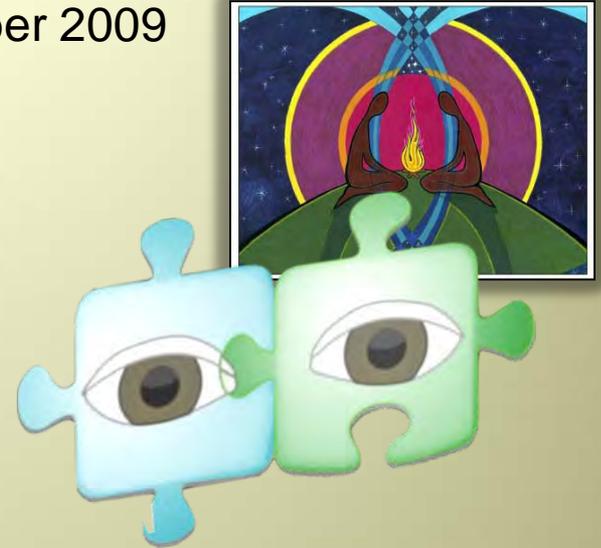


Integrative Science & Two-Eyed Seeing

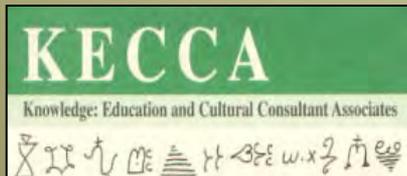


Albert Marshall¹ and Annamarie Hatcher²
with Cheryl Bartlett³

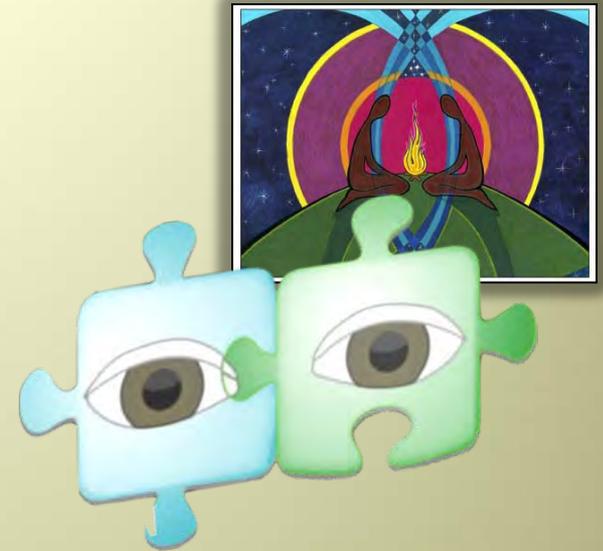
¹ *Elder and HonDLitt*, Eskasoni community, Mi'kmaq First Nation

² *Research Associate in Integrative Science*, CBU, Sydney, NS

³ *Canada Research Chair in Integrative Science*, CBU, Sydney, NS



Integrative Science & Two-Eyed Seeing



OUTLINE FOR PRESENTATION

- 1. Co-Learning Journey: towards something new**
- 2. Why: the need for something new**
- 3. Integrative Science: our new approach**
- 4. Two-Eyed Seeing: our Guiding Principle**
- 5. MSIT: our new science courses (university level)**
- 6. this new approach: all educational levels**



Canada Research
Chairs

Chaires de recherche
du Canada



Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
sciences humaines du Canada

Canada
Canada

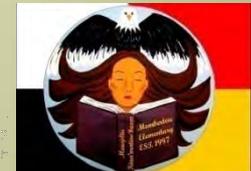
Thank you / Wela'liog

IAPH



Canada Foundation
for Innovation

Fondation canadienne
pour l'innovation



Membertou
Elementary

CIHR IRSC

Canadian Institutes of
Health Research Instituts de recherche
en santé du Canada



NSERC
CRSNG



Mi'kmawey Debert



IWK Health Centre
Foundation



Mermaid Theatre
of Nova Scotia



Eskasoni First Nation Detachment
Royal Canadian Mounted Police Gendarmerie royale
du Canada



Mi'kmaq College Institute
Mi'kmaq Espi Kina'matno'kuom

The support of various
partners and funding agencies
is gratefully acknowledged.

**for 15+ years we have been on a
Co-Learning Journey**
(wherein we have been our own experimental rats)



our THANKS to many Elders & many others

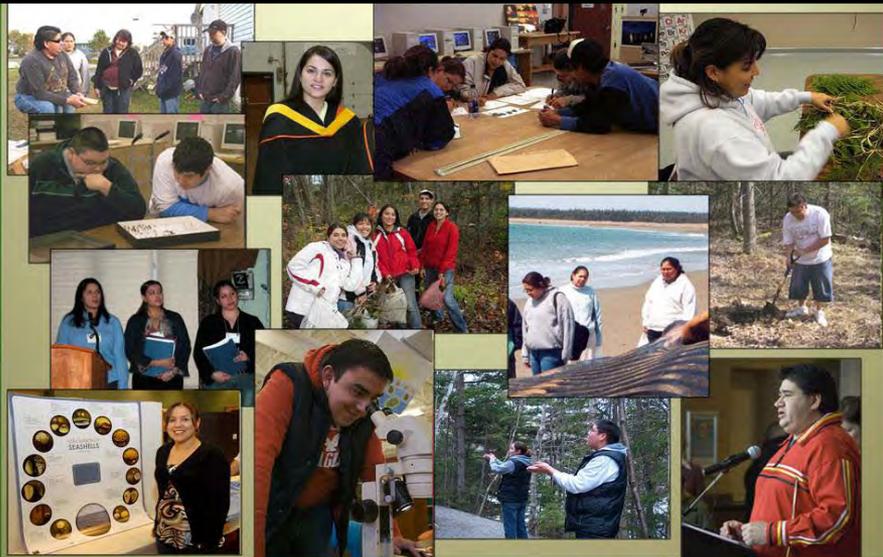


our THANKS to CBU's Integrative Science Team



**Mi'kmaq Elders
&
Students**

**Research Team
with
Artist & Graphic Designer**



**Artist
Basma Kavanagh**



**Graphic Design
Kristy Read**

Co-Learning Journey



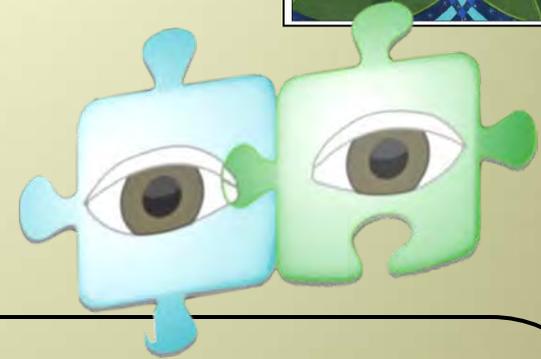
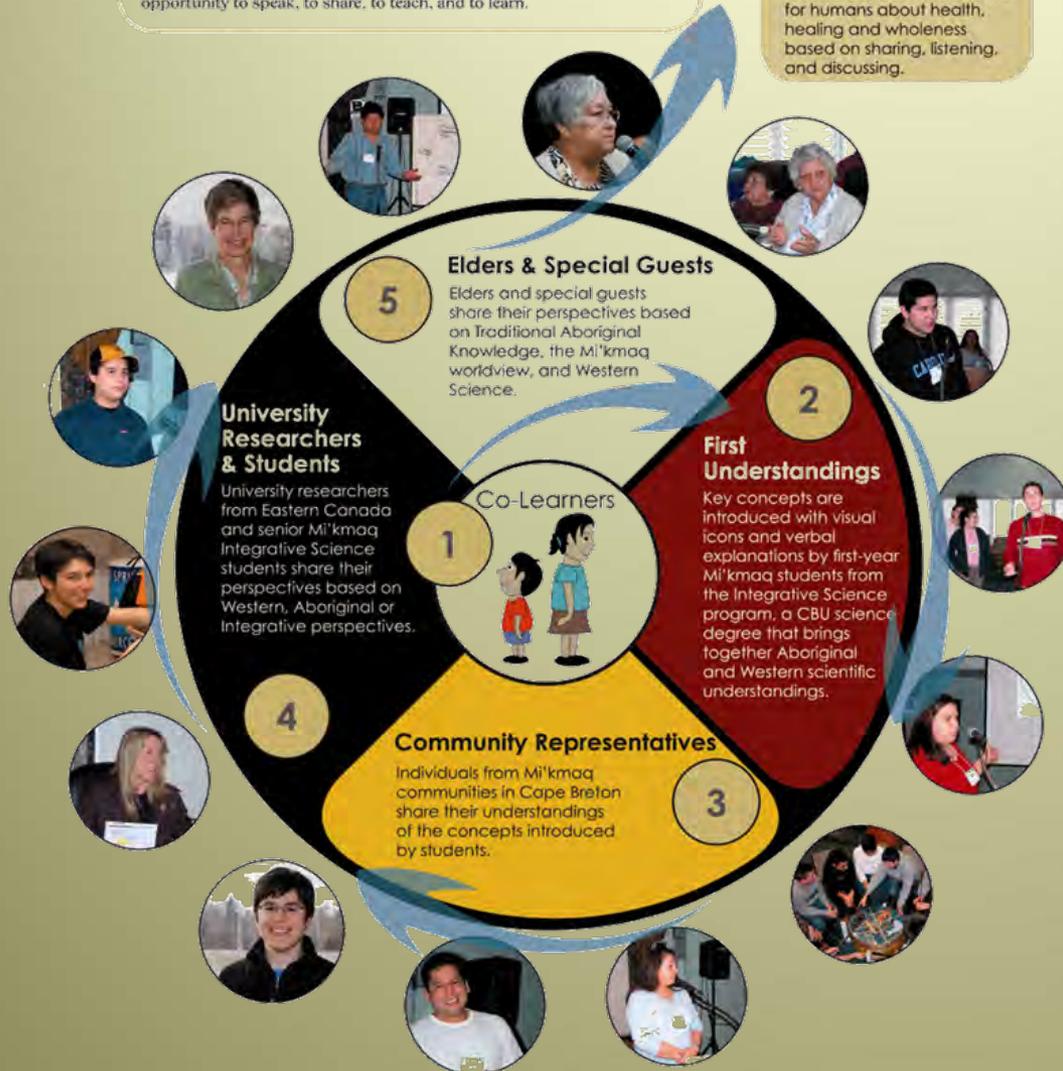
Co-Learning Journey

A shared understanding of how to talk together

This visual is based on the Medicine Wheel (or Circle of Learning) which is a commonly used Aboriginal teaching tool. The visual shows that within the discussion, all have a role to play. Each person has an opportunity to speak, to share, to teach, and to learn.

6

Each participant gains some new understandings of Mother Earth and her lessons for humans about health, healing and wholeness based on sharing, listening, and discussing.



praxis-based RESEARCH

- *integrative*
- *community-based*
- *participatory*
- *action*

methodologies

Toqwa'tu'kl Kijitaqnn Integrative Science

Indigenous

Western

“bringing our sciences together”

Toqwa'tu'kl Kijitaqnn Integrative Science

our sciences
our stories

Indigenous our worldviews Western

“bringing our knowledges together”



***Indigenous and Western
scientific knowledges are
based in observations
of the natural world.***



Science?



Artist: Basma Kavanagh



Indigenous and Western scientific knowledges are based in observations of the natural world.

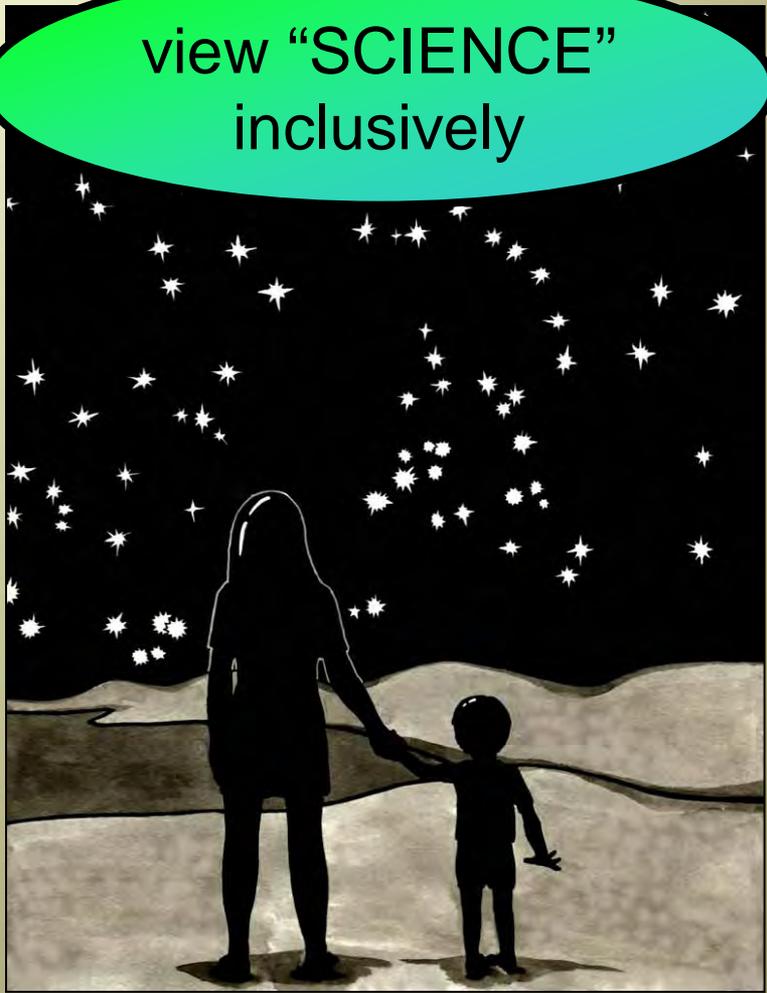


“stories of our interactions with and within nature”

pattern smarts

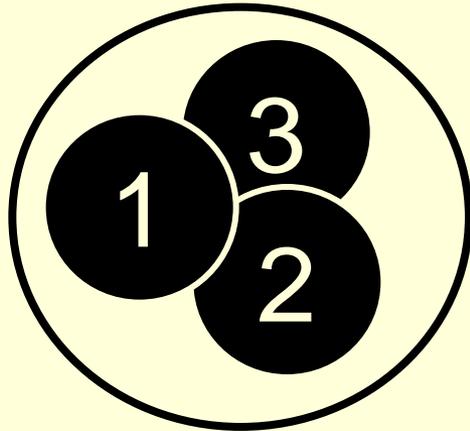
Science is dynamic,
pattern-based knowledge.

view “SCIENCE” inclusively



Artist: Basma Kavanagh

15+ years ago we started a Co-Learning Journey. WHY?



reasons



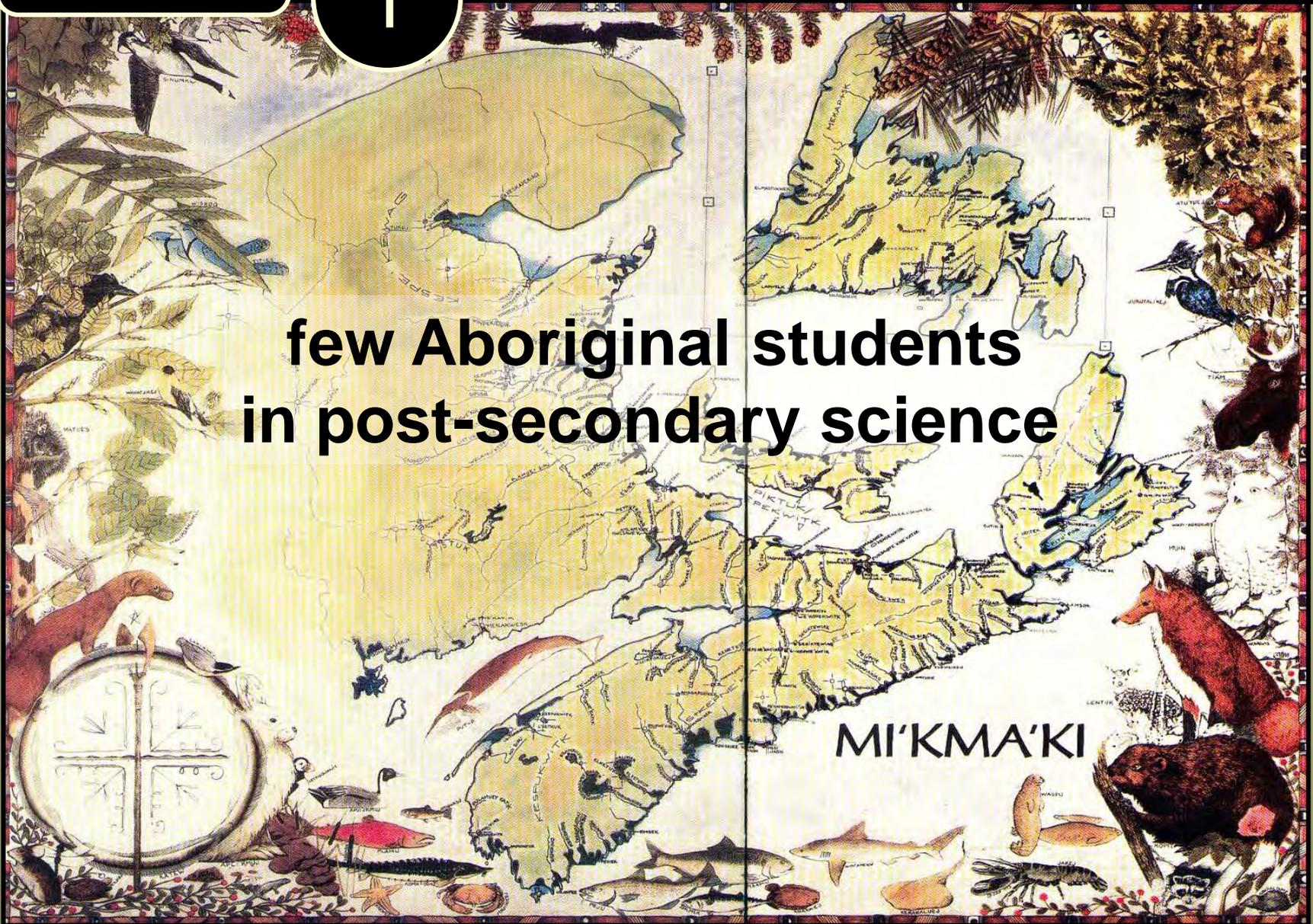
Artist: Basma Kavanagh

Why?

1

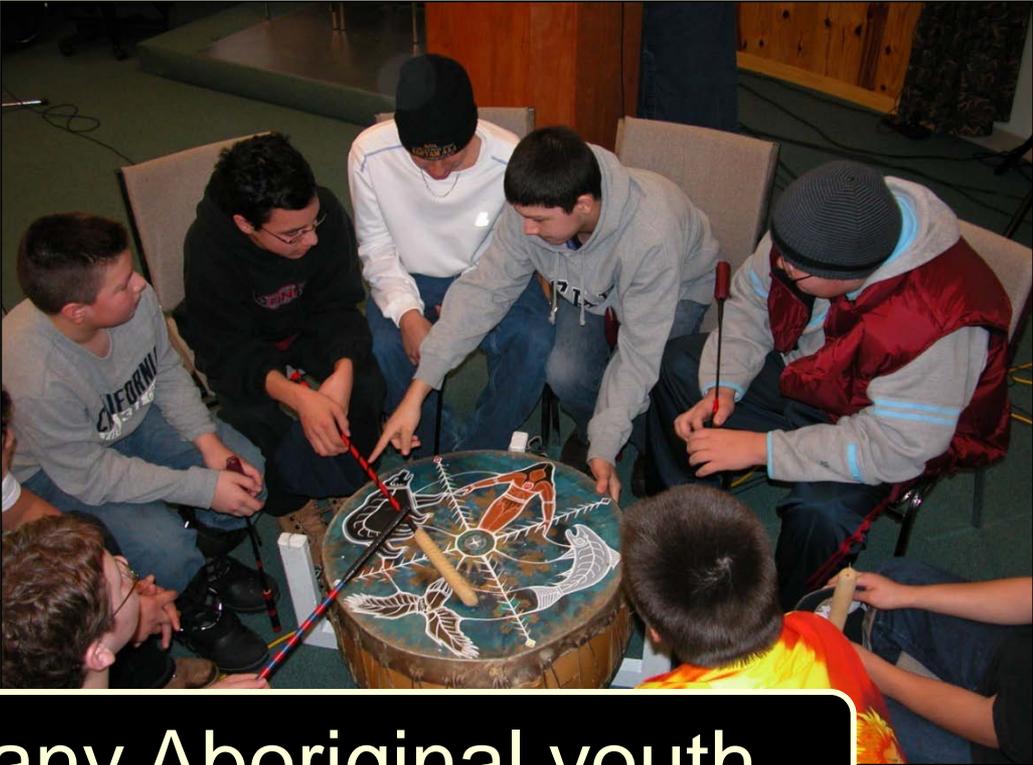
Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin

**few Aboriginal students
in post-secondary science**



Why?

2



many Aboriginal youth



Why?

2

Because today ...

**Mi'kmaq and other Aboriginal youth
are poised on the edge of two worlds.**

Indigenous



Western

Why?

2

Because today ...

Mi'kmaq and other Aboriginal youth are losing their cultural connections.

Indigenous

**Cognitive imperialism.
Colonization of
the consciousness.
Genocide.**

Western



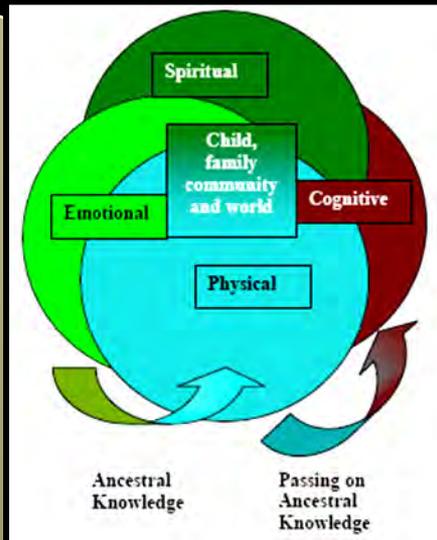
Why?

2

Because ...

health (individuals & communities) and transmission of
Traditional Knowledge are strongly related
(source: Elders & others)

Indigenous



Western



model & visual from: CINDY BLACKSTOCK

<http://www.win-hec.org/docs/pdfs/cindy.pdf> (WIN-HEC Journal 2007)

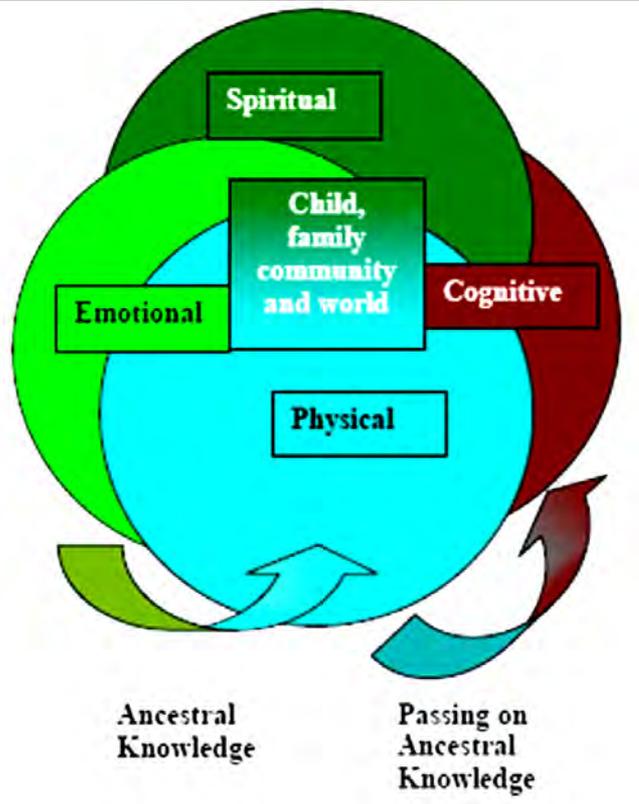
Why?

2

Because ...

health (individuals & communities) and transmission of
Traditional Knowledge are strongly related

(source: Elders & others)



Western

model & visual from: CINDY BLACKSTOCK

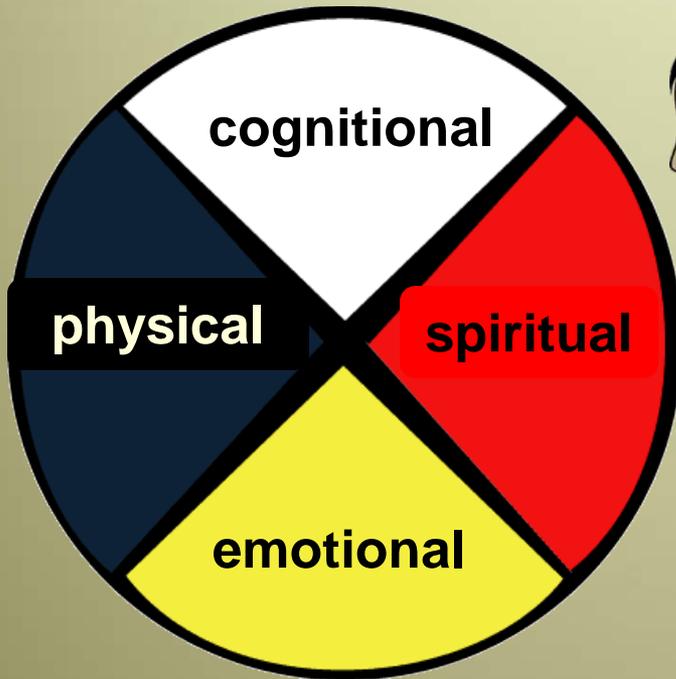
<http://www.win-hec.org/docs/pdfs/cindy.pdf> (WIN-HEC Journal 2007)

Why?

2

Because ...

health (individuals & communities) and transmission of Traditional Knowledge are strongly related
(source: Elders & others)



Western

Why?

3

Indigenous

Western

The central dilemma of science education today is the teaching of science from only one cultural perspective, and in an incomplete and non-connected manner.

Gregory Cajete, PhD
Native American Scientist & Educator, Univ. of New Mexico

Why?

3

Indigenous

Western

The central dilemma of science education today is the teaching of science from only one cultural perspective, and in an incomplete and non-connected manner.

Gregory Cajete, PhD
Native American Scientist & Educator, Univ. of New Mexico

starting in the mid 1990's

**15+ years: where our
Co-Learning Journey
has been**



Integrative Science

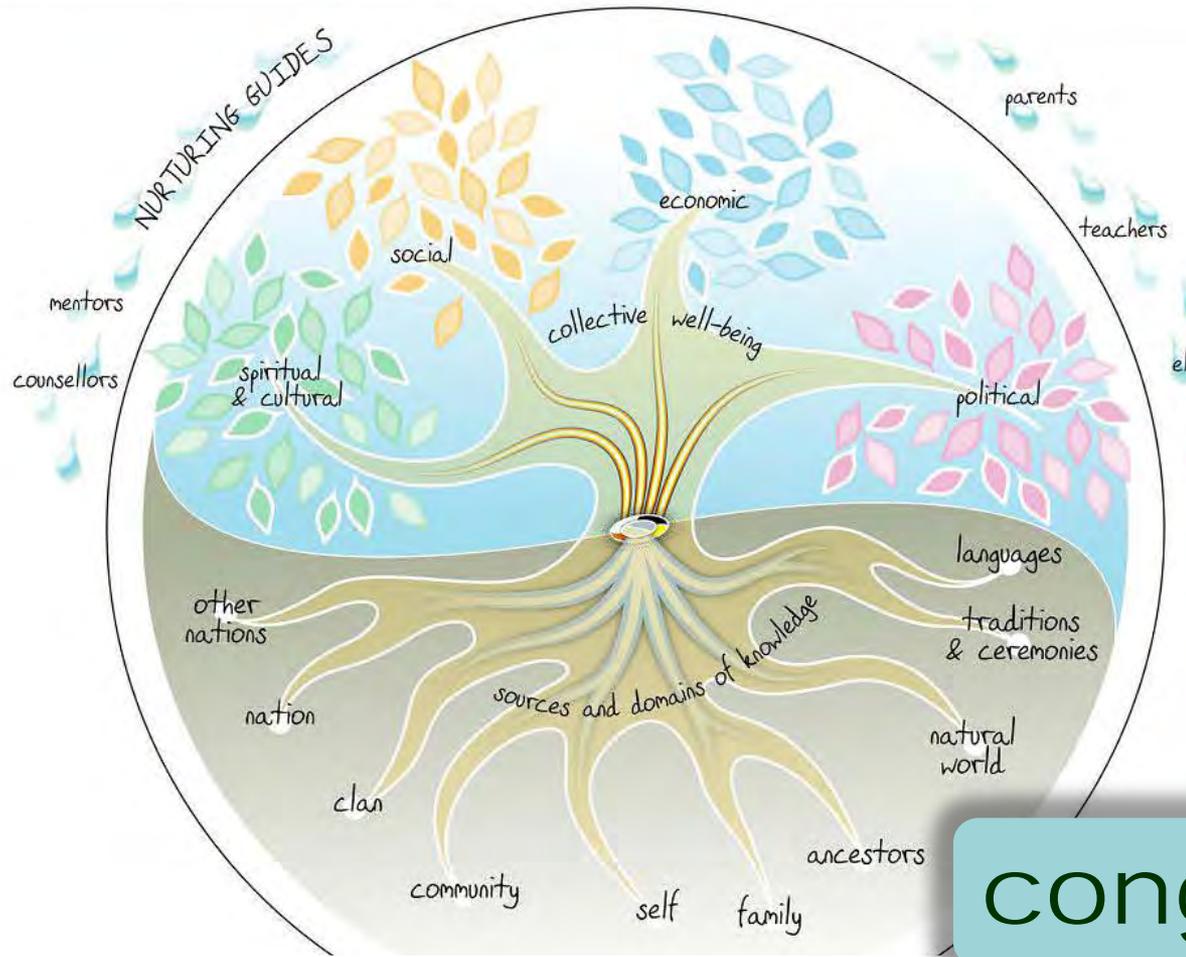
bringing together Indigenous and Western
scientific knowledges and ways of knowing

Indigenous

GUIDED BY

Western

TWO-EYED SEEING



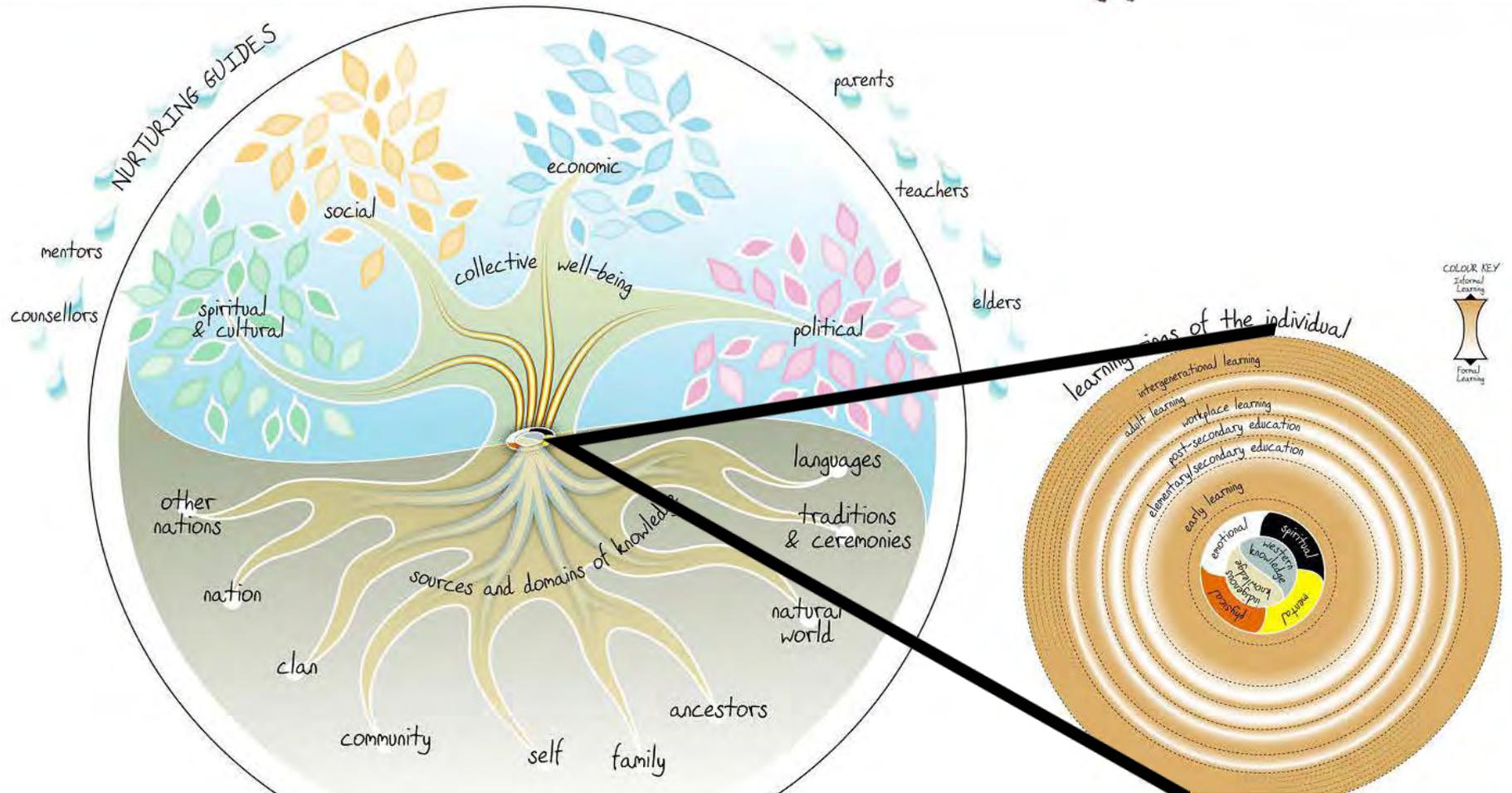
Integrative Science
&
Two-Eyed Seeing

congruent with

First Nations Holistic Lifelong Learning Model

from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

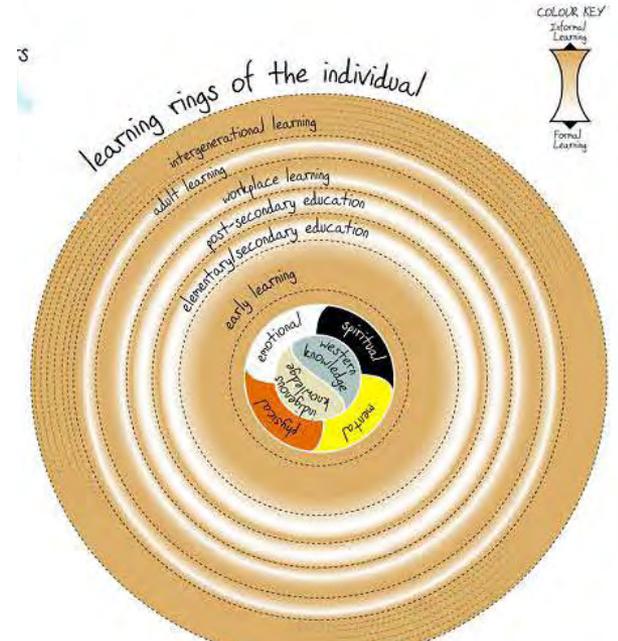
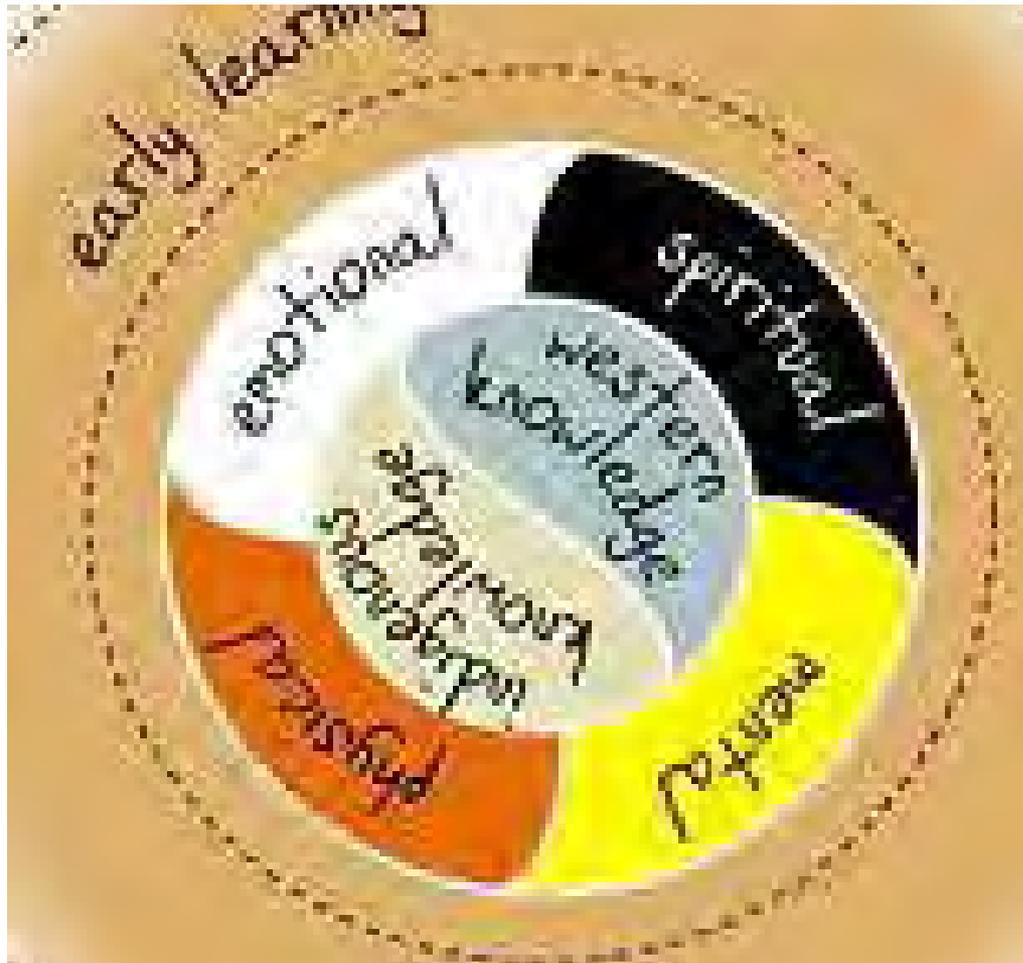
<http://www.ccl-cca/CCL>



First Nations Holistic Lifelong Learning Model

from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

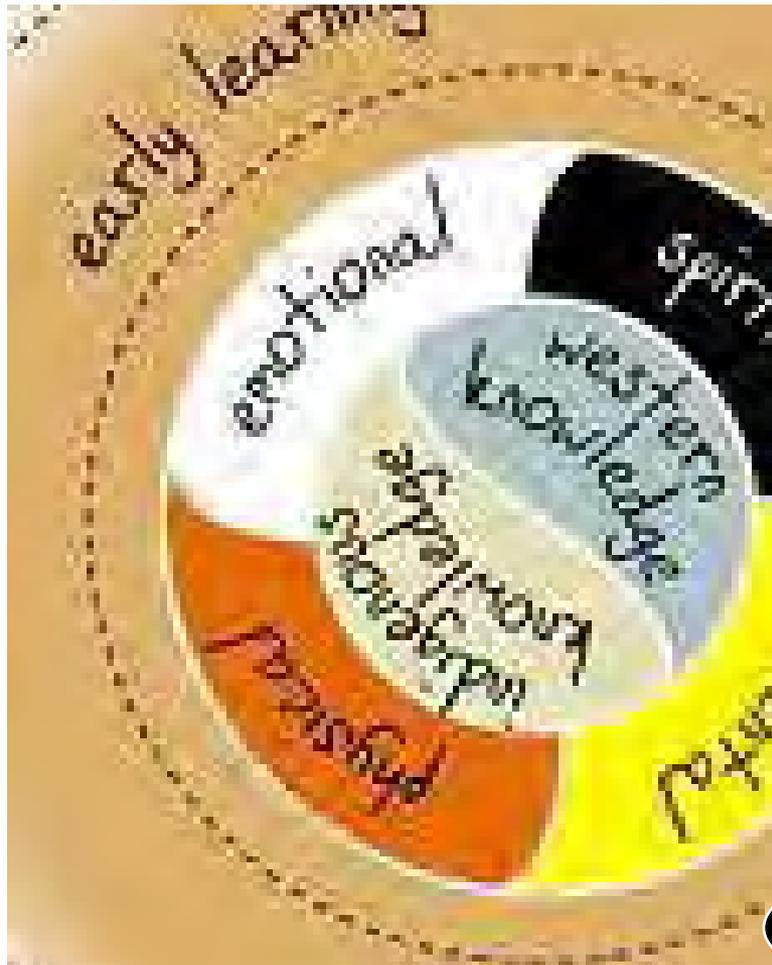
<http://www.ccl-cca/CCL>



First Nations Holistic Lifelong Learning Model

from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

<http://www.ccl-cca/CCL>



Integrative Science



Indigenous

Western

First Nations Holistic Lifelong Learning Model

from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

(<http://www.ccl-cca/CCL>)

Integrative Science

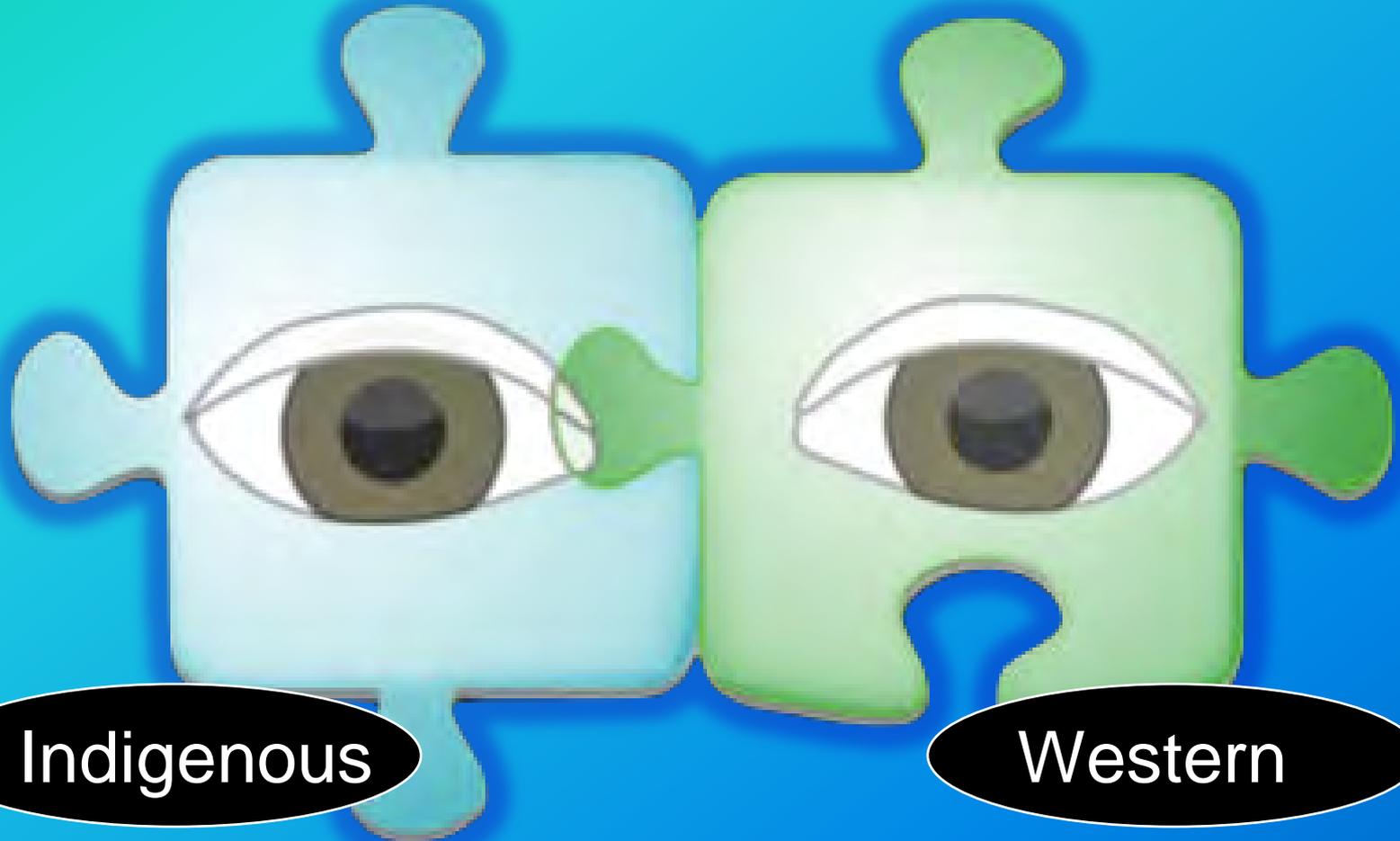
The illustration features a central scene where two brown hands hold a bright yellow and orange flame. This scene is framed by a purple and orange archway, which is itself set within a larger yellow archway. The background is a dark blue space filled with white stars. In the foreground, two interlocking puzzle pieces, one light blue and one light green, each have a large eye drawn on it. The overall composition is symmetrical and vibrant.

Indigenous

Western

“bringing our sciences together”

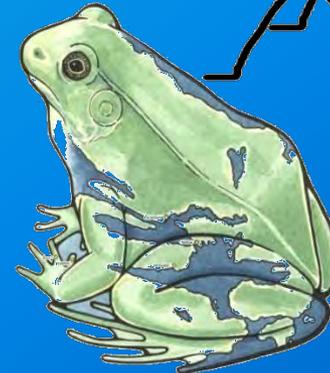
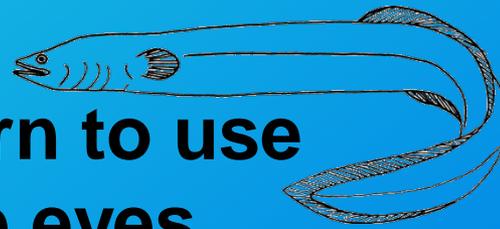
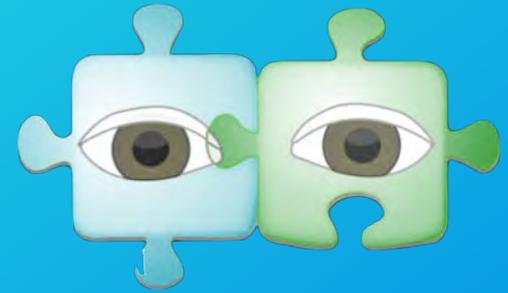
Etuaptmumk - Two-Eyed Seeing

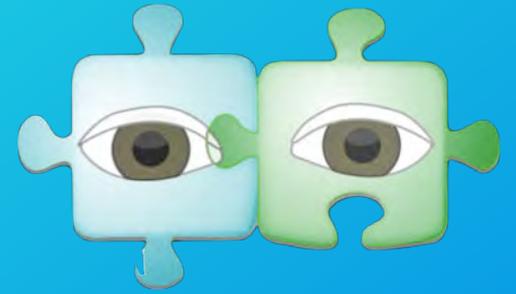


Two-Eyed Seeing

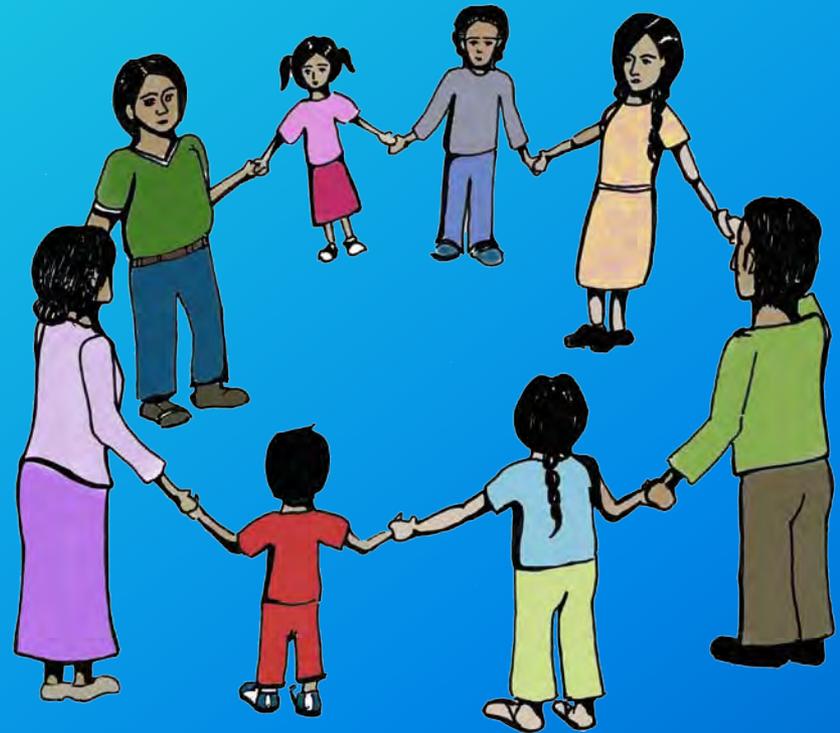
LEARN ... to see from one eye with the best in our Indigenous ways of knowing, and from the other eye with the best in the Western (or mainstream) ways of knowing ...

... and learn to use both these eyes together, for the benefit of all.

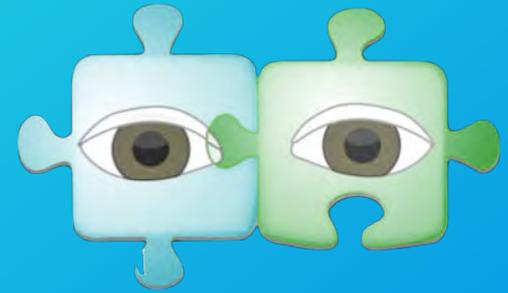




**It is not
enough to go
through life
with one
perspective;
we must
embrace
all the tools
we have ...**



Consciousness of Knowing

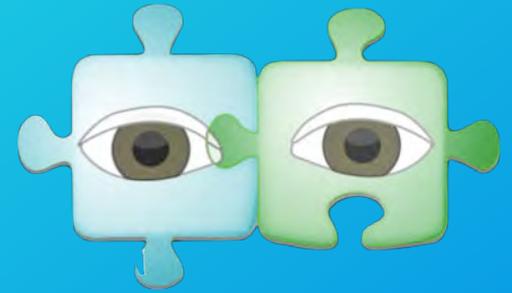


artist Basma Kavanagh

*... our interdependence
on each other and
on Mother Earth*

All people must learn
“Two-Eyed Seeing”
so that knowledge of the
physical is not separated
from wisdom
of the spiritual.

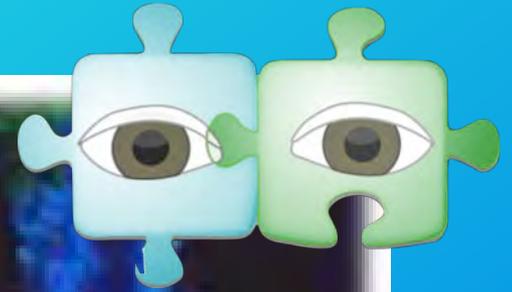
**Two-Eyed Seeing
teaches you to awaken
the spirit within you.**



**You become
a student of life ...
and you become
observant of the
natural world ...
and realize we
humans are part
and parcel of the
whole.**



artist Basma Kavanagh

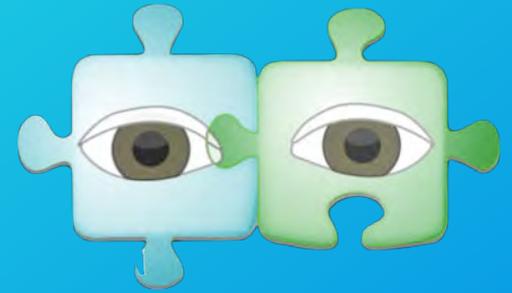


everything that we do to our natural world ... we also do to ourselves

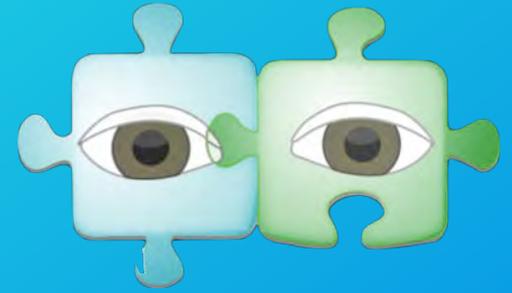
**Our language teaches us
about interdependence.**

Nature has rights.

Humans have responsibilities.



**Our language teaches us
that everything alive is
both physical and spiritual.**

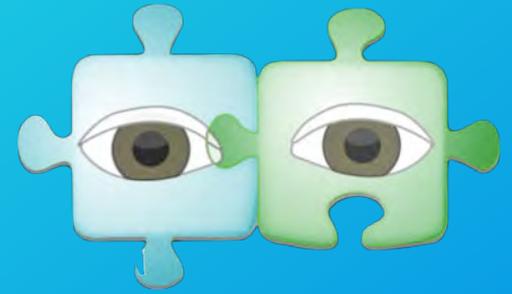


**The onus is on the
person to look at our
natural world with
two perspectives.**

**Modern science
sees objects,
but our language
teaches us to see
subjects.**



artist Basma Kavanagh



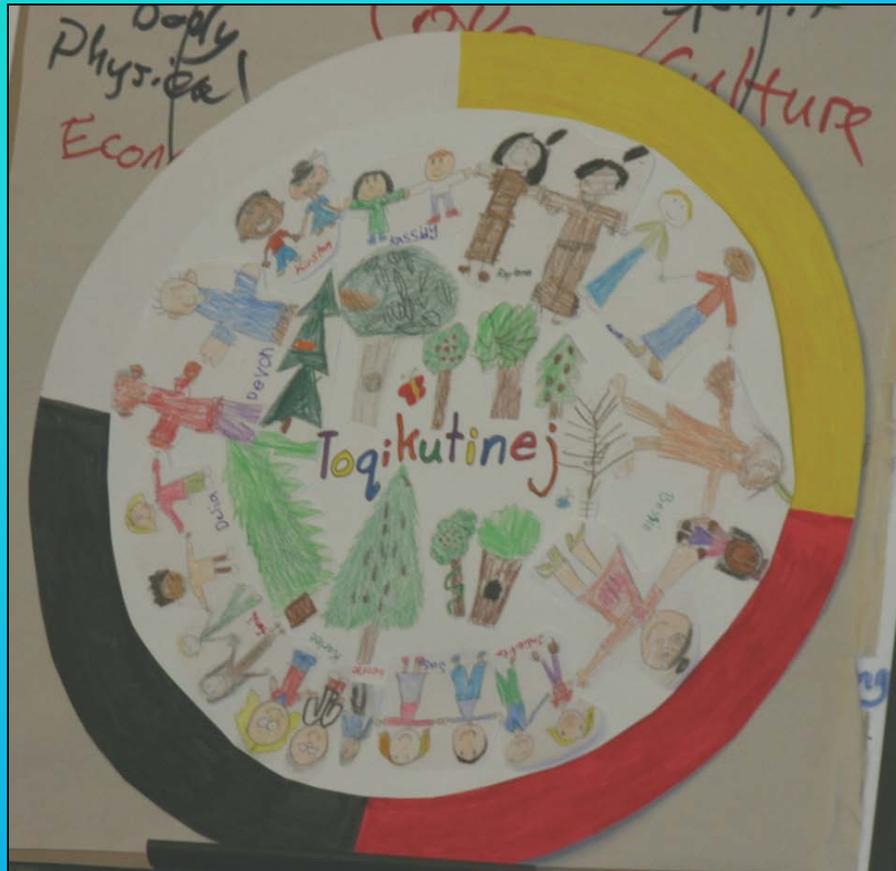
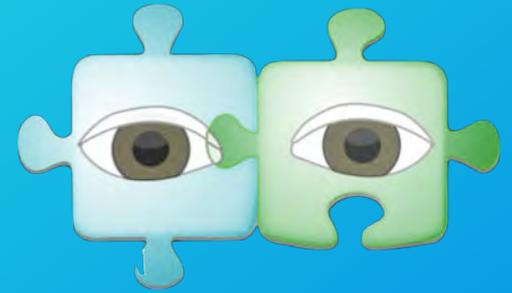
**Humans are a
very small part of
the whole.**

**Our natural world
provides for us,
shelters us,
nourishes us.**

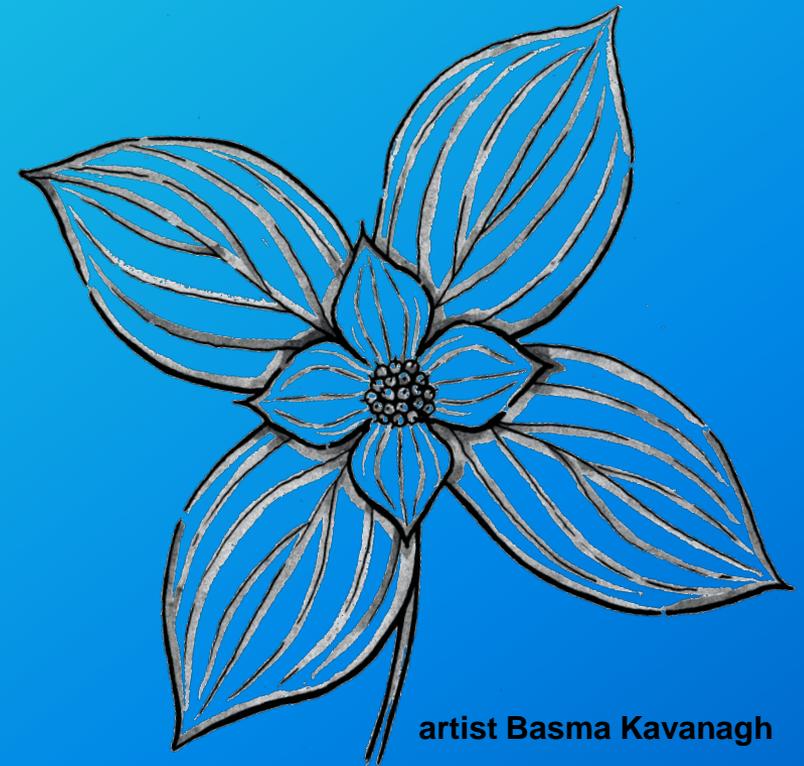


artist Basma Kavanagh

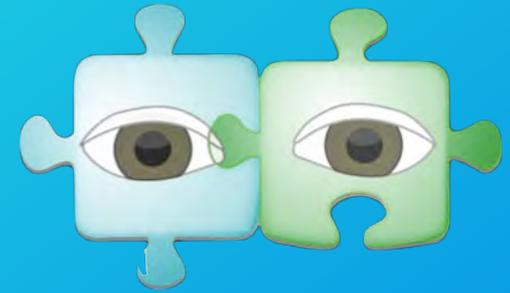
Our language takes us into a Life Long Journey.



artwork: Eskasoni Elementary School Children



artist Basma Kavanagh



**Knowledge is not a tool
but rather it is a spirit.**

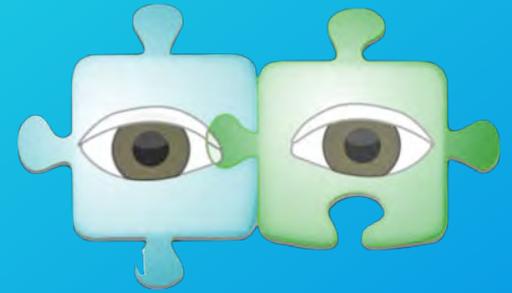
**It transforms the
holder. It also
reminds us that we
have responsibilities
to the spirit of that
knowledge.**

We must pass it on.



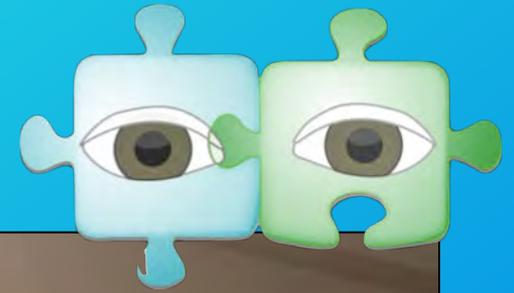
artist Basma Kavanagh

Our seasons follow the
cycles of **Mother Earth** ...

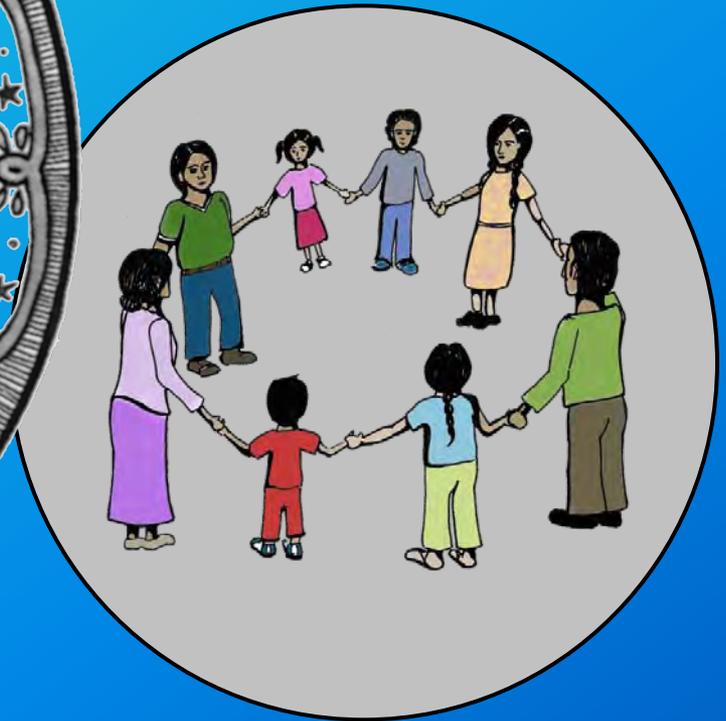
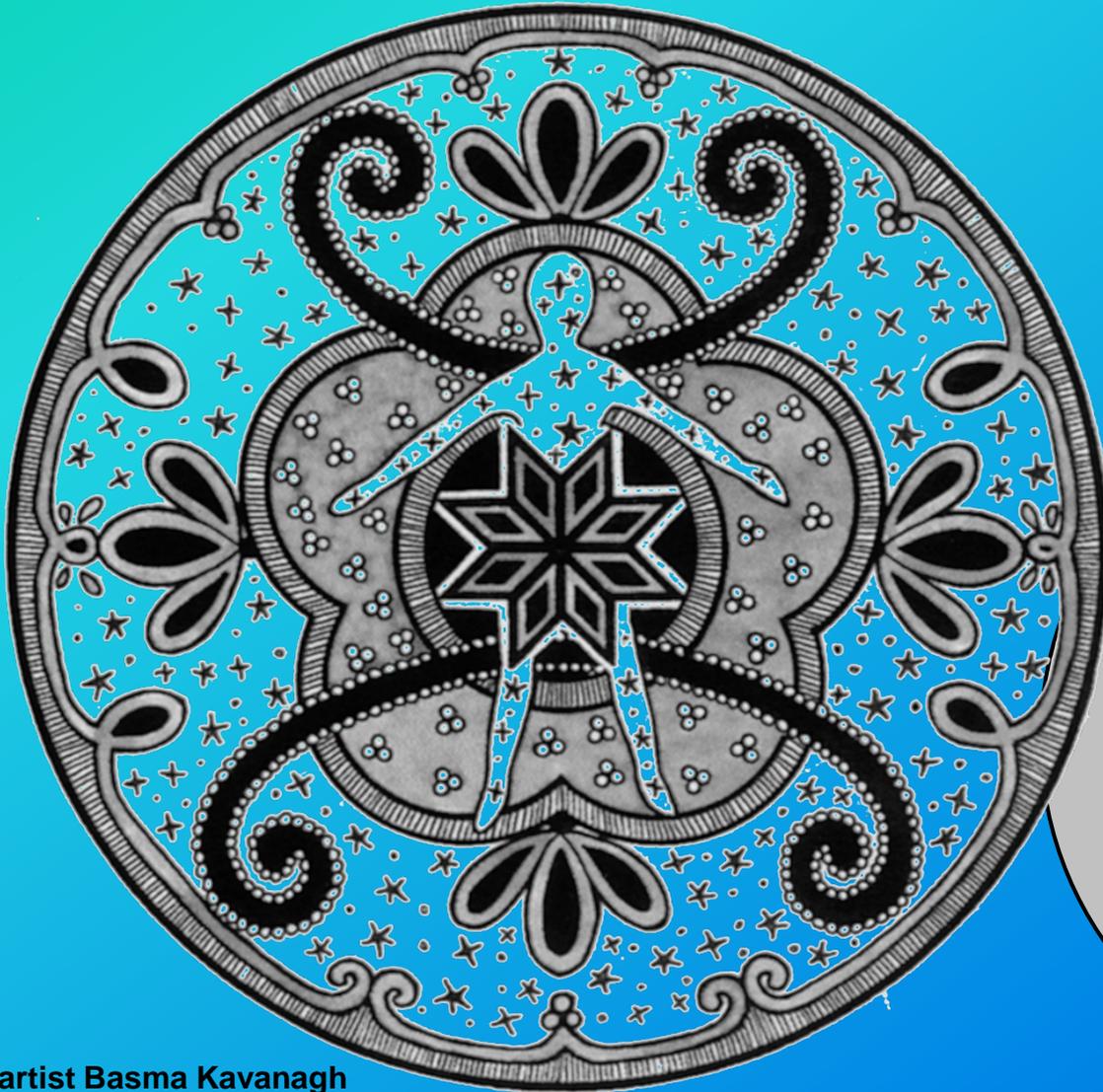
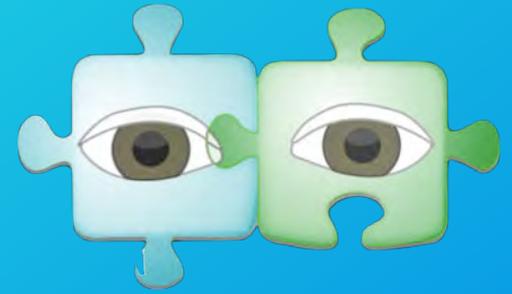


... so that our
children will
always be
reminded of the
beauty of
creation, and of
our dependence
on her.

Like nature, we must always have a nurturing component.



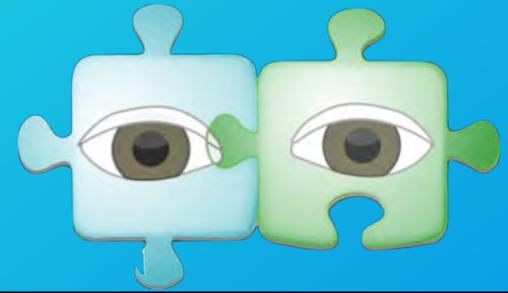
Seven Generations



artist Basma Kavanagh

Netukulimk

developing the skills and sense of responsibility required to become a protector of other species



<http://blog.silive.com/weather/2007/09/red-maple-tree.jpg>



<http://myanimalblog.files.wordpress.com/2008/03/g-bull-moose.jpg>

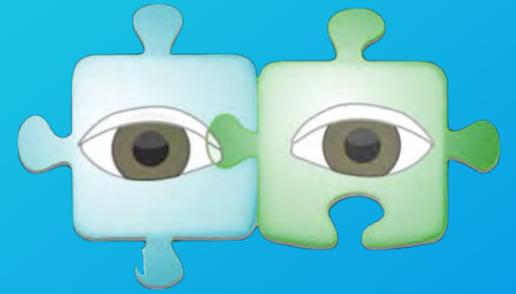


<http://www.greenexpander.com/wp-content/uploads/2007/09/gex-bald-eagle.jpg>



http://www.krisweb.com/krisshoopscot/krisdb/html/krisweb/aqualife/atlantic_salmon_asc_beland.jpg

Life, Land, Language, Love

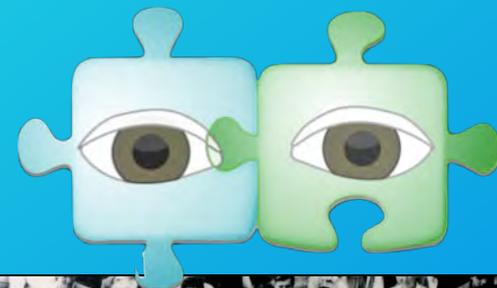


artist Basma Kavanagh



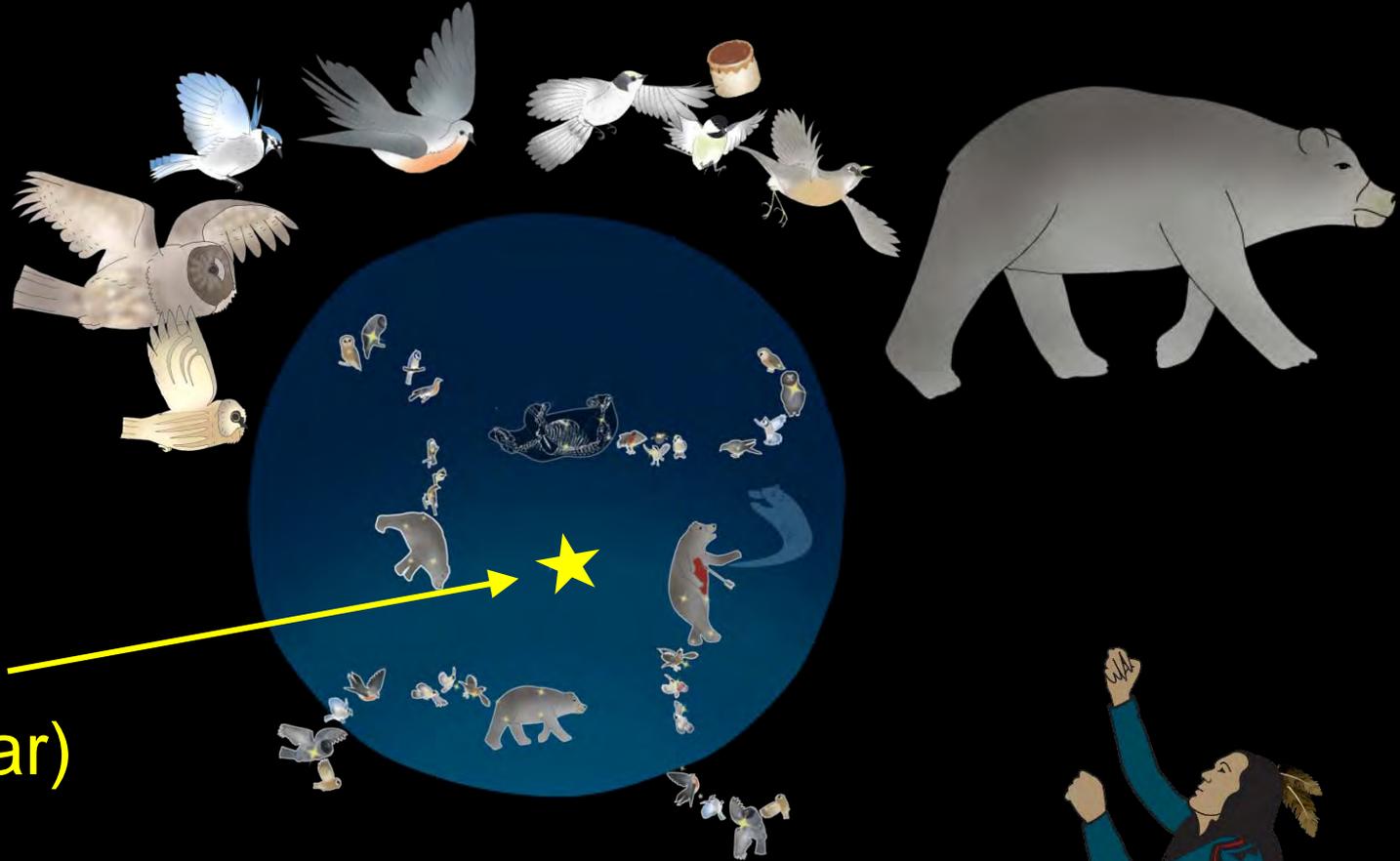
As Elders in Our Time

We seek to be a conduit for wisdom of our Ancestors. We seek to see with “Two-Eyes” ... to take the accomplishments of Western Science further by blending it with the wisdom of our Ancestors.



Tatapn
(North Star)

**Muin and the Seven Bird Hunters:
a Mi'kmaq Night Sky Story
... interconnectiveness of
space-time-life-knowledge-spirit**



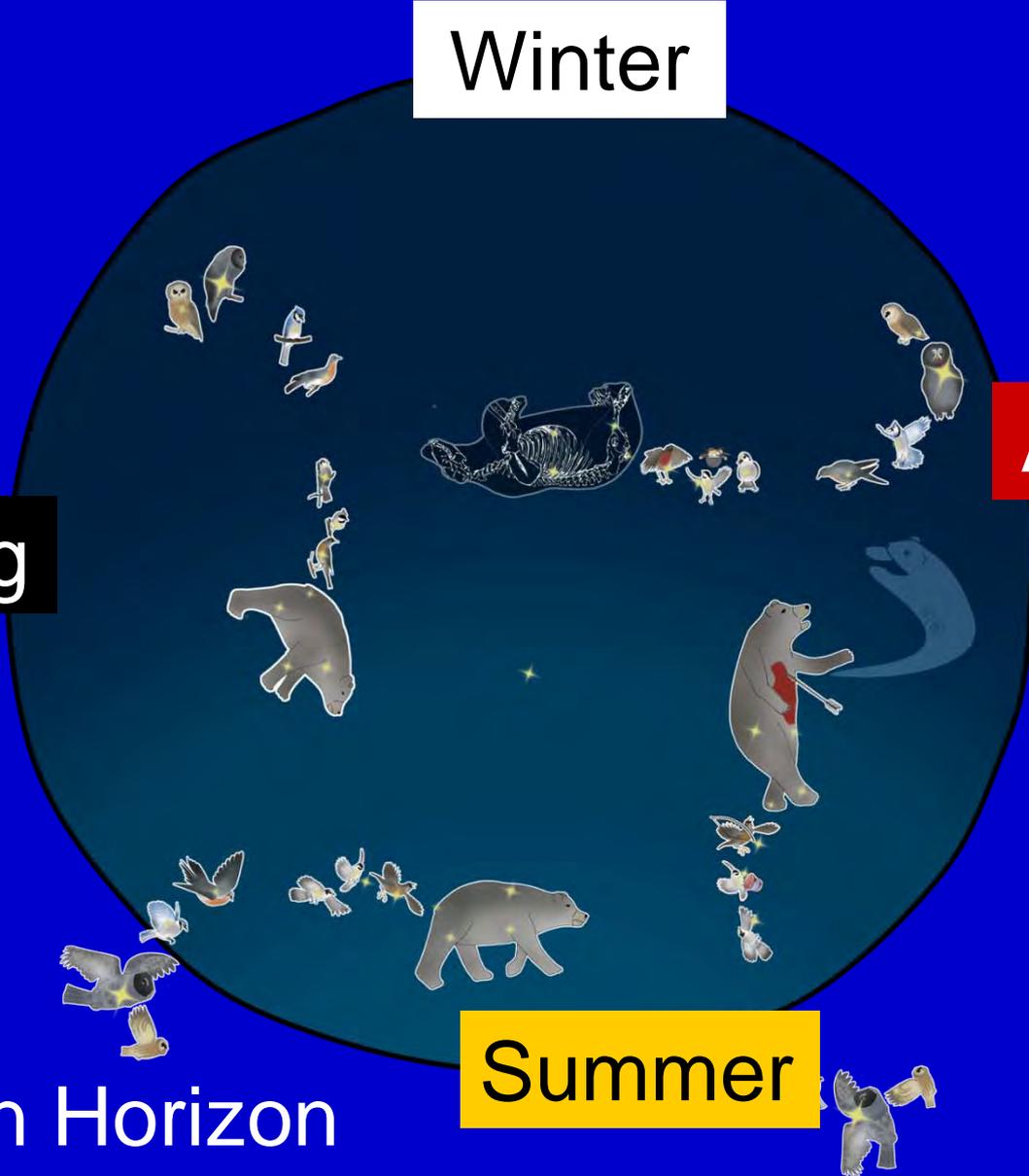
Winter

Autumn

Spring

Summer

Northern Horizon



Pemi Pungek Mi'kma'ki

Winter

Autumn

Spring

Summer

This poster is dedicated to all Mi'kmaq Elders.

This poster is one in a series made by the Institute for Integrative Science and Health at Cape Breton University and Mi'kmaq First Nations' Elders of Cape Breton. Integrative Science brings together Indigenous and Western scientific knowledge and ways of knowing for science education.

This poster is called Pemi Pungek Mi'kma'ki, which means one continuous year in the Mi'kmaq traditional territory. On the outside, it shows the four seasons and the 12 months of the year. On the inside, it shows the land, water, and sky over a full year. The pictures of plants, animals, and weather show the cycle of changing events in nature. The pictures of people show when to do traditional and modern activities. Read this poster in a circle to see the cycle of the seasons. Spring is on the left, summer is on the bottom, fall is on the right, and winter is at the top.



Pemi Pungek Mi'kma'ki

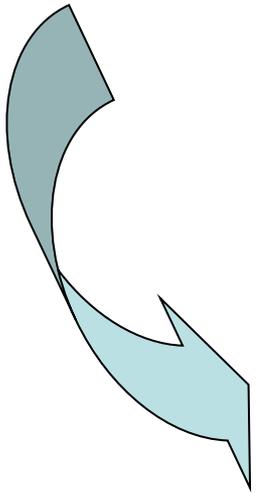
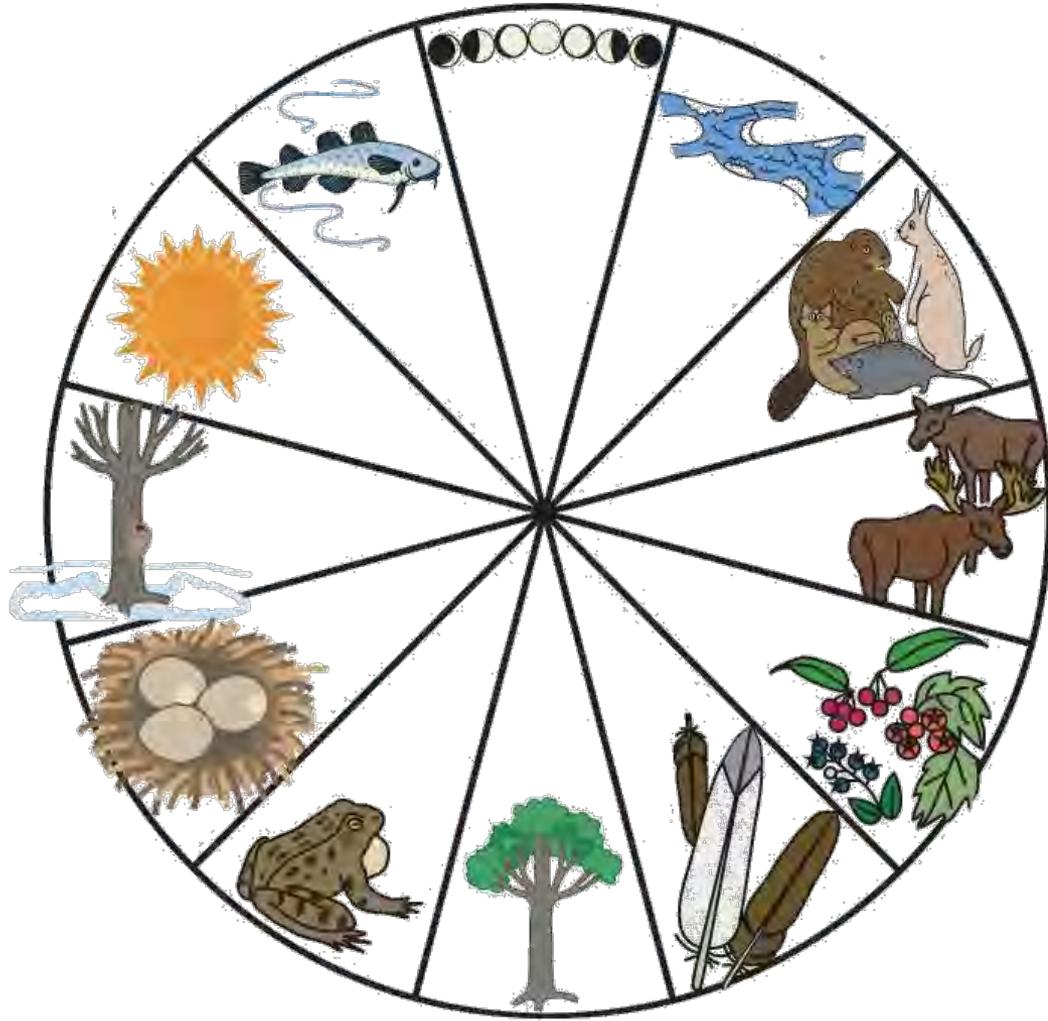


This poster is dedicated to all Mi'kmaq Elders.

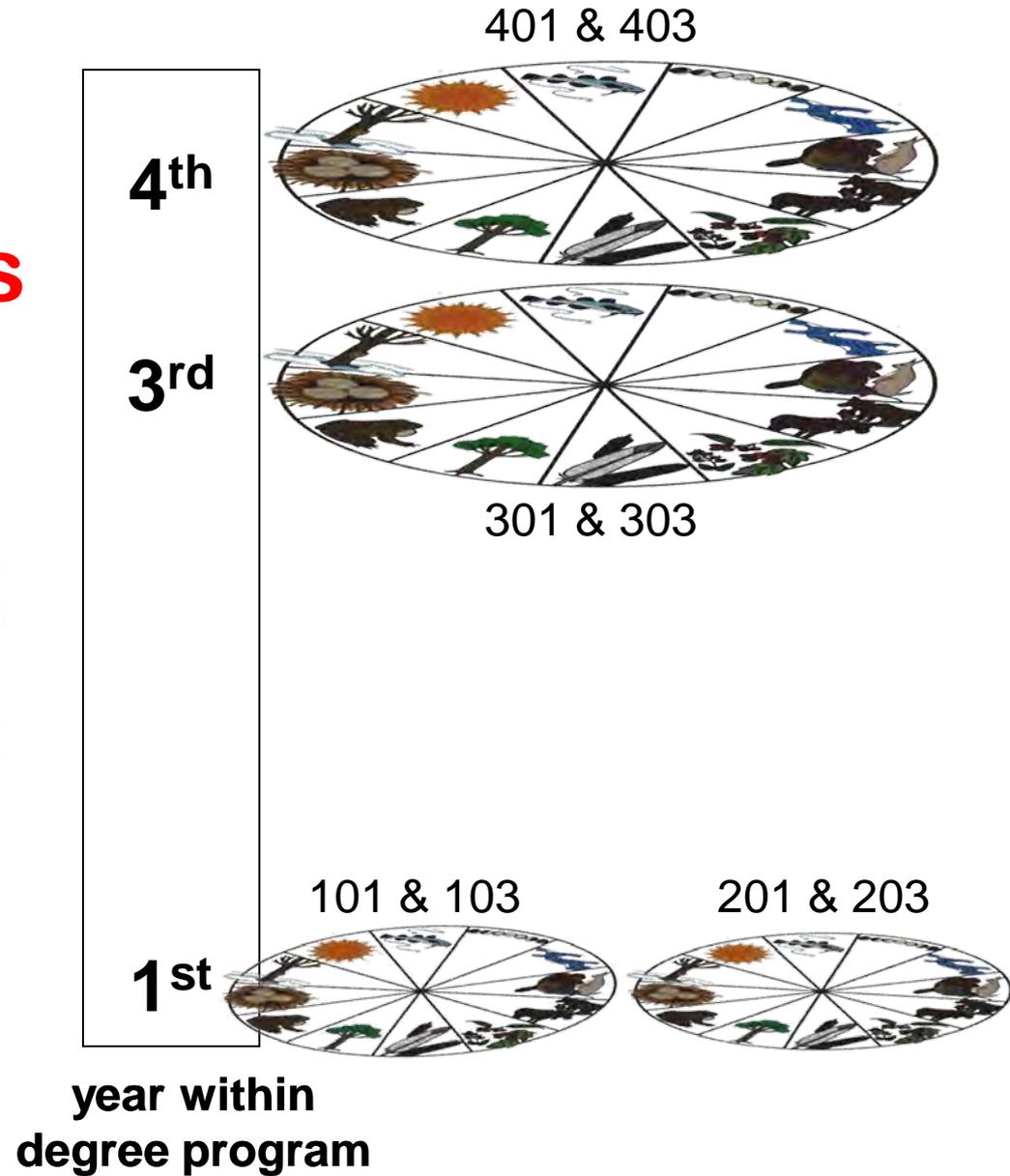
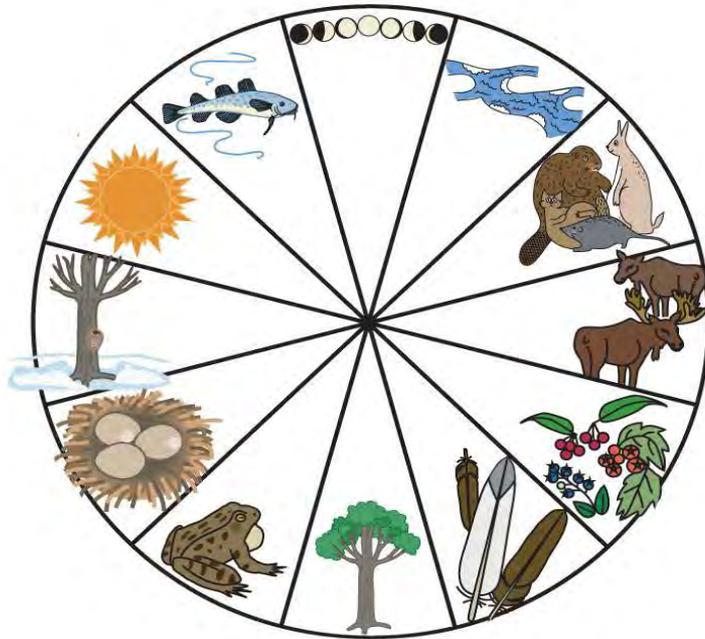
This poster is one in a series made by the Institute for Integrative Science and Health at Cape Breton University and Mi'kmaq First Nations' Elders of Cape Breton. Integrative Science brings together Indigenous and Western scientific knowledge and ways of knowing for science education.

This poster is called Pemi Pungek Mi'kma'ki, which means one continuous year in the Mi'kmaq traditional territory. On the outside, it shows the four seasons and the 12 months of the year. On the inside, it shows the land, water, and sky over a full year. The pictures of plants, animals, and weather show the signs of changing events in nature. The pictures of people show when to do traditional and modern activities. Read this poster in a circle to see the cycle of the seasons. Spring is on the left, summer is on the bottom, fall is on the right, and winter is at the top.





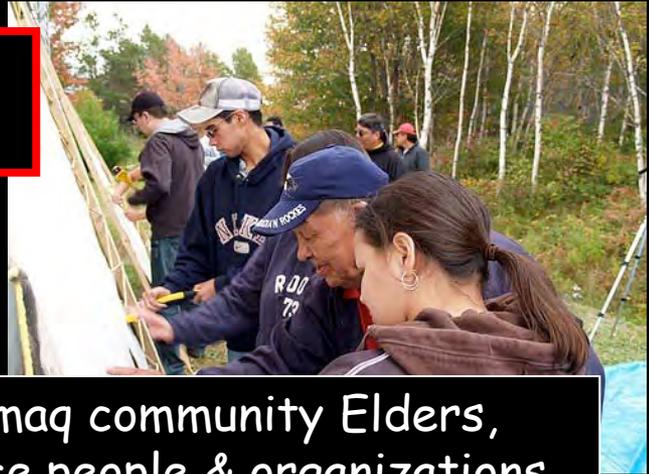
MSIT university science courses



MSIT content



1



Mi'kmaq community Elders, resource people & organizations, TK events in community



2

TK literature



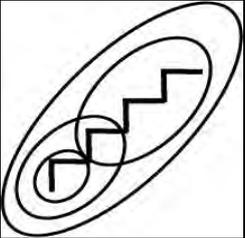
3

students out-of-doors

6

co-learning RESEARCH

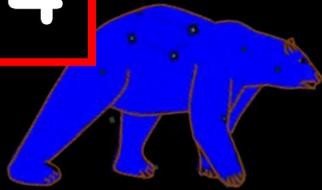
5



Western science: cosmology-physics-chemistry-geology-biology-consciousness

4

Aboriginal concepts, pedagogy, language



CANADIAN JOURNAL OF SCIENCE, MATHEMATICS
AND TECHNOLOGY EDUCATION, 9(3), 141-153, 2009
Copyright © DESI
ISSN: 1492-6156 print / 1942-8051 online
DOI: 10.1080/14926159903118342



Two-Eyed Seeing in the Classroom Environment: Concepts, Approaches, and Challenges

*Annamarie Hatcher and Cheryl Bartlett
Cape Breton University, Nova Scotia, Canada*

*Albert Marshall and Mardena Marshall
Mi'kmaq Nation Elders, Nova Scotia, Canada*

2009; Vol. 9(3): 141-153

CANADIAN JOURNAL OF SCIENCE, MATHEMATICS
AND TECHNOLOGY EDUCATION, 9(3), 141-153, 2009
Copyright © DESI
ISSN: 1492-6156 print / 1942-8051 online
DOI: 10.1080/14926159903118342



Two-Eyed Seeing in the Classroom Environment: Concepts, Approaches, and Challenges

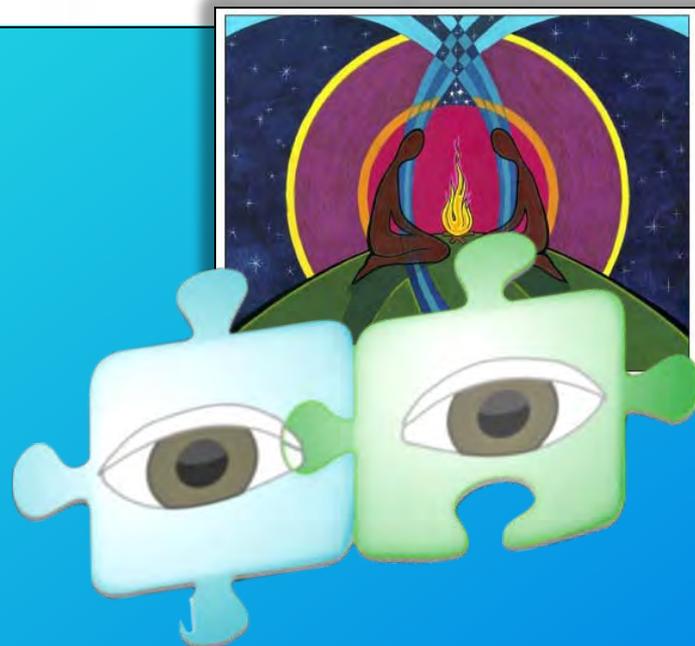
*Annamarie Hatcher and Cheryl Bartlett
Cape Breton University, Nova Scotia, Canada*

*Albert Marshall and Mardena Marshall
Mi'kmaq Nation Elders, Nova Scotia, Canada*

Abstract: This article outlines concepts and approaches for teaching Integrative Science (in Mi'kmaq: *Tapw'u'li Kji'liqatqot*) using the guiding principle of Two-Eyed Seeing, and it discusses challenges that need to be overcome. This discussion is based on the almost 10 years of experience delivering Integrative Science to students at Cape Breton University. Integrative Science is the interface between Indigenous Sciences (at Cape Breton University guided by eastern Canadian Mi'kmaq traditions) and Western Sciences where one does not have to relinquish either position but can come to understand elements of both. Western scientists seek to understand how the Universe works. The basic premise of Indigenous Sciences is participating within nature's relationships, not necessarily deciphering how they work. The Two-Eyed Seeing approach used in Integrative Science seeks to avoid knowledge domination and assimilation by recognizing the best from both worlds. Integrative Science in the classroom relies on a holistic transdisciplinary curriculum firmly based in place. Crucial elements include a colearning philosophy, connection with culture and community, a psychologically safe classroom, and Aboriginal pedagogy.

Résumé: Cet article présente brièvement les concepts et approches qui se fondent sur le principe de la « vision à deux yeux » en enseignement des Sciences Intégrées (dans la langue micmaque: *Tapw'u'li Kji'liqatqot*), et analyse les défis à relever dans ce domaine. L'analyse se base sur l'expérience du programme de Sciences Intégrées de l'Université du Cap Breton, mis en place il y a près de dix ans. Les Sciences Intégrées sont une sorte d'interface entre les sciences autochtones (qui à l'Université du Cap Breton se rattachent aux traditions Micmaques de l'est du Canada) et les Sciences Occidentales, perspective selon laquelle il n'est pas nécessaire de renoncer à l'une ou l'autre position car il est possible d'embrasser des éléments des deux. Les scientifiques du monde occidental cherchent à comprendre comment fonctionne l'univers, tandis que le principe de base des sciences autochtones est la participation aux relations qui existent dans le monde naturel, sans qu'il soit nécessaire de déchiffrer son fonctionnement. La « vision à deux yeux » qui est utilisée dans le programme de Sciences Intégrées cherche à éviter la domination et l'assimilation grâce à une reconnaissance du meilleur des deux mondes. Dans la salle de classe, ce programme se fonde sur un curriculum solide, holistique et transdisciplinaire, dont les éléments principaux sont entre autres une philosophie

Address correspondence to Annamarie Hatcher, Research Consultant, Institute for Integrative Science and Health, Cape Breton University, P.O. Box 5300, Sydney, N.S., Canada B1P 6L2. E-mail: annamarie_hatcher@cbu.ca



Fall 2009: article titles

Linking Astronomy and Legend
Resanctifying Nature through Story
Teaching Solstices and Equinoxes

Vitamin C Trees: Traditional Medicine
Integrative Science with Native Elders
Earth Alive! Ecosystem Deities



Green Teacher

EDUCATION FOR PLANET EARTH \$7.95

Fall 2009 Issue 86

Two-Eyed Seeing: Integrative Science

The cover illustration depicts a classroom scene on the left where children are engaged in learning. One child uses a telescope, another a laptop, and a globe is visible. On the right, the scene transitions to a forest where a child interacts with a bear, and another child is near a stream. The overall theme is the integration of science and nature.

Vitamin C Trees: Traditional Medicine **Linking Astronomy and Legend**
Integrative Science with Native Elders **Resanctifying Nature through Story**
Earth Alive! Ecosystem Deities **Teaching Solstices and Equinoxes**

92
1527492478
ISSN 1527-4924
06062230

Green Teacher

EDUCATION FOR PLANET EARTH

\$7.95

Fall 2009

Issue 86

Two-Eyed Seeing: Integrative Science

Two-Eyed Seeing: A cross-cultural science journey



By Annmarie Hatcher, Cheryl Bartlett,
Murdena Marshall and Albert Marshall

represents the coming together of Indigenous and Western sciences in a type of co-existence, a functioning of both systems side by side, as recommended by Battiste.³ This bridge building began as a way to address the serious under-



Green Teacher

EDUCATION FOR PLANET EARTH

\$7.95

Fall 2009

Issue 86

Two-Eyed Seeing: Integrative Science

MS+T: Transdisciplinary, cross-cultural science

An Integrative Science unit on birds for high school students



Ray Crone



By Annamarie Hatcher and Cheryl Bartlett

Seeing" approach of integrating Western and Aboriginal world views. The classroom mirrors the world outside the

Green Teacher

EDUCATION FOR PLANET EARTH

\$7.95

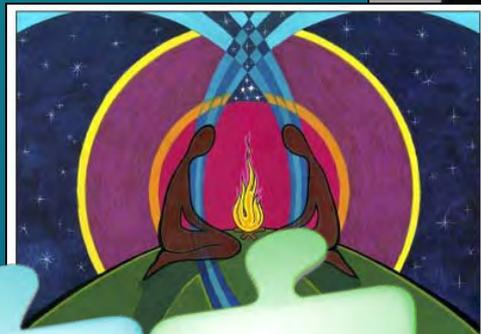
Fall 2009

Issue 86

Two-Eyed Seeing: Integrative Science

Traditional Medicines: How much is enough?

An integrative science activity for senior elementary and junior high students



By Annamarie Hatcher and Cheryl Bartlett



Photographs: Shaun Johnson

resins and essential oils. However, conifer needles contain other compounds that are toxic if consumed in large quantities. These compounds are not suitable for medicinal use.

Green Teacher

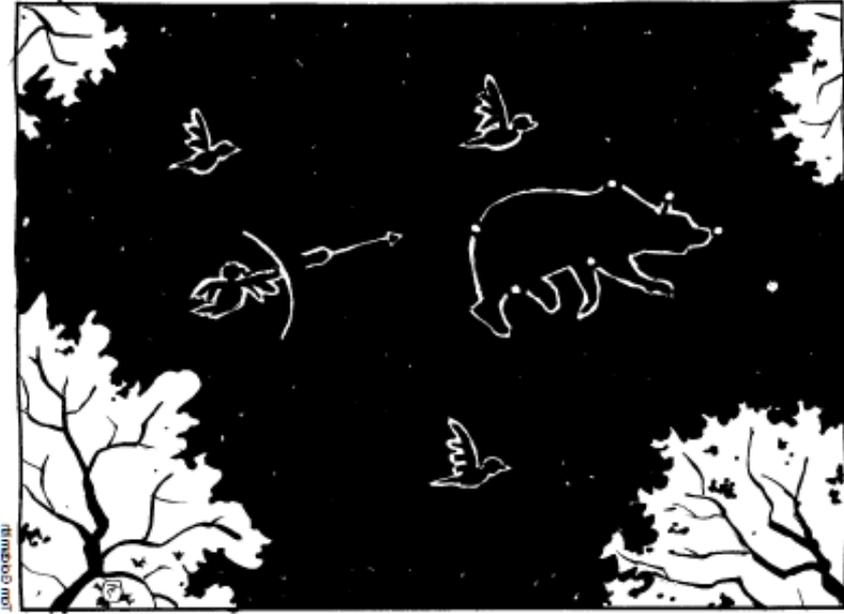
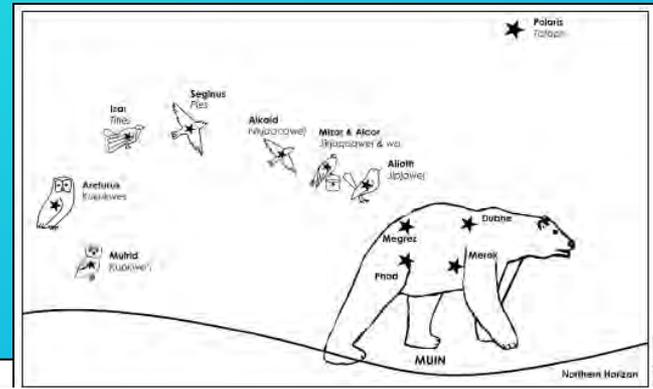
EDUCATION FOR PLANET EARTH

\$7.95

Fall 2009

Issue 86

Two-Eyed Seeing: Integrative Science



Traditional Legends: Meanings on many levels

A lesson in astronomy and storytelling for high school students

By Annamarie Hatcher, Sana Kavanagh,
Cheryl Bartlett and Murdena Marshall

or *Kukukwee*; and little Saw-whet Owl, or *Kupkwee*). *Muin's* den is what others know as Corona Borealis.

Green Teacher

EDUCATION FOR PLANET EARTH

\$7.95

Fall 2009

Issue 86

Two-Eyed Seeing: Integrative Science

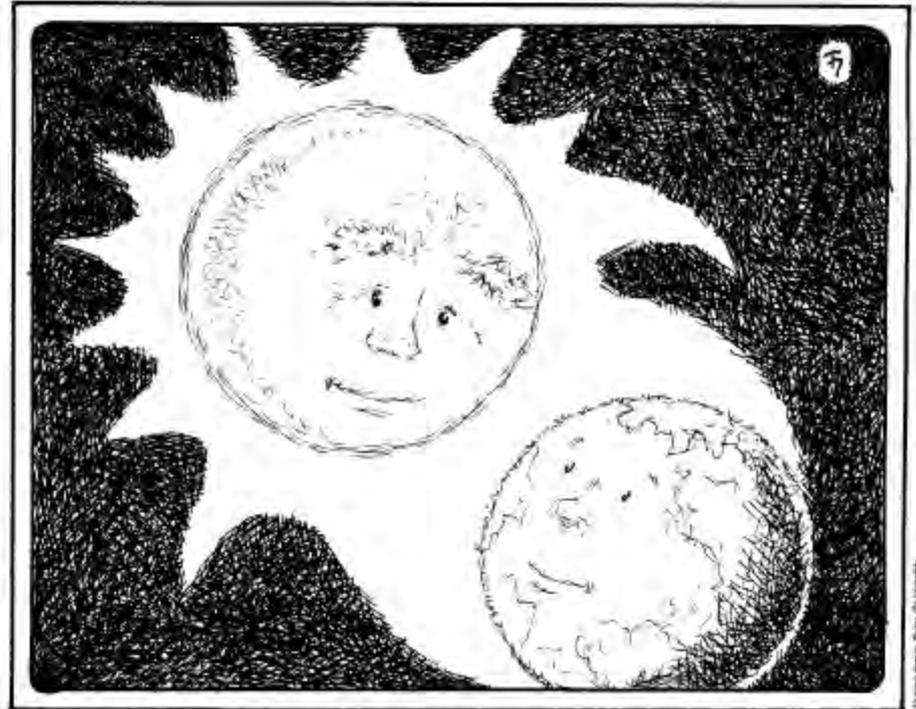
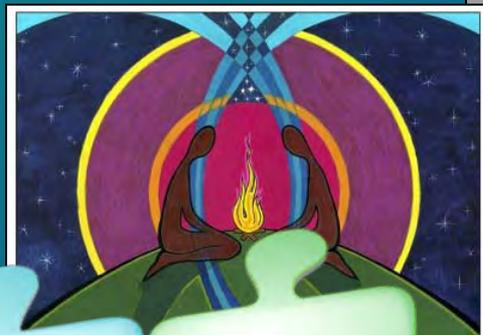


Illustration: Tom O'Saugh

Mother Earth, Grandfather Sun

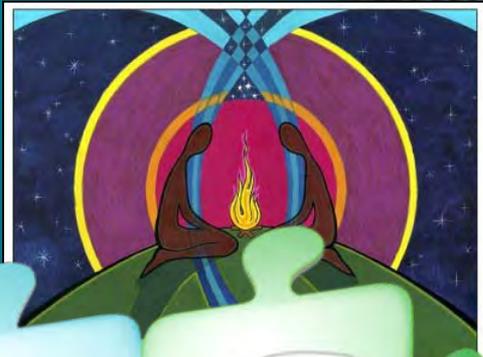
A "two-eyed seeing" activity that integrates Western and Aboriginal world views in teaching about solstices and equinoxes

By Cheryl M. Bartlett

Sun — and thereby enable him to see the Earth (Mother Earth). The exercise also provides an experiential founda-



Wela'liog
Thank you





Canada Research
Chairs

Chaires de recherche
du Canada

Canada
Canada



Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
sciences humaines du Canada

Thank you / Wela'liog

IAPH



Canada Foundation
for Innovation

Fondation canadienne
pour l'innovation



Membertou
Elementary

CIHR IRSC

Canadian Institutes of
Health Research Instituts de recherche
en santé du Canada



NSERC
CRSNG



Mi'kmawey Debert



IWK Health Centre
Foundation



Mermaid Theatre
of Nova Scotia



Eskasoni First Nation Detachment
Royal Canadian Mounted Police Gendarmerie royale
du Canada



Mi'kmaq College Institute
Mi'kmaq Espi Kina'matno'kuom

The support of various
partners and funding agencies
is gratefully acknowledged.