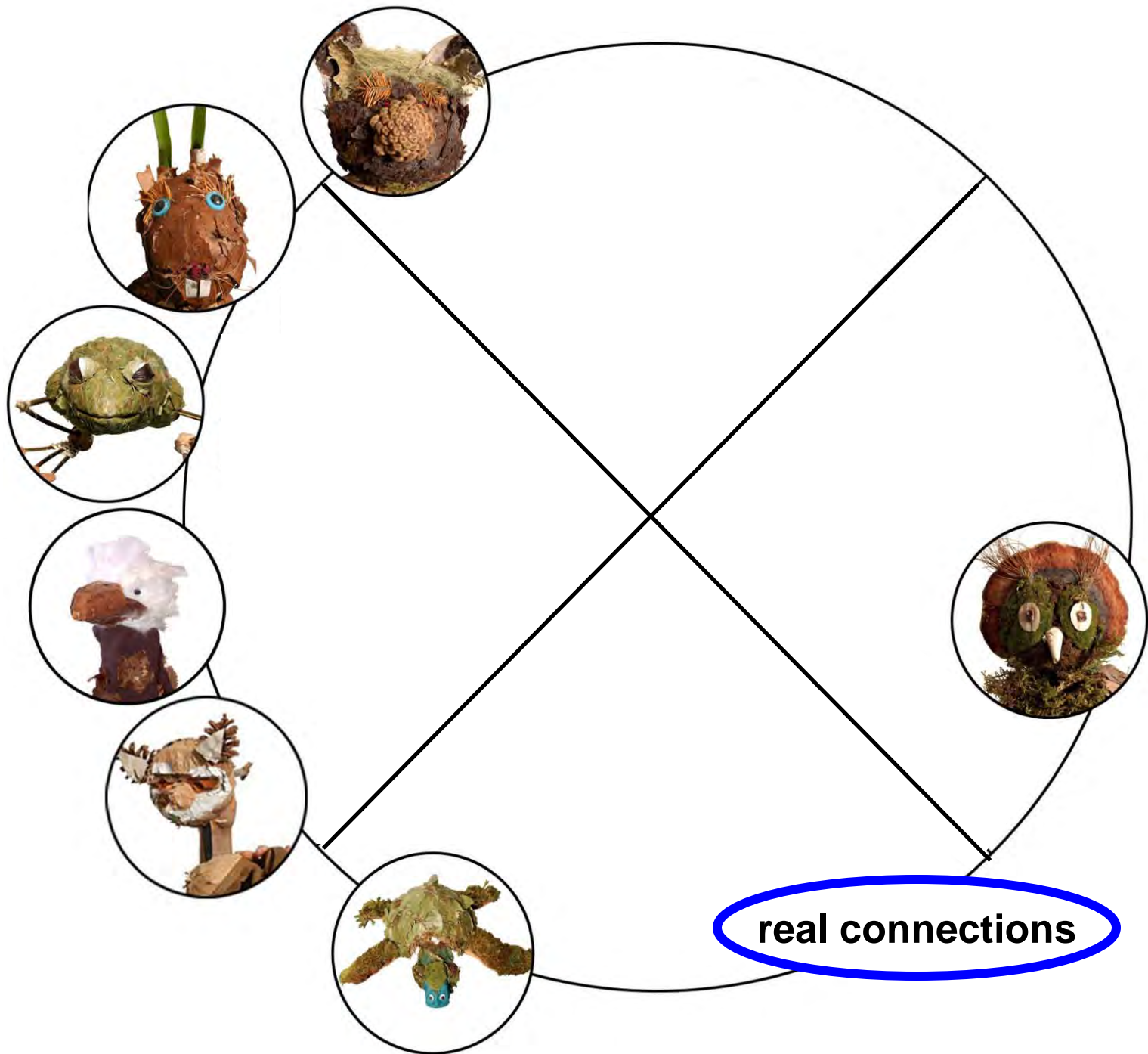


7. Extension of co-learnings into sustainable ventures

Themes



Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin




puppets made from the Earth


TOQWA'TU'KL KJIJITAQNN
Integrative Science

Nipuktuk Wejiaql A'tukuaqnn
FROM THE FOREST COMES OUR STORY


Apl'kmuj
Lepus americanus
SNOWSHOE HARE




Kaqajulman
Clintonia borealis
BLUE BEAD LILY




Pukusp
DECAYING WOOD




Kawatk
Picea sp.
SPRUCE CONES




Stoqn
Abies balsamea
DWARF FIR




Wso'qmanaqsil
Cornus canadensis
BOWENBERRY



Qqnn
TWIGS




Kuow
Pinus strobus
PINE NEEDLES



A small multicultural group of young people worked at the University College of Cape Breton during the summer of 2004 to make puppets for the characters in two Mi'kmaq legends: *Haw Rabbit Coo Ho Long Ears* and *Haw Bollyng Waa Conqueror*. All puppets were made from natural materials easily collected in the forests of Nova Scotia - Cape Breton. The puppets are part of a larger research effort to help people have a better understanding of their own and others' knowledge of our forests and ecosystems while creating awareness, especially as these relationships help foster our human sense of who we are and what we are. This Canadian document is funded through the Canadian Government's Forest Research - Science of Stewardship Program.

For all things integrative science: Members@uccb.ca 902-779-2200
For additional information contact: Integrative Science Program, University College of Cape Breton, 270 Blue 17000, Sydney, Nova Scotia, B1P 6L2. 1-877-647-4444



TOQWA'TU'KL KJIJITAQNN
Integrative Science

Nipuktuk Wejiaql A'tukuaqnn
FROM THE FOREST COMES OUR STORY

T'i'tikli
Bubo virginianus
GREAT HORNED OWL



Jikoqs
Fomes fomentarius
BRACKET FUNGUS



Kuow
Pinus strobus
PINE NEEDLES



Maskwi
Betula papyrifera
BIRCH BARK



Wisqasaw
Pinus strobus
PINE CONE



Pukusip
Dicranum sp.
MOSS



Qqnn
TWIGS



Ulnetkul
WATER

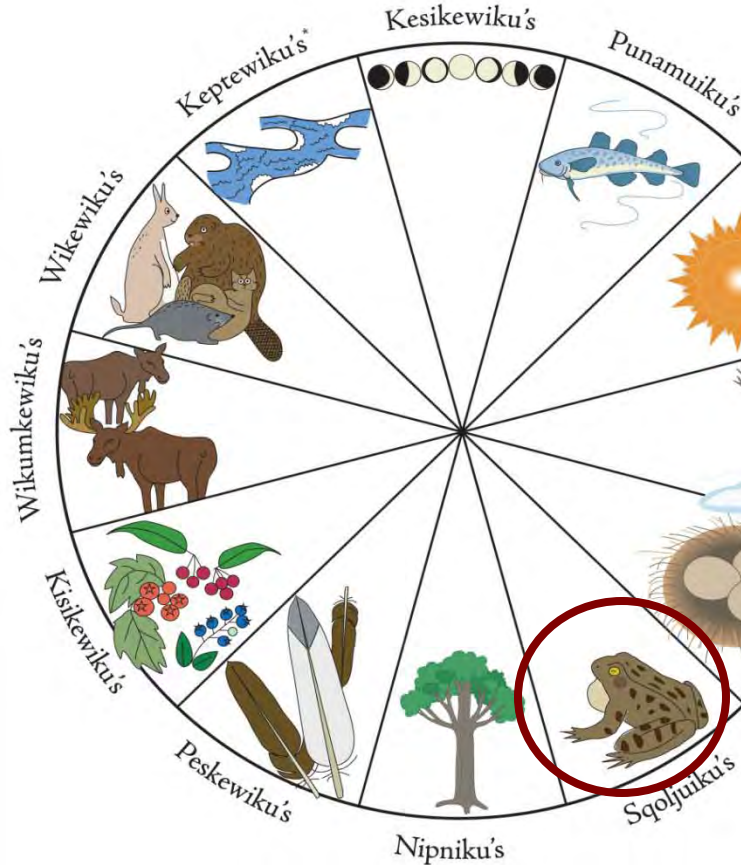


Jikoqs - BRACKET FUNGUS: This hard, woody, slow growing bracket fungus once had a very special role to play in the life of the Mi'kmaq Nation. Jikoqs, Keeper of the Sacred Flame, was used to ensure that embers of the fire remained alive when the people moved to a new camp. The fungus was set on fire and then placed in a clamshell for protection. Jikoqs would burn slowly and thus *keep the fire alive*. At the new campsite, Jikoqs would be used to start a new campfire - this was in the time before we had modern matches. Similarly, to ensure that the fire could be restarted every morning at the same campsite, Jikoqs and a clamshell were used to safeguard an ember each night. The species of fungus used was possibly *Fomes fomentarius*, which is known in English as *tinder* many tiny holes (tinder polypore).

A small multicultural group of young people worked at the University College of Cape Breton during the summer of 2004 to make puppets for the characters in two Mi'kmaq legends: *Haw Rabbit Coo Ho Long Ears* and *Haw Bollyng Waa Conqueror*. All puppets were made from natural materials easily collected



Mi'kmawe'k Tepknusetk



*Alternative – Kepti'kewiku's



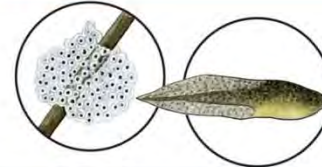
Earth speaks: health indicators

ECOSYSTEM HEALTH CONSCIOUSNESS Difference, Pattern, Variation

TOQWA'TU'KL KJIJITAQNN • INTEGRATIVE SCIENCE

Frogs of Unama'ki

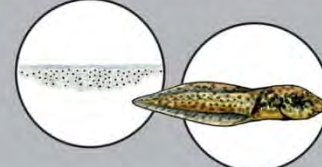
Mink Frog



Mink Frog • *Rana septentrionalis*
 Mink Frog is green with many dark markings and is 4 – 7 cm long. He gets his common name from his musky odour; he smells like a mink. Mink Frog's song sounds like pieces of wood being rapped together... TAP TAP! While other frogs live on both land and water, Mink Frog spends most of his life in the water. He prefers permanent bodies of water like ponds and lakes. Female Mink Frog lays 2000 to 4000 eggs in a round jelly mass. This jelly mass is attached to an underwater plant stem or submerged twig. Mink Frog eats dragonflies, damselflies, water beetles, aphids, minnows, leeches, snails, millipedes, and spiders.

MINK FROG

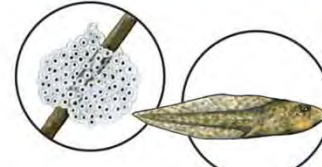
Green Frog



Green Frog • *Rana clamitans*
 Green Frog is green with gray or brown markings on her back and legs, and has a pale belly marked with dark streaks. Male Green Frog has a bright yellow throat and is 6 – 10 cm long. Green Frog's song sounds like a loose banjo string being plucked, or like a small pebble dropped into water... LINGKI! Green Frog prefers to be close to water, and tends to live at the edge of rivers, ponds, lakes or streams. Female Green Frog lays 1000 to 4000 eggs in a loose jelly mass that floats on the surface of the water like a raft. Green Frog eats beetles, flies, caterpillars, grasshoppers, spiders, snails, algae, waterbugs, butterflies and moths, and sometimes other small frogs.

GREEN FROG

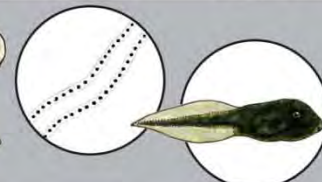
Pickerel Frog



Pickerel Frog • *Rana palustris*
 Pickerel Frog is light brown with many dark blotches on his back and legs. He is 4 – 7 cm long. Pickerel Frog's song sounds like somebody snoring, or like the sound of someone slowly pushing open a creaky door... ARREP ARREP! Pickerel Frog lives on the shores of ponds or lakes, or on the banks of streams, often staying near permanent bodies of water at breeding time. However, he will also live in moist fields, bogs, or damp woods. Female Pickerel Frog lays her eggs in a round jelly mass attached to a plant or stick below the surface of the water. She can lay as many as 800 to 1800 eggs at a time. Pickerel Frog eats beetles, ants, spiders, caterpillars, sow bugs, mites, snails, true bugs, and many small water creatures.

PICKEREL FROG

Eastern American Toad



Eastern American Toad • *Bufo americanus*
 Toad is a plump creature with stubby toes and rough warty skin. He is usually brownish, with darker brown or black markings. Toad has a pale belly with dark spots that become more distinct at night. Toad can grow to be 5 – 11 cm long. Toad lives in many different places, for example, in the woods, near a swamp or lake, in a field, or even in your backyard! His song sounds like a long, high trilling sound... THRRR! Female Toad prefers temporary ponds for breeding. She lays 8000 to 80000 eggs in a mass in two long strings near the bottom of the pond or puddle. Toad eats many kinds of insects like caterpillars, earwigs, sow bugs, as well as slugs, earthworms, and millipedes.

AMERICAN TOAD

Northern Spring Peeper

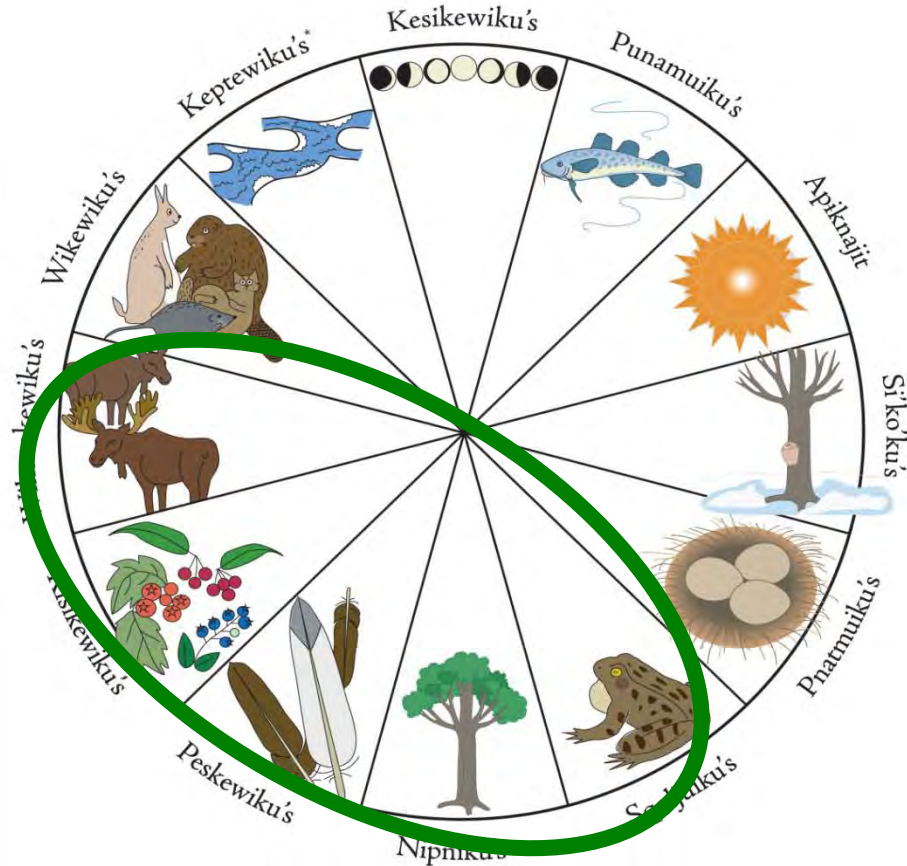


Northern Spring Peeper • *Pseudacris crucifer*
 Spring Peeper is our smallest frog; he grows to 2 – 4 cm long. We know that spring has arrived when we hear Spring Peeper singing at night. His song sounds like a high "PEEP!" Spring Peeper lives in the woods near ponds, marshes or swamps. He is our only tree frog and can change the colour of his skin to blend in with his

SPRING

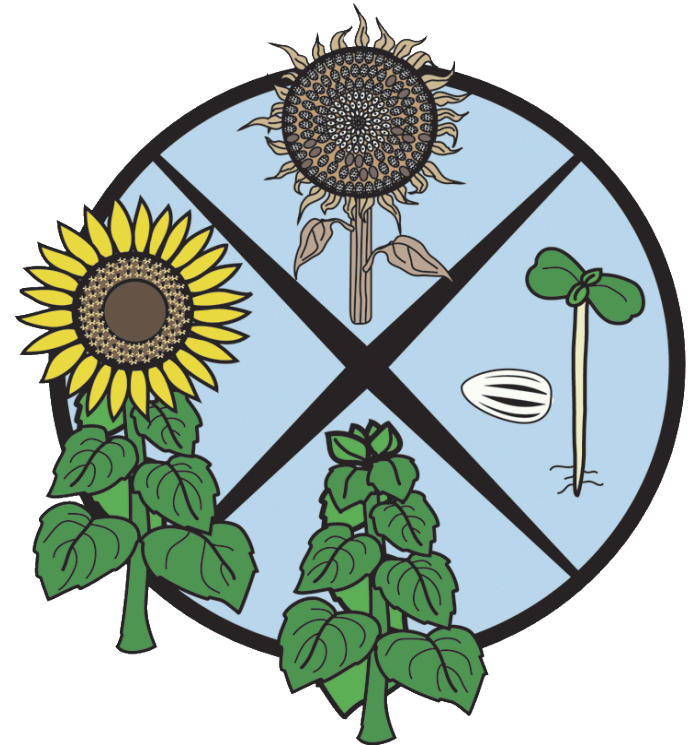


Mi'kmawe'k Tepknusetk

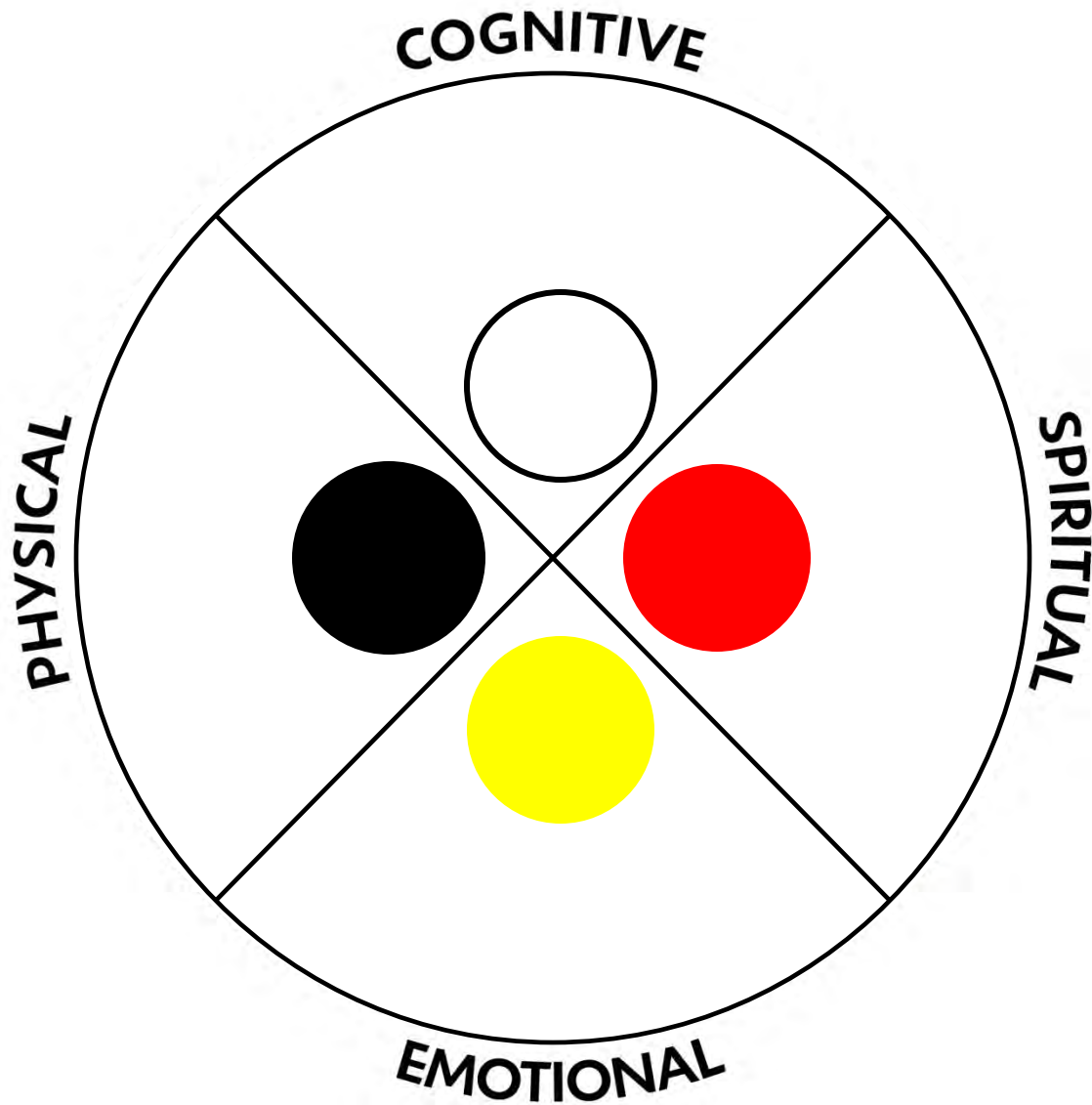


*Alternative - Keptewiku's

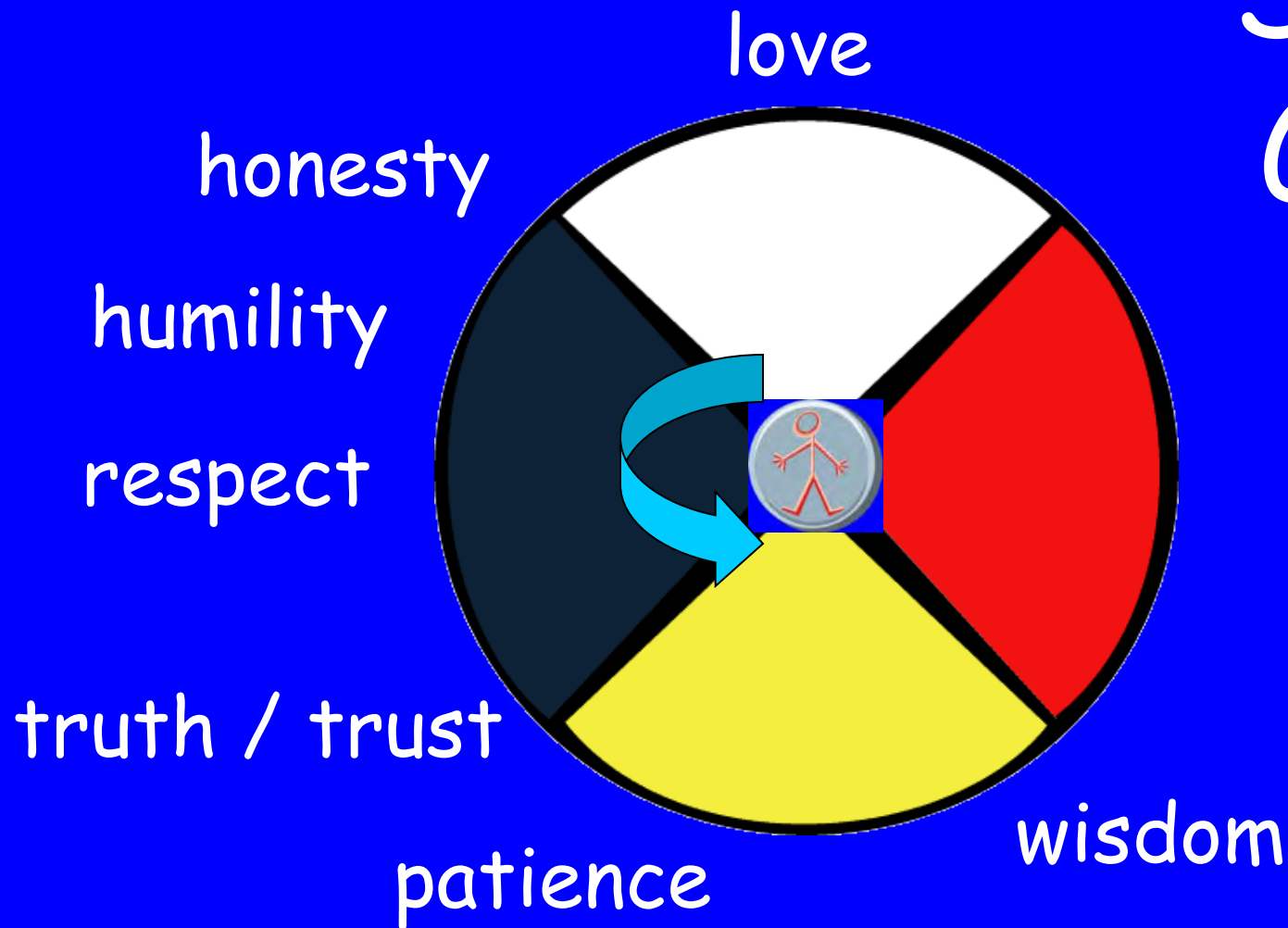
Earth speaks: voices of health in the land



Medicine Wheel



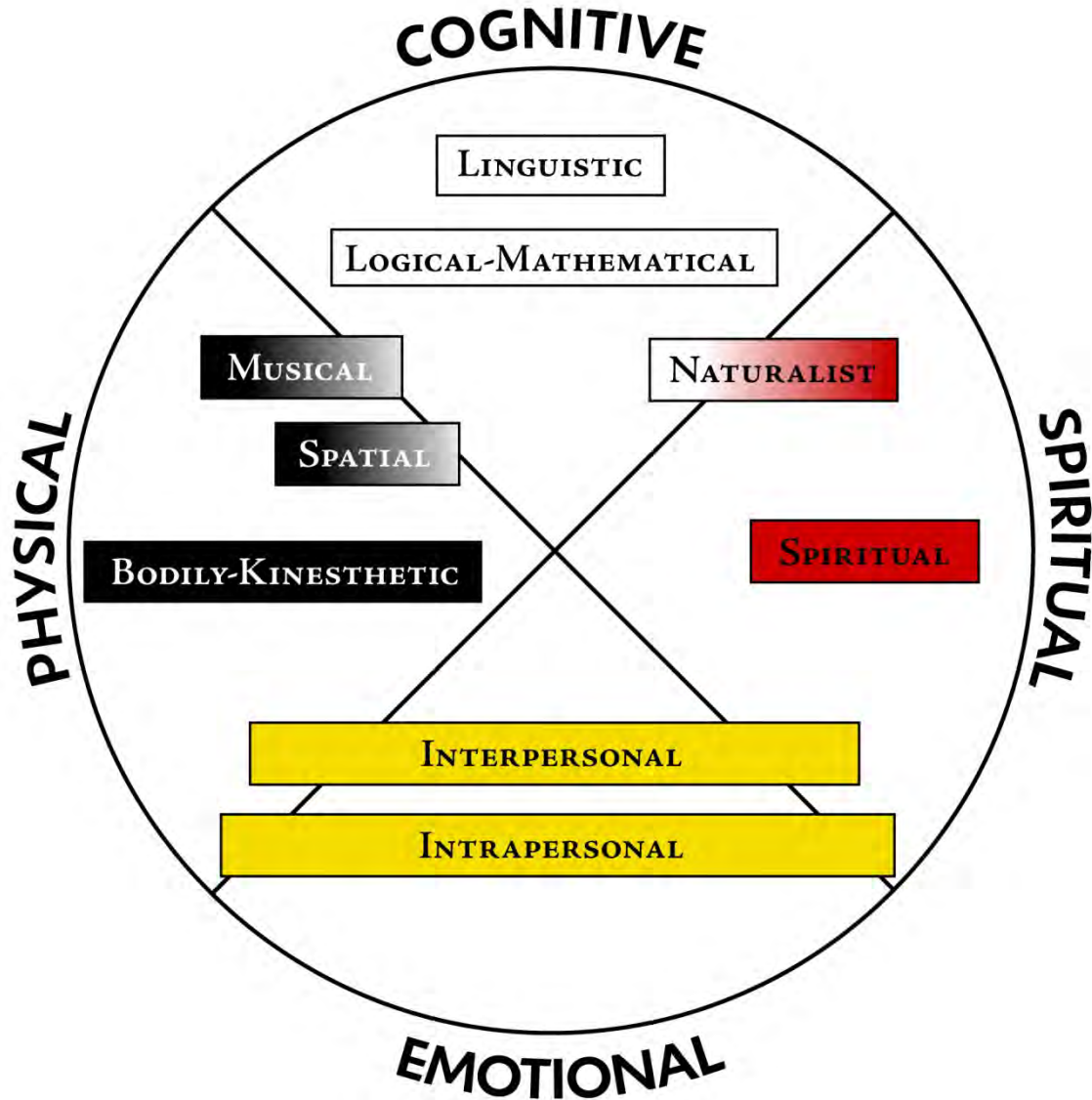
Seven Gifts Of Life



Teachings of Mi'kmaq Elder Murdena Marshall,
Eskasoni First Nation, Unama'ki – Cape Breton

Gardner's Multiple Intelligences
in association with Medicine Wheel

(cross-mapping possibility while recognizing "non-fit" challenges)



Co-learning our way to expanding wholeness through restoration of relationships with the land



Artist: Rod Restoule
from: Into the Daylight;
C. Morrisseau, 1998

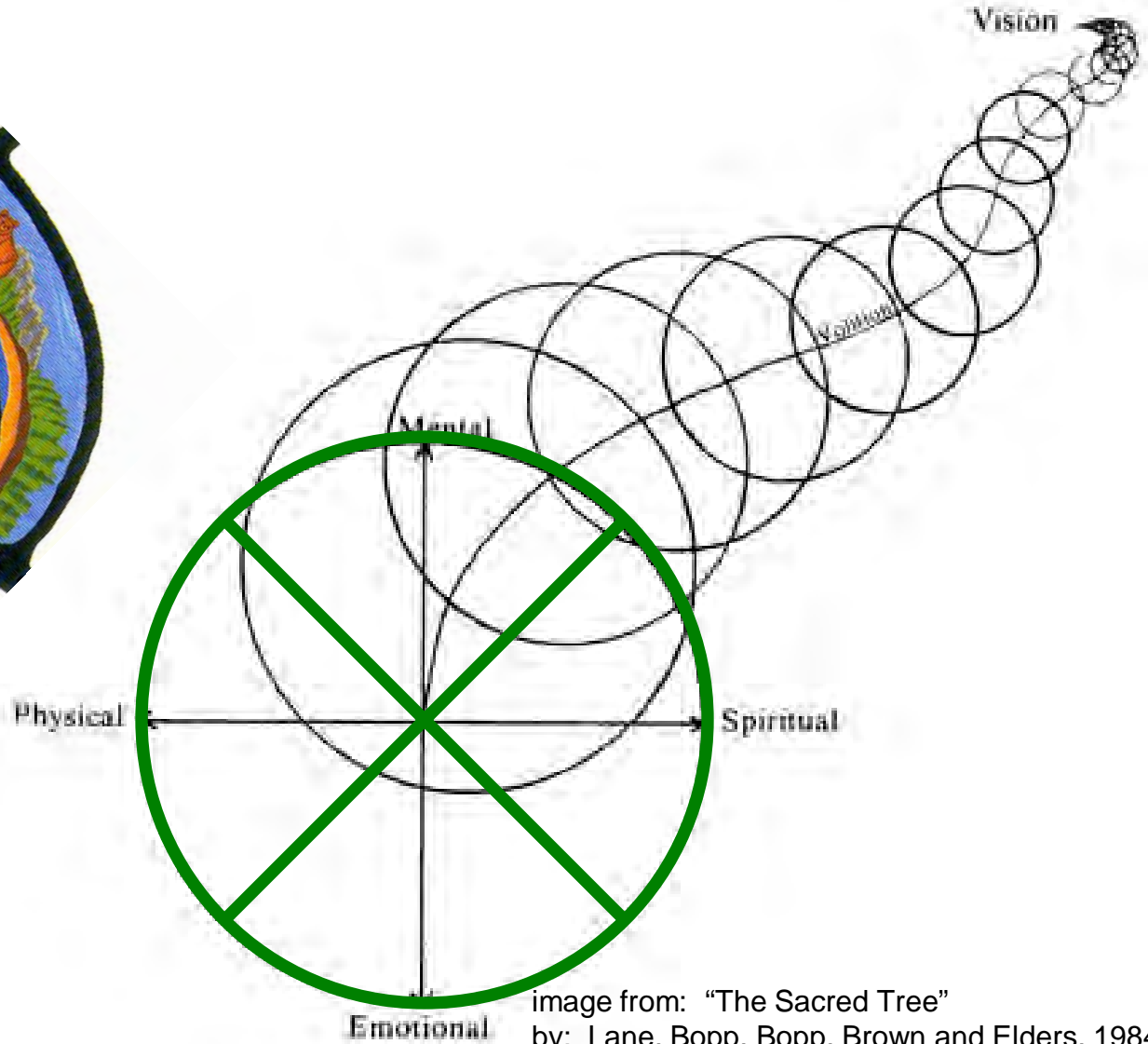
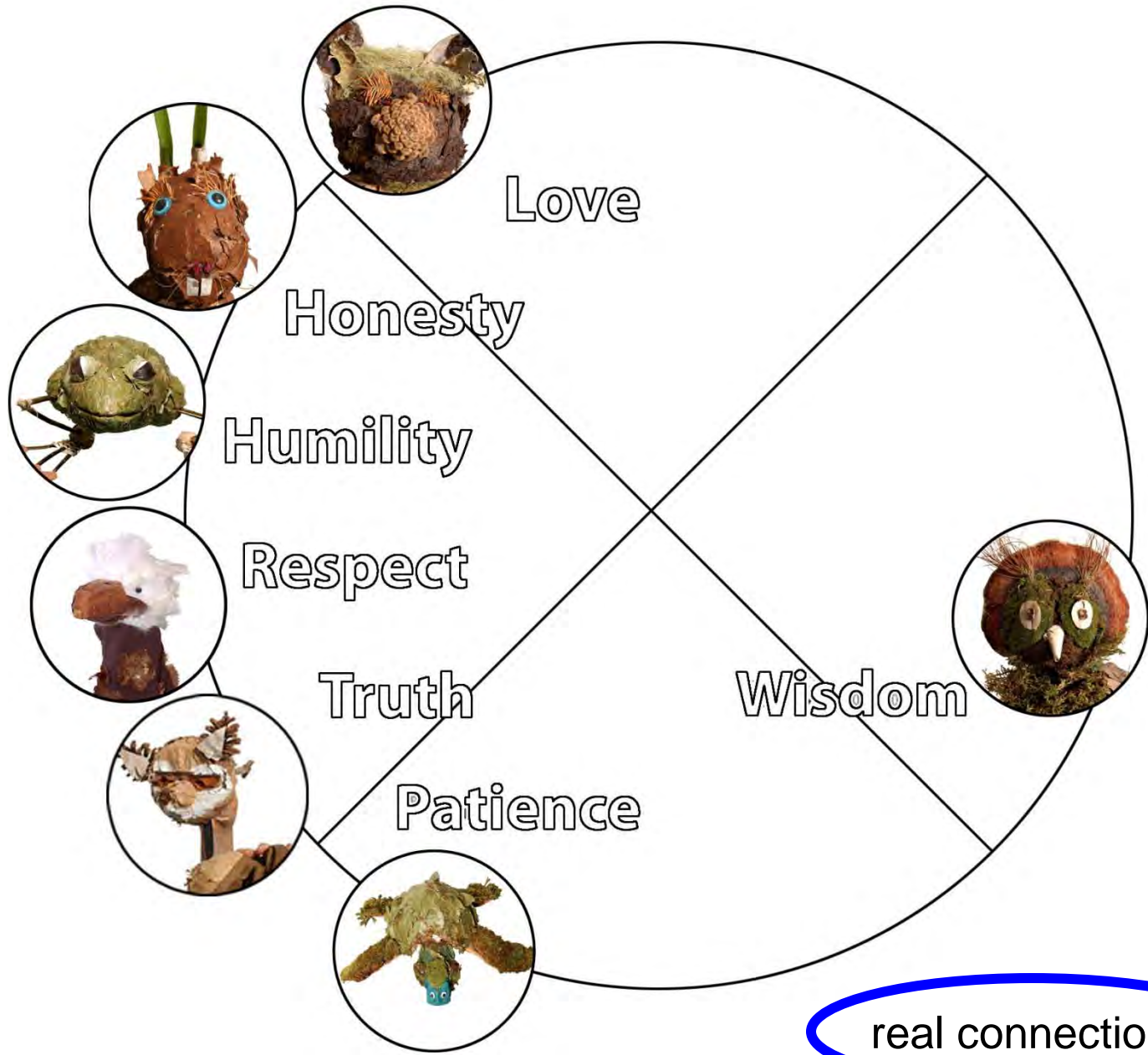
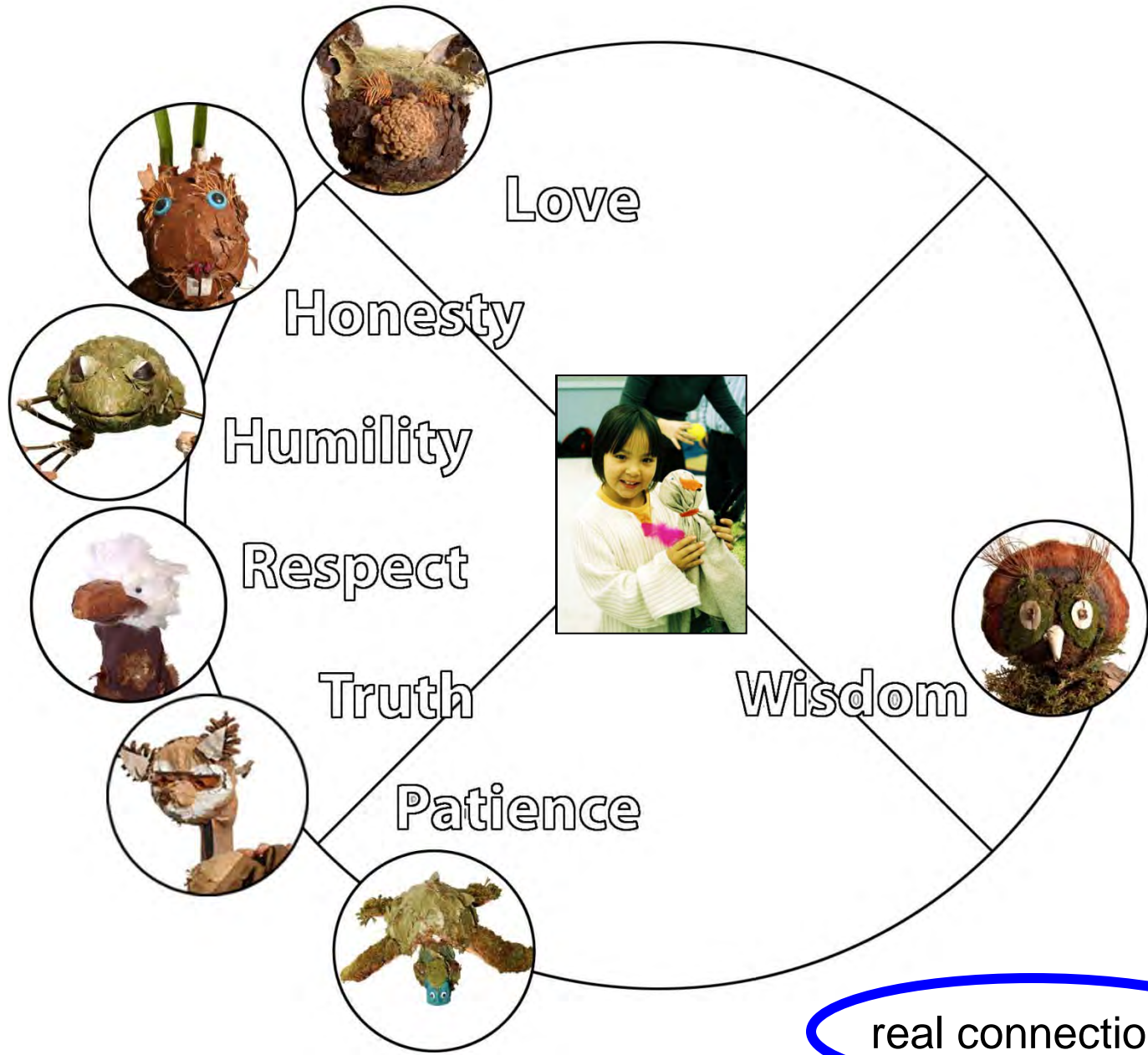


image from: "The Sacred Tree"
by: Lane, Bopp, Bopp, Brown and Elders, 1984.
published by: Four Worlds International Institute



real connections



real connections

It is not enough to just value the links between the experiences, disciplines, creativity, and ideas (as in inter & multi disciplinarity) ...



... one has to develop methods, strategies and practices that will transform those links to the real connections

[paraphrase of Ron Burnett at http://www.chocuk.net/troupe/ism_01]

CAPE BRETON
UNIVERSITY



Canada Research
Chairs

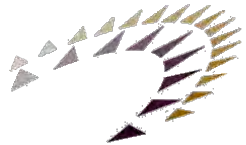
Chaires d
du Canad

Social Sciences and Humanities
Research Council of Canada

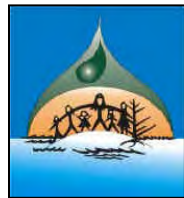
Conseil
sciences



Canada Foundation
for Innovation
Fondation canadienne
pour l'innovation



IAPH



UNAMA'KI
INSTITUTE OF
NATURAL
RESOURCES



THANK YOU

Mi'kmaq Elders



NSERC
CRSNG



Mi'kmawey Debert



Royal Canadian
Mounted Police

Gendarmerie royale
du Canada