

SFU

SIMON FRASER UNIVERSITY
THINKING OF THE WORLD

10 February 2009; Burnaby Campus

We can have a “Two-Eyed Seeing” conversation, yes?

Cheryl Bartlett, PhD

Canada Research Chair in Integrative Science

Professor of Biology, Sydney, Nova Scotia

**CAPE BRETON
UNIVERSITY**



UNIVERSITY-WIDE PRESENTATION: We can have a “Two-Eyed Seeing” conversation, yes? (abstract)

Integrative Science is defined as “bringing together Indigenous and Western scientific knowledges and ways of knowing” for the purposes of science education, research, applications, and outreach to Aboriginal youth and community. It was created at Cape Breton University in Sydney, Nova Scotia, in the mid-1990s as the radical innovation that Mi’kmaw First Nation individuals suggested would be required to begin to address the shocking under-participation by their people in university science programs and thus also in careers that require such education. The presentation will discuss challenges that experience has shown Integrative Science can pose both inside and outside the mainstream. “Two-Eyed Seeing” is an important guiding principle in this regard. It encourages that we learn to see from our one eye with the best in (or strengths of) the Indigenous sciences and from our other eye with the best in (or strengths of) the Western sciences ... and that we learn to use these two eyes together, for the benefit of all.

Two vibrant parrots, likely Sun Conures, are perched on a weathered wooden branch. They have bright yellow-orange heads and chests, with green wings and backs. They are facing each other, with their beaks slightly open, suggesting a conversation. The background is a solid black color.

**We can have a “Two-Eyed Seeing”
conversation, yes?**

**We (scientists) can dialogue with other
cultures re our knowledges about nature.**

Two vibrant parrots, likely Sun Conures, are shown in profile, facing each other as if in conversation. They have bright yellow and orange heads and chests, with green wings and backs. The background is dark, making the birds stand out.

**We can have a “Two-Eyed Seeing”
conversation, yes?**

The program of my Canada Research Chair in Integrative Science serves an overall two-fold, long-term goal: to help Aboriginal individuals and Indigenous knowledges become increasingly and actively involved in science in the 21st century AND to help mainstream science better engage with Indigenous knowledges and ways of knowing.

We (scientists) can dialogue with other cultures re our knowledges about nature.



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

Mi'kmaq Elders



CIHR IRSC

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



NSERC
CRSNG

Canada Foundation
for Innovation

Fondation canadienne
pour l'innovation



Mi'kma'wey Debert



Membertou
Elementary



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.

Integrative Science

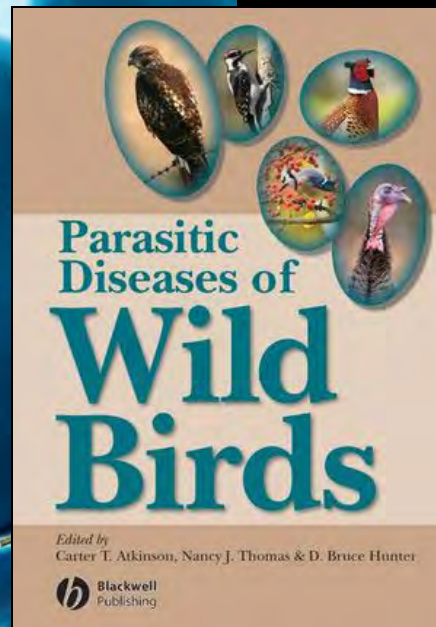
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Indigenous

Western

“bringing our sciences together”

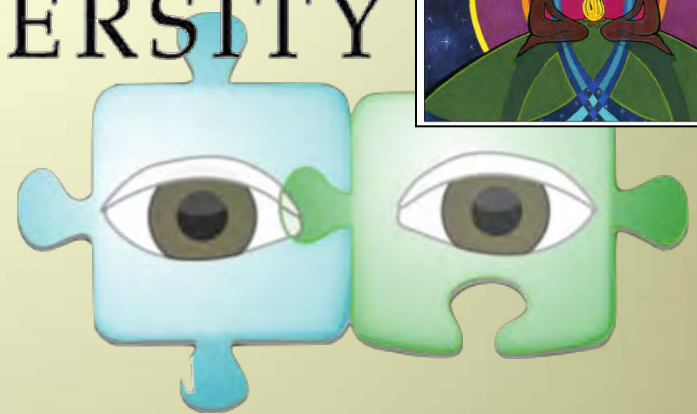
image from: <http://jan.ucc.nau.edu/~rcb7/namPres.jg>





Integrative Science (arenas of action)

- science education
(post-secondary)
- science research
- science applications
- science outreach
(youth & community)





Challenges

- conceptual (science?)
- political (systemic racism? +?)
- jurisdictional (whose program?)
- structural (what kind of program?)
- financial (resources?)
- instructional (who can / should?)
- physical (where?)
- pedagogical (how?)
- recruitment (who and how?)
- audience (whose interests / needs?)
- pragmatic (within context of students' lives?)
- definitional (what is "success"?)
- pragmatic (graduates do what?)
- capacity development (how nurture & make sustainable?)





Challenges

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Challenges

conceptual (science?)

- political (systemic racism? +?)
- ~~jurisdictional (whose program?)~~

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pedagogical (how?)

- ~~recruitment (who and how?)~~
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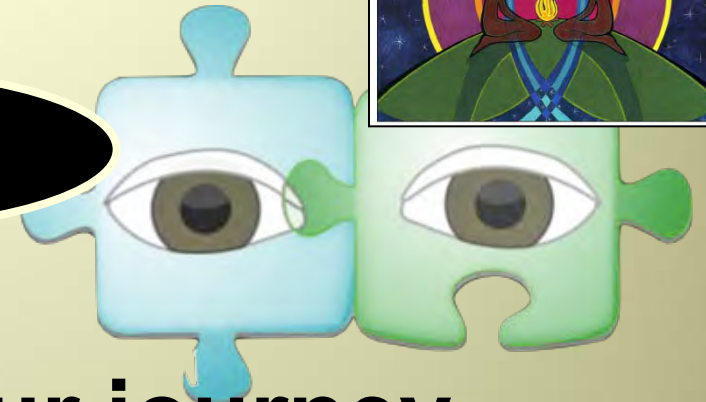


definitional (what is "success"?)

- pragmatic (graduates do what?)
- capacity development (how nurture & make sustainable?)

Indigenous

Western



**≈ 15 years: where our journey
has been and continues to be ...**

Integrative Science

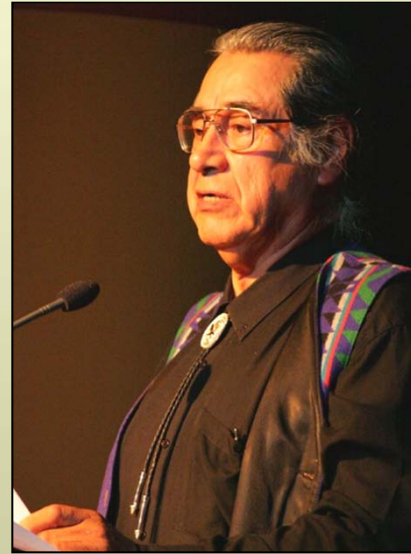
**bringing together Indigenous and Western
scientific knowledges and ways of knowing**

Elders, Mi'kmaq Nation



Murdena Marshall

Lillian Marshall



**Albert
Marshall**

**Jane
Meader**



Elders, Mi'kmaq Nation

and other
**Knowledge
Holders**

plus various
**Knowledge
Gatherings**



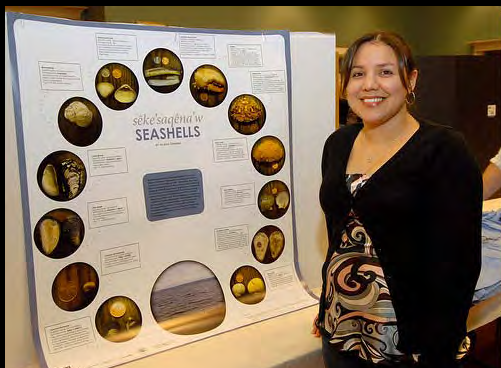
Mi'kmawey Debert



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



Students, Mi'kmaq Nation



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.



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.

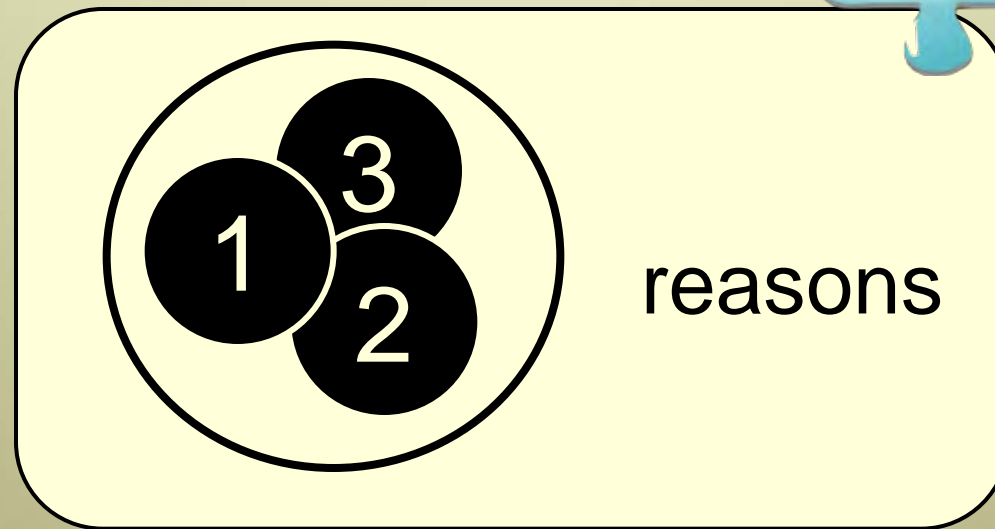


praxis

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

methodologies

WHY did we start a Co-Learning Journey?

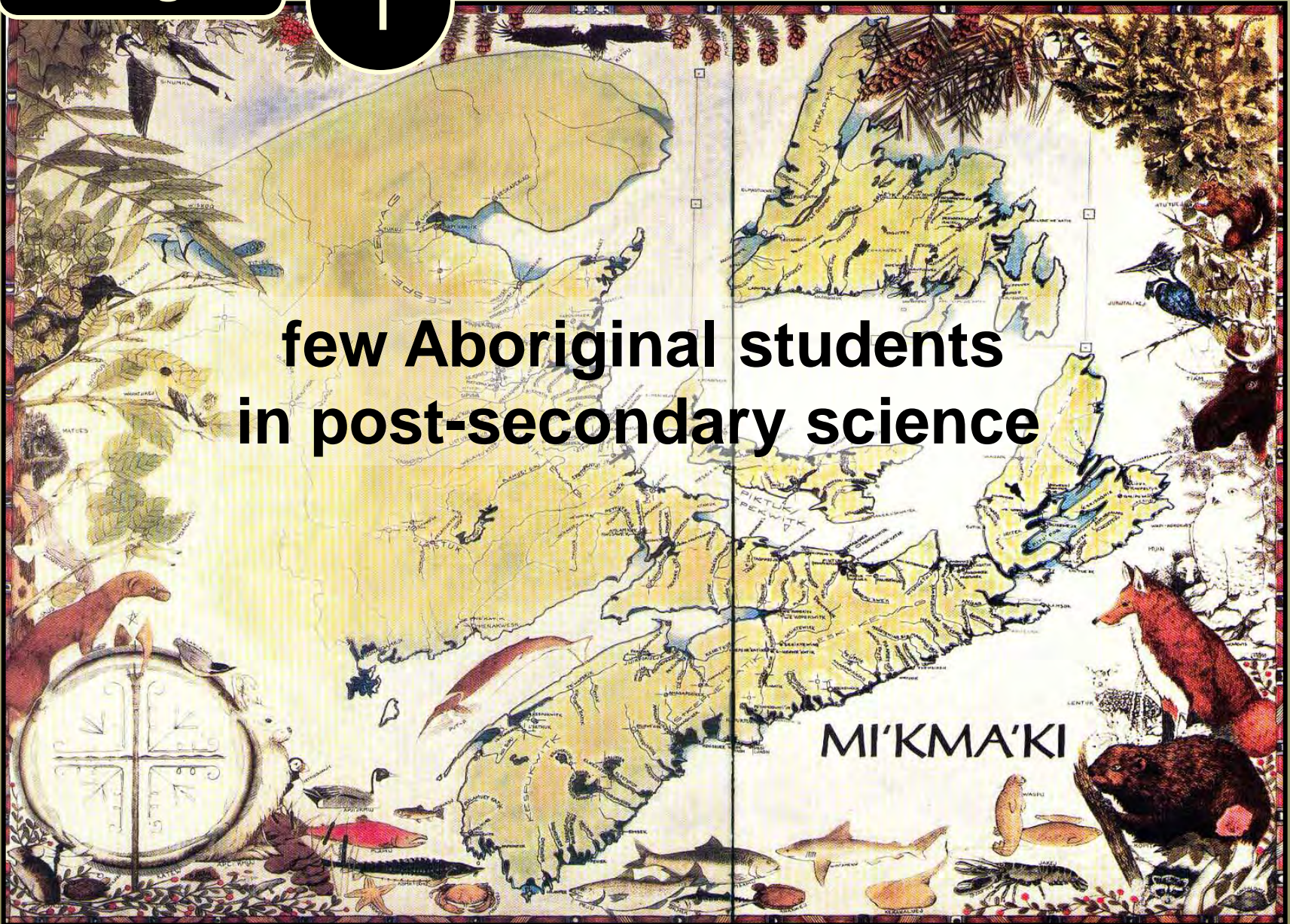


Why?

1

visual: Confederacy of Mainland Mi'kmaq

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



Why?

2



many Aboriginal youth



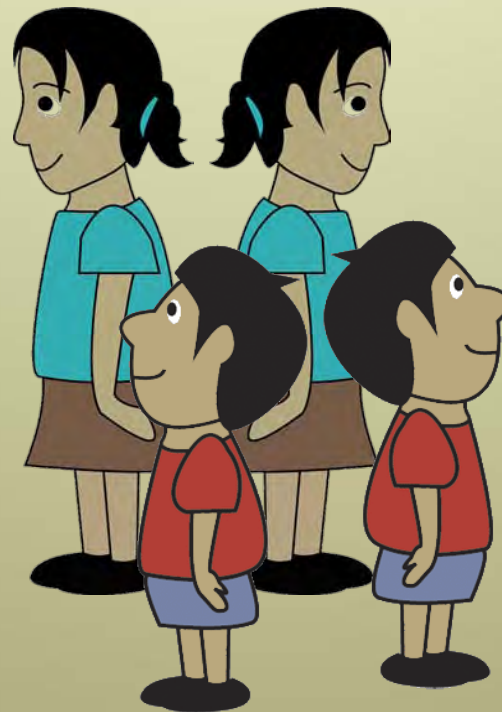
Why?

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



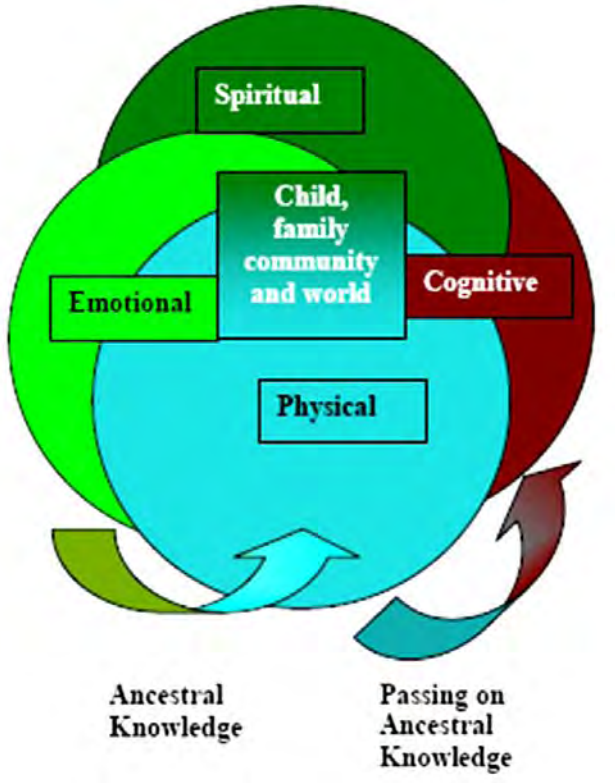
Why?

2

Because ...

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

(source: Elders & others)



Western

visual from: CINDY BLACKSTOCK
<http://www.win-hec.org/docs/pdfs/cindy.pdf>

(WIN-HEC Journal 2007)

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 and continues**



Integrative Science

**bringing together Indigenous and Western
scientific knowledges and ways of knowing**

Indigenous

Western

starting in the mid 1990's

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



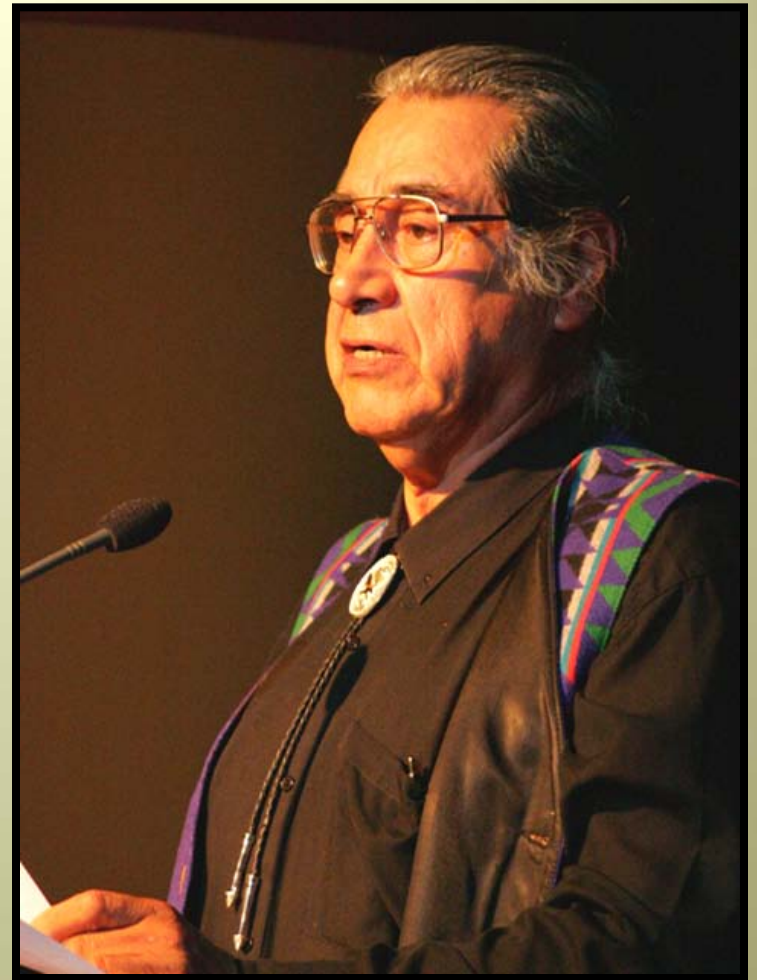
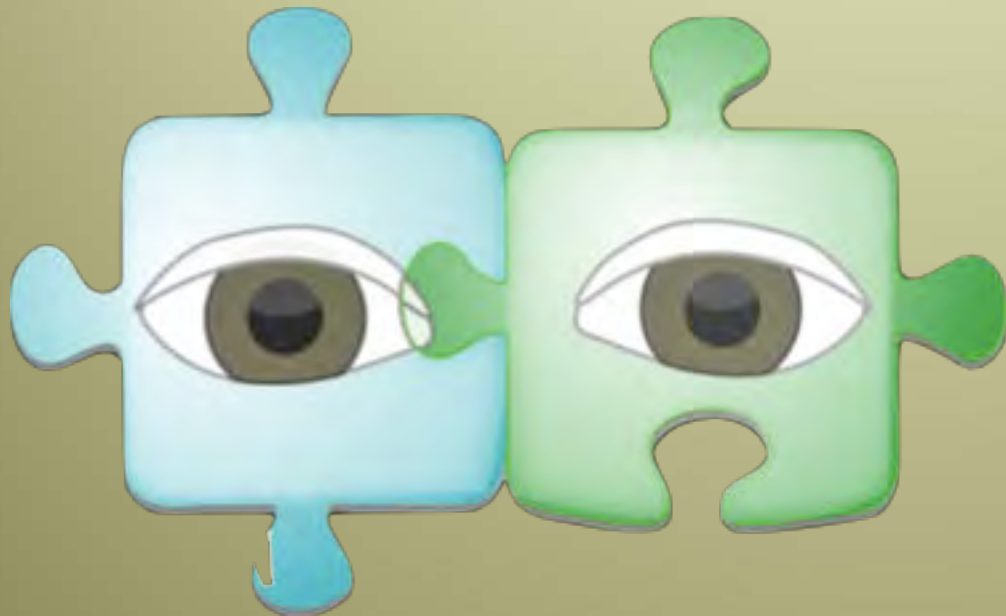
Integrative Science

bringing together Indigenous and Western
science and ways of knowing



Western

Two-Eyed *Seeing*



**Elder Albert Marshall
Eskasoni community, NS
Mi'kmaq Nation**

A Guiding Principle

“LEARN ... 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 (or Eurocentric or mainstream) knowledges and ways of knowing ... and to use both these eyes together, for the benefit of all.”





“Two-Eyed Seeing”

We can have a conversation, yes?

The breath of life versus the embodiment of life: Indigenous knowledge and western research

WIN-HEC Journal 2007 (World Indigenous Nations – Higher Education Consortium)

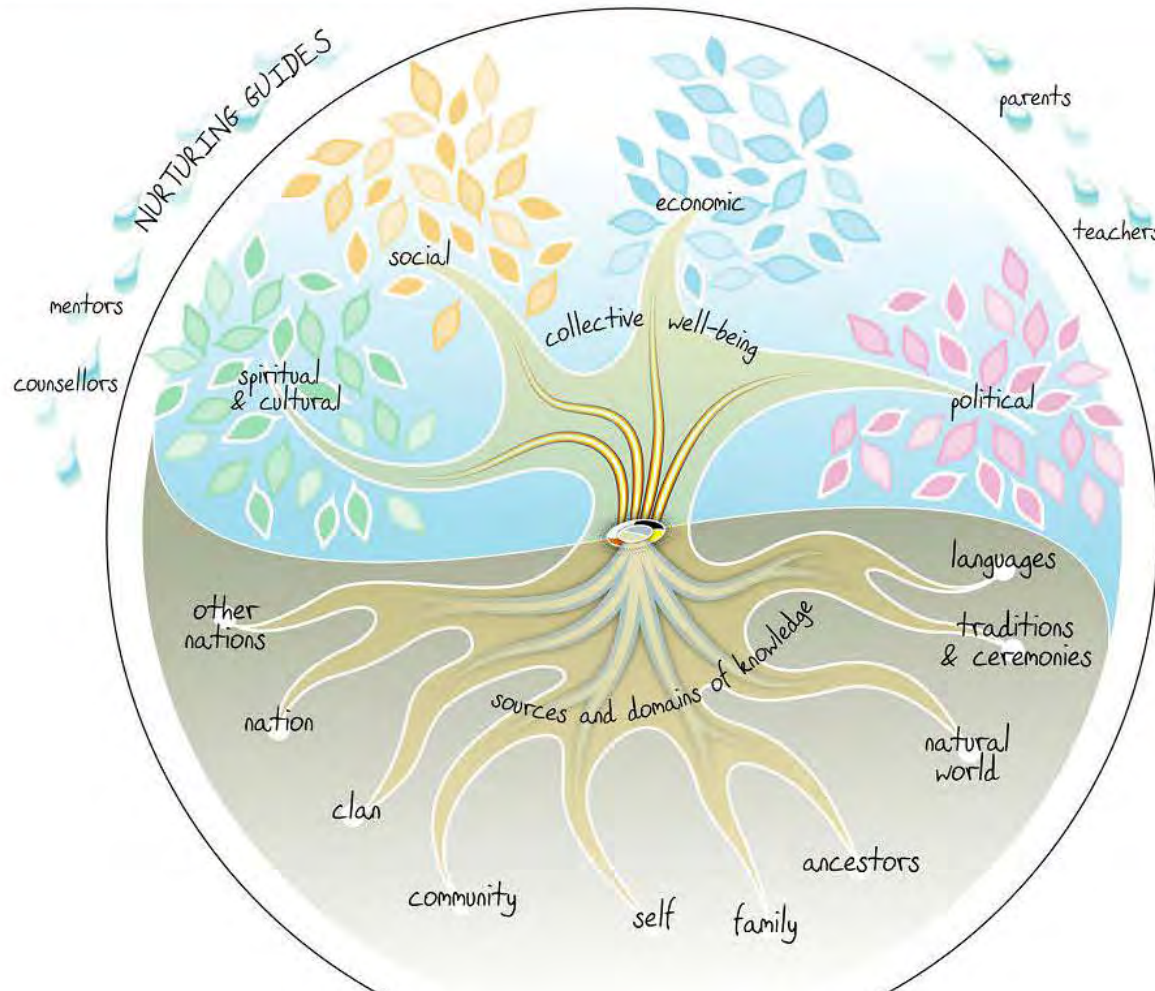
CINDY BLACKSTOCK <http://www.win-hec.org/docs/pdfs/cindy.pdf>

Executive Director, First Nations Child and Family Caring Society of Canada

We can have a “Two-Eyed Seeing” conversation, yes?

FROM BLACKSTOCK: Despite the diversity of Aboriginal cultures, there are several common fundamental differences between Aboriginal and western epistemologies¹⁾ Aboriginal peoples believe their ancestors were right on most things and western peoples: believe their ancestors were either mostly wrong or their ideas could be improved upon (Assembly of First Nations, 1993; Auger, 2001), 2) Aboriginal peoples believe they hold the land and life knowledge in a sacred trust for the generations to follow whereas many western peoples believe they can own land and knowledge and use it for individual benefit with little concern for future generations (RCAP, 1996; Pinto, in press), and 3) Aboriginal knowledge is situated within more expansive concepts of space and time (Auger, 2001). From these differences, flow very different concepts.

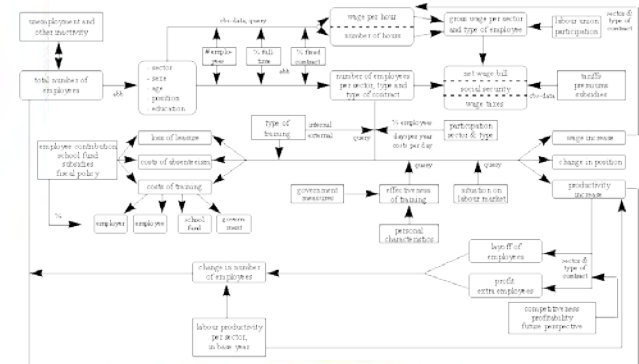
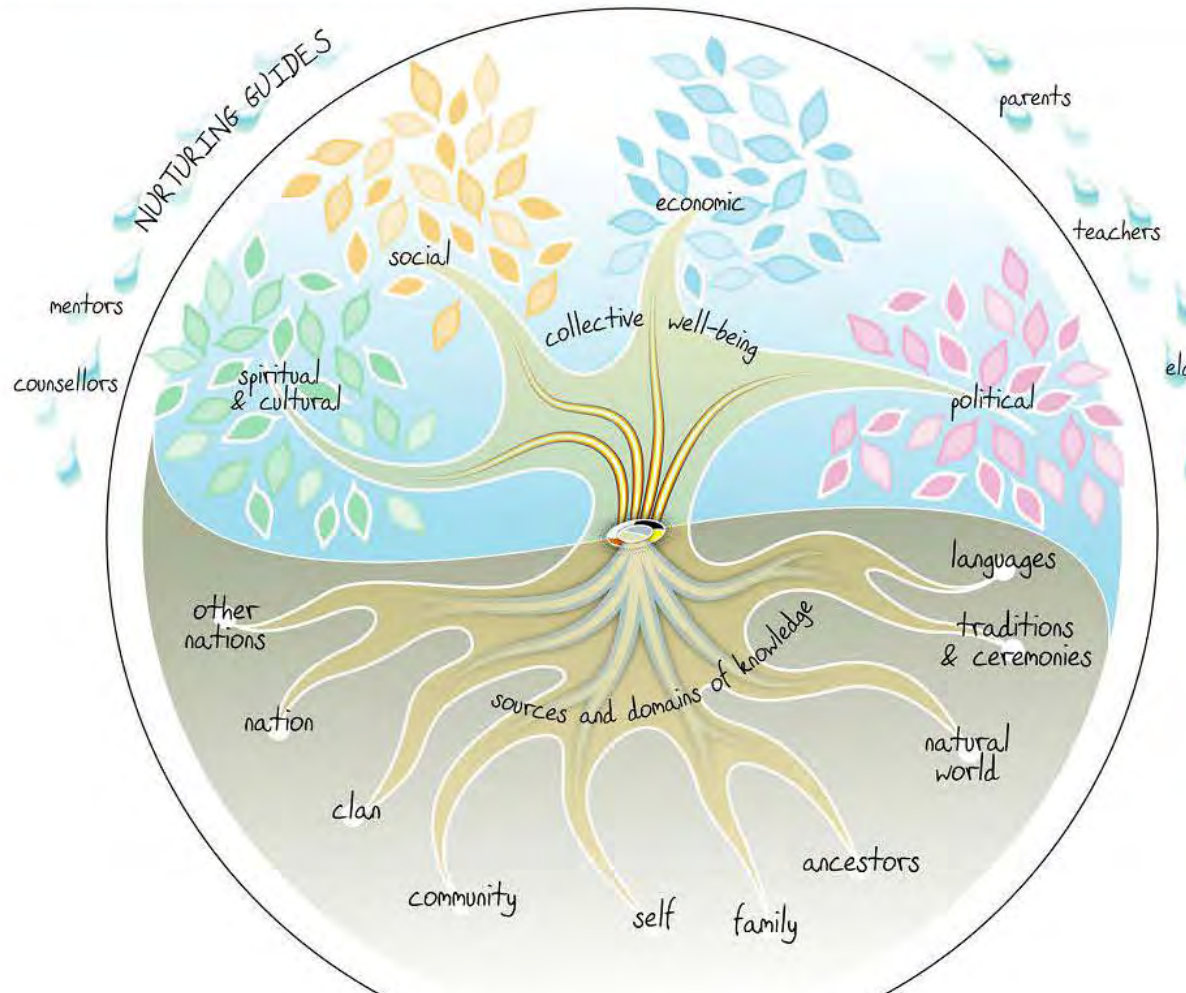
We (scientists) can dialogue with other cultures re our knowledges about nature.



First Nations Holistic Lifelong Learning Model

from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

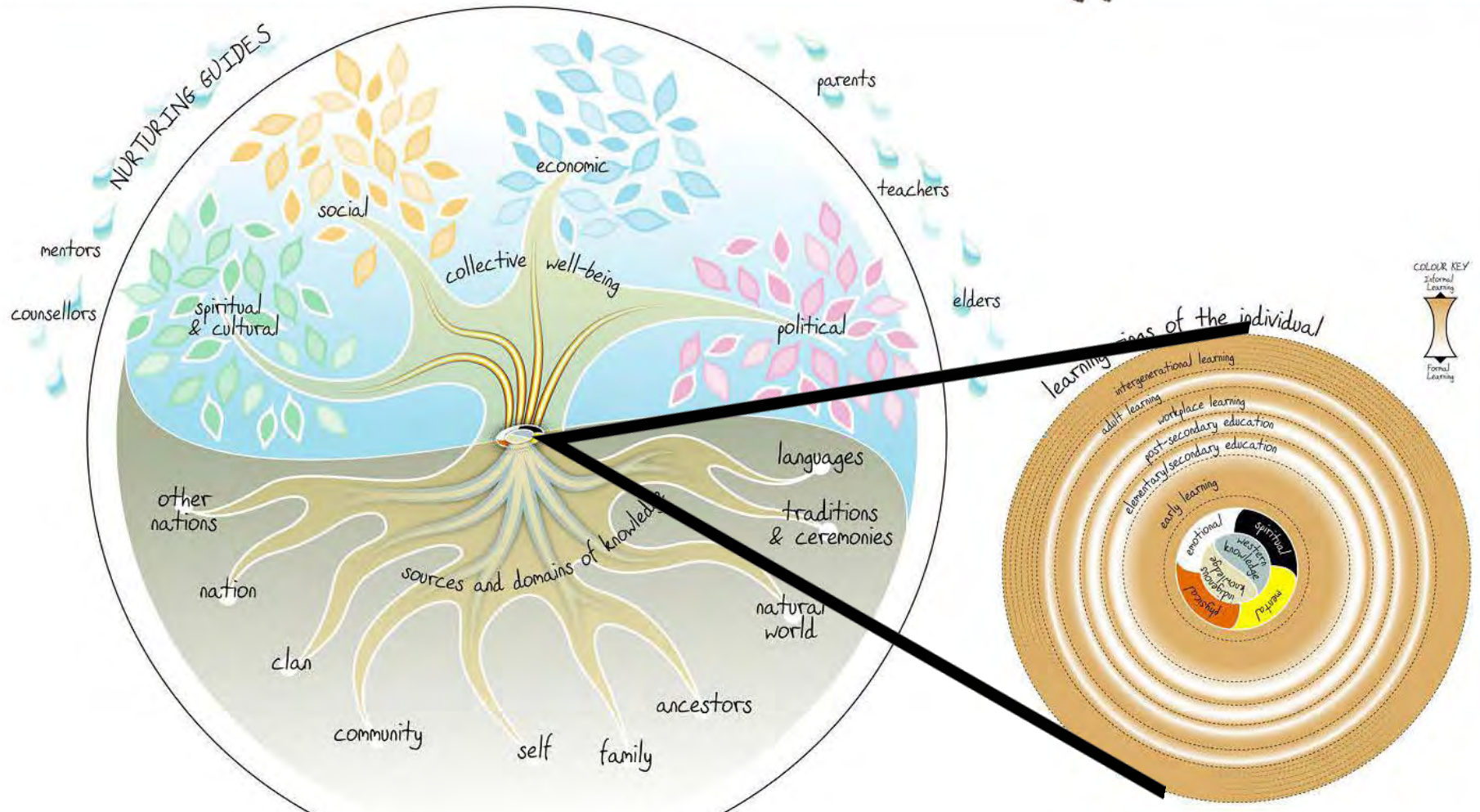
(www.ccl-cca.ca/CCL)



First Nations Holistic Lifelong Learning Model

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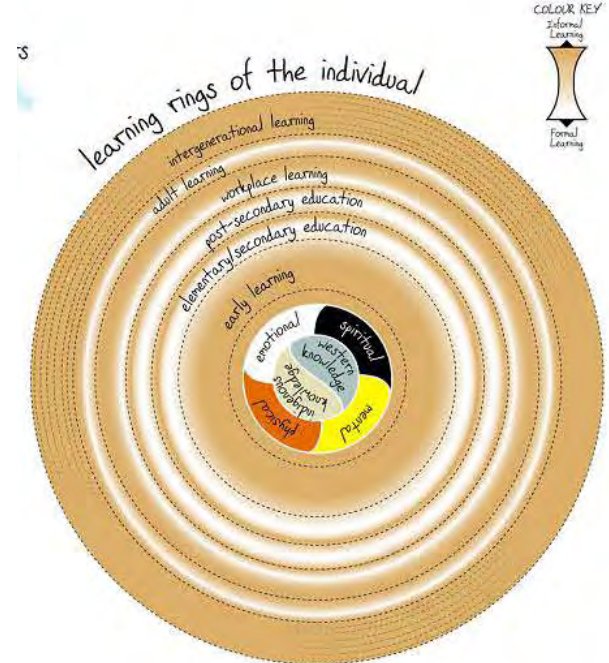
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First Nations Holistic Lifelong Learning Model

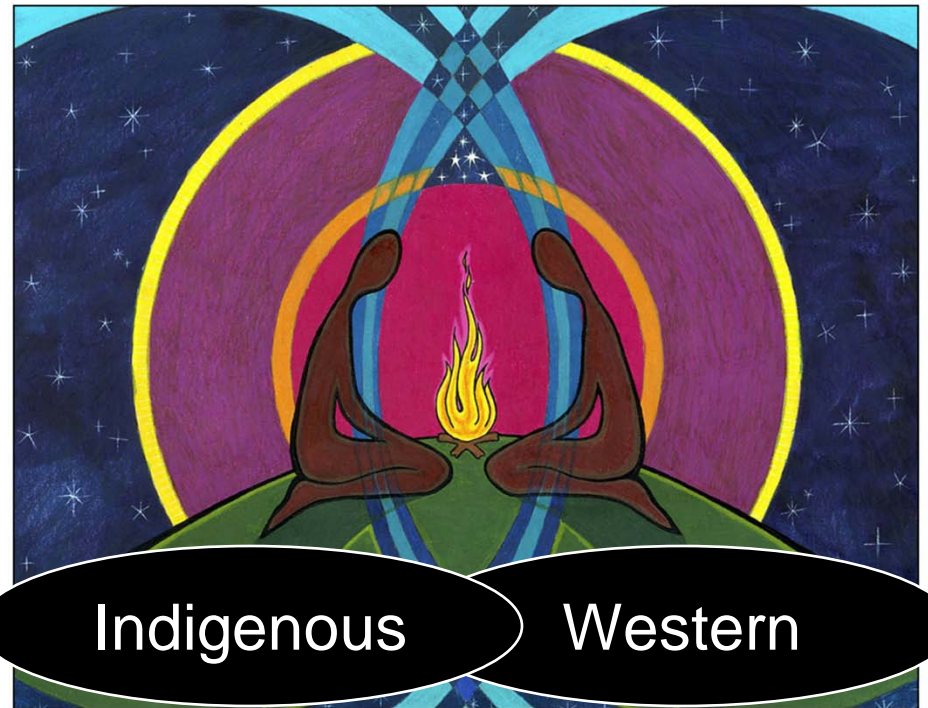
from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

www.ccl-cca.ca/CCL



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Integrative Science



First Nations Holistic Lifelong Learning Model

from: Canadian Council on Learning: Aboriginal Learning Knowledge Centre

www.ccl-cca.ca/CCL

How?



PART 1) Innovative program structure

- degree profile
 - 40 courses (120 credits)
 - 2 work placements (non credit)
- conventional courses: 32 of 40
- innovative courses: 8 of 40

PART 2) Innovative courses (MSIT)

- integrative framework
- curricular components
- pattern recognition & transformation

How?

integrative framework

"integrative"

both Indigenous & Western, plus:

- **role of me and you in "the knowing"**
 - esp. patterns: recognition & transformation
- **our common ground**
- **our differences**
- **our journey forward, together**

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



How?

education

lived | book-based

spirituality

central | absent

emphasis

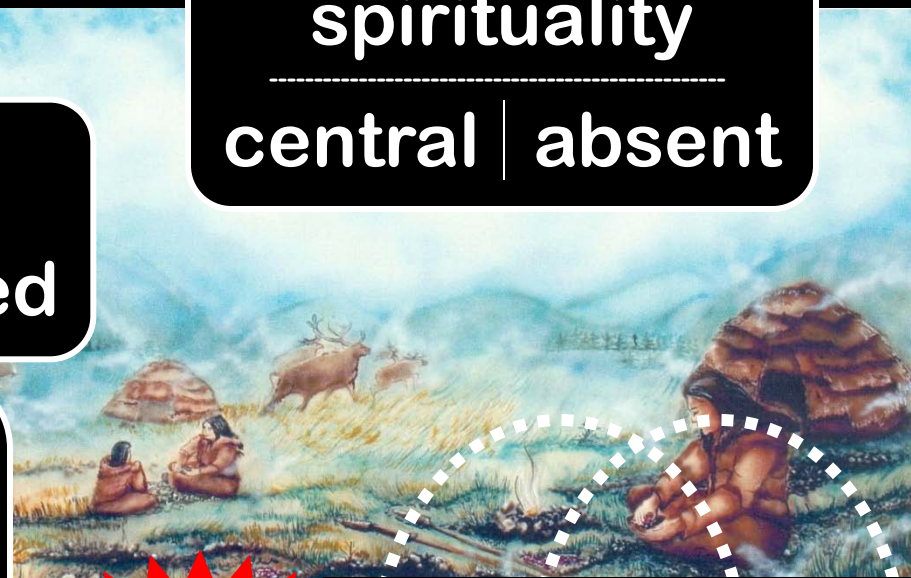
change
wholeness | parts
balance

1st

(unique)

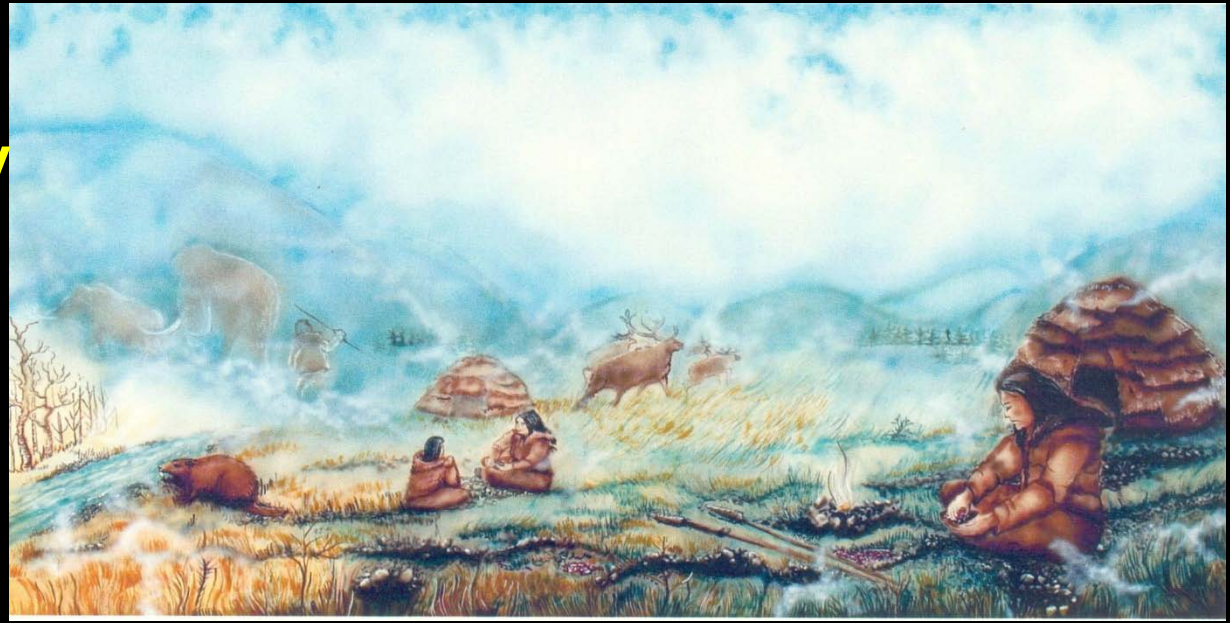
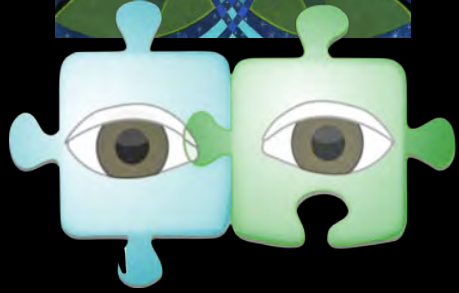
challenges!

today's students
exceedingly familiar with
entertainment technology,
but not with nature



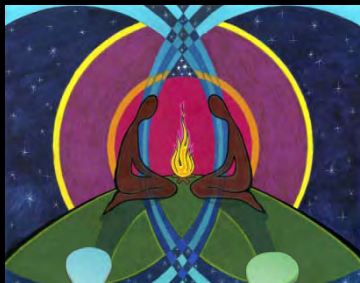
How?

21st Century



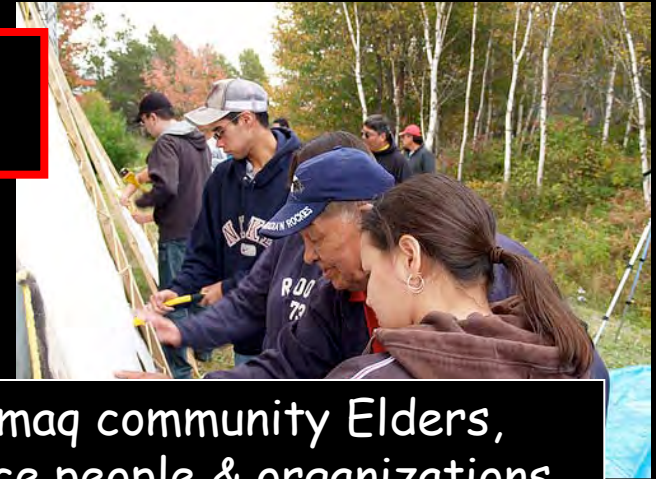
How?

21st Century



How?

1



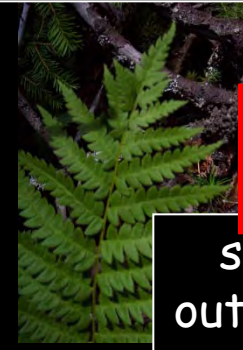
Mi'kmaq community Elders, resource people & organizations, TK events in community

2



TK literature

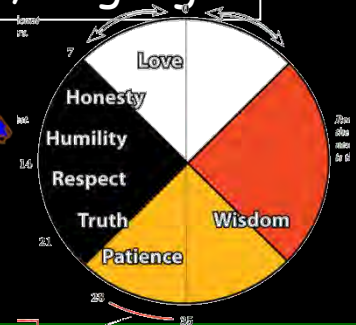
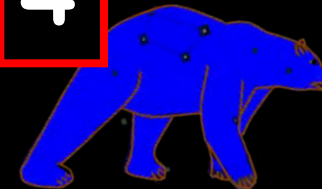
3



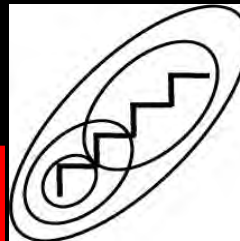
students out-of-doors

Aboriginal concepts, pedagogy, language

4

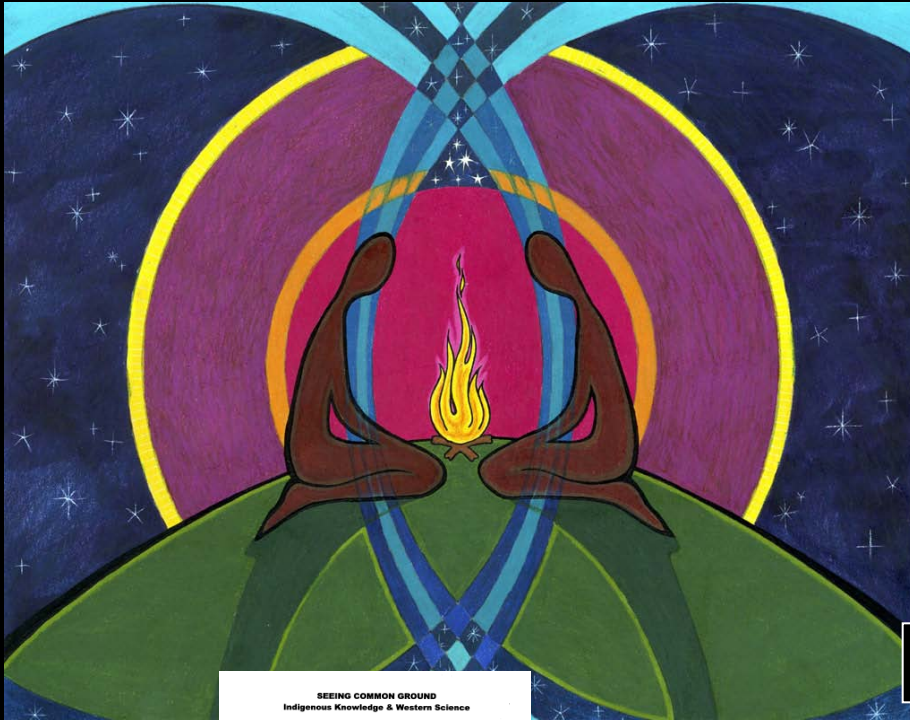
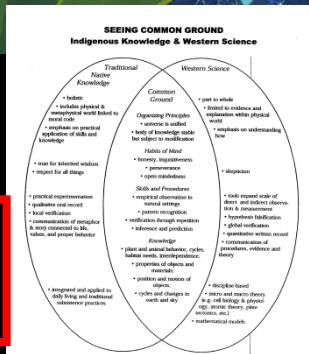


5



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

6



How?

Handbook for
culturally responsive
science curriculum;
S. Stephens, 2000;
U of Alaska

COMMON
GROUND



6



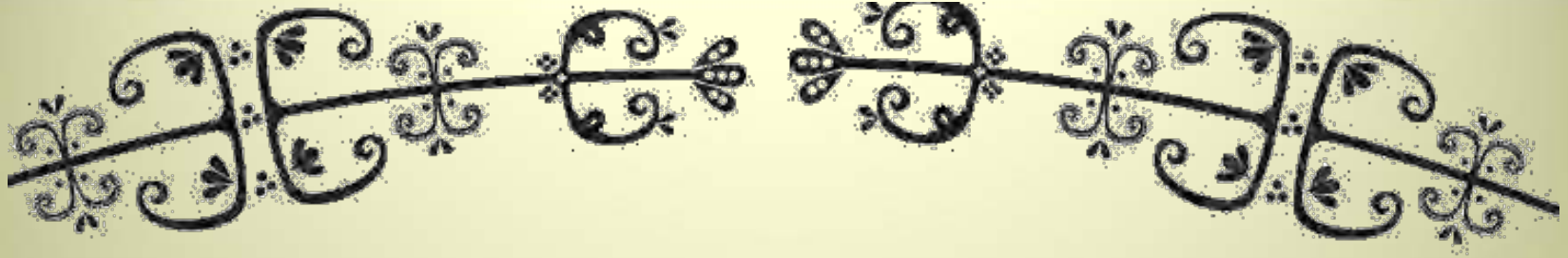
pattern recognition

How?

conceptual



Science



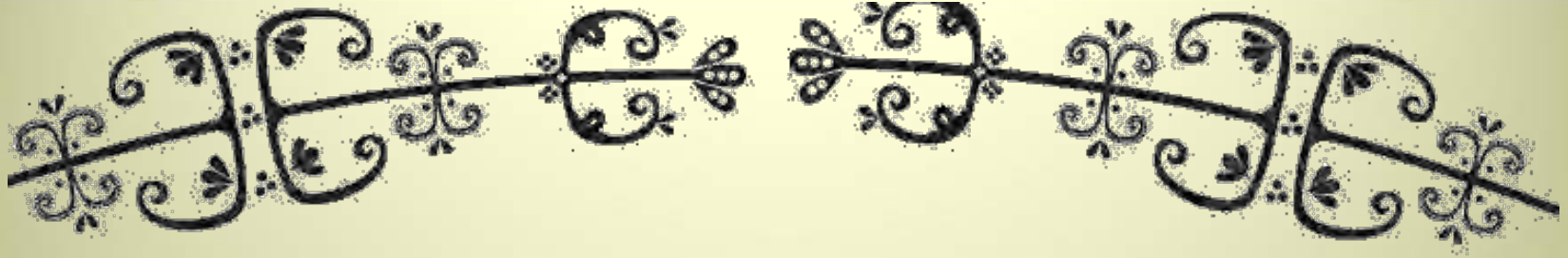
***Indigenous and Western
scientific knowledges are
based in observations
of the natural world.***



Science?



view "SCIENCE"
inclusively



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.



stories of our interactions with and within nature

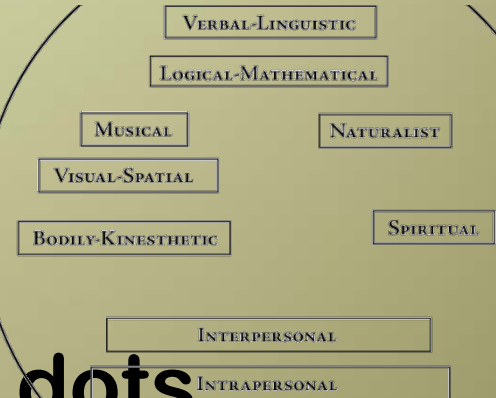
Science



pattern

- recognition
- transformation
- expression

Multiple Intelligences
(Howard Gardner)



• pattern smarts

- various ways to connect the dots
- variety in our stories

A profound realization is that Canada's most significant natural resource is human creativity.

(Peter Hackett, CEO and President of Alberta Ingenuity)



**A profound realization is that
Canada's most significant natural
resource is human creativity.**

(Peter Hackett, CEO and President of Alberta Ingenuity)

**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 National Science Advisor to PM)

(2000 Conference on Creativity in the Arts and Sciences)



pattern recognition, breaking, reshaping

4 “BIG PATTERN” UNDERSTANDINGS

Two-Eyed Seeing
learning to see with the strengths of each & together
OUR WORLDS

ontologies

Two-Eyed Seeing
learning to see with the strengths of each & together
OUR KEY CONCEPTS and ACTIONS

epistemologies

Two-Eyed Seeing
learning to see with the strengths of each & together
OUR LANGUAGES and METHODOLOGIES

methodologies

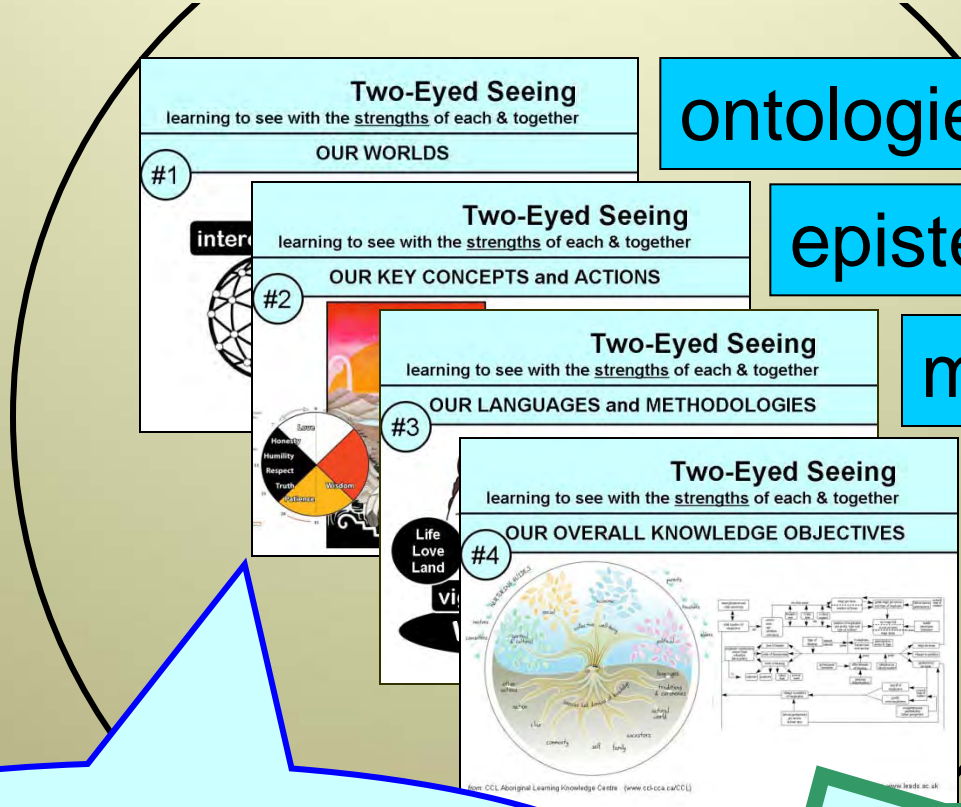
Two-Eyed Seeing
learning to see with the strengths of each & together
OUR OVERALL KNOWLEDGE OBJECTIVES

goals

put our *values + actions*
+ knowledges in front of
us ... like an object

use **VISUALS**

LANGUAGE



How?

structural

Bachelor of Science Community Studies

Degree Profile for:
**Toqwa'tu'kl Kjjitaqnn /
Integrative Science**

Bringing Knowledges Together
... from Western scientific and Aboriginal world views



Degree Core (48 credits)

- 1) _____ PCS 100: Analysis and Decision Making (6 credits)
- 2) _____ PCS 200: Applied Research (6 credits)
- 3) _____ PCS 300: Community Intervention (6 credits)
- 4) _____ science and technology perspectives (6 credits): Phil 222, or equivalent
- 5) _____ world views and values (3 credits): Phil 251, Phil 253, or equivalent
- 6) _____ Aboriginal perspectives (3 credits): Mikm at 100 or 200 level, or 361, or equivalent
- 7) _____ business perspectives (3 credits): Buss 111, Buss 231, or equivalent
- 8) _____ public communication (3 credits): Comm 103, Comm 105, or equivalent
- 9) _____ effective writing (6 credits): Engl 100, Engl 205 + Engl 207, or equivalent
- 10) _____ computer literacy (3 credits): Phil 115, Comp 102 or 111, Buss 181, or equivalent
- 11) _____ statistics (3 credits): Math 135, Math 335, Buss 182, Psych 201, or equivalent

Science Area of Concentration (42 credits)

- | | |
|--|--|
| <p>a) <u>University</u> (8 courses)</p> <ol style="list-style-type: none"> 1) 3 credits: MSIT 101 2) 3 credits: MSIT 103 3) 3 credits: MSIT 201 4) 3 credits: MSIT 203 5) 3 credits: MSIT 301 6) 3 credits: MSIT 303 7) 3 credits: MSIT 401 8) 3 credits: MSIT 401 | <p>b) <u>Technology</u> (6 courses)</p> <ol style="list-style-type: none"> 1 + 2) 6 credits: Chem 121 + 122 3 + 4) 6 credits: Math 131 + 132, or
Phys 100, or Phys 111 + 112 5 + 6) 6 credits (at least 3 credits must be at 300 level):
- Geol 111
- any PubH at 200 level or higher
- any Envi at 200 level or higher |
|--|--|

Student's Electives (30 credits)

- | | |
|---|--|
| <ol style="list-style-type: none"> 1) 3 credits: _____ 2) 3 credits: _____ 3) 3 credits: _____ 4) 3 credits: _____ 5) 3 credits: _____ | <ol style="list-style-type: none"> 6) 3 credits: _____ 7) 3 credits: _____ 8) 3 credits: _____ 9) 3 credits: _____ 10) 3 credits: _____ |
|---|--|

Work Placements (paid or voluntary, each at least 120 hours)

- 1) _____
- 2) _____

An overall average of 60% (in courses over your four years) is required for graduation.



Science

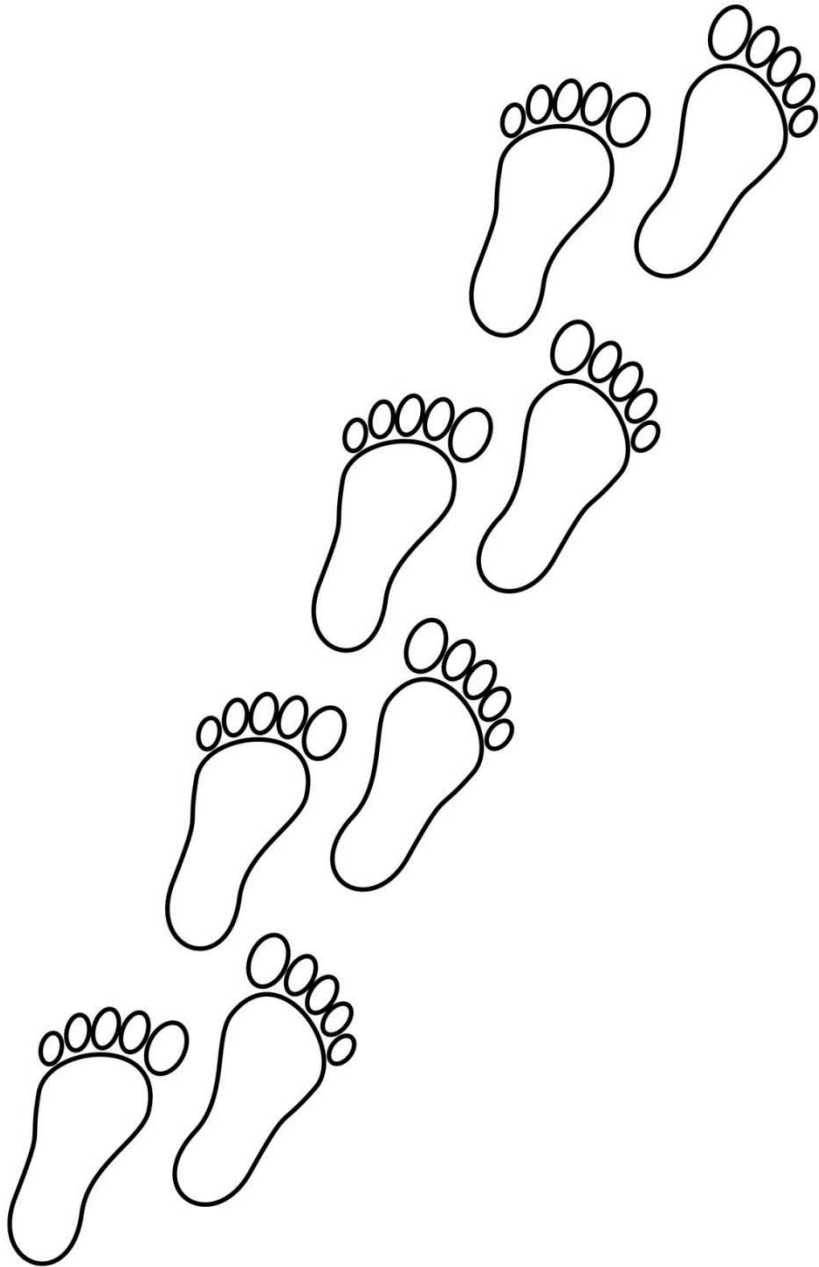
PATTERN

conceptual space shifting

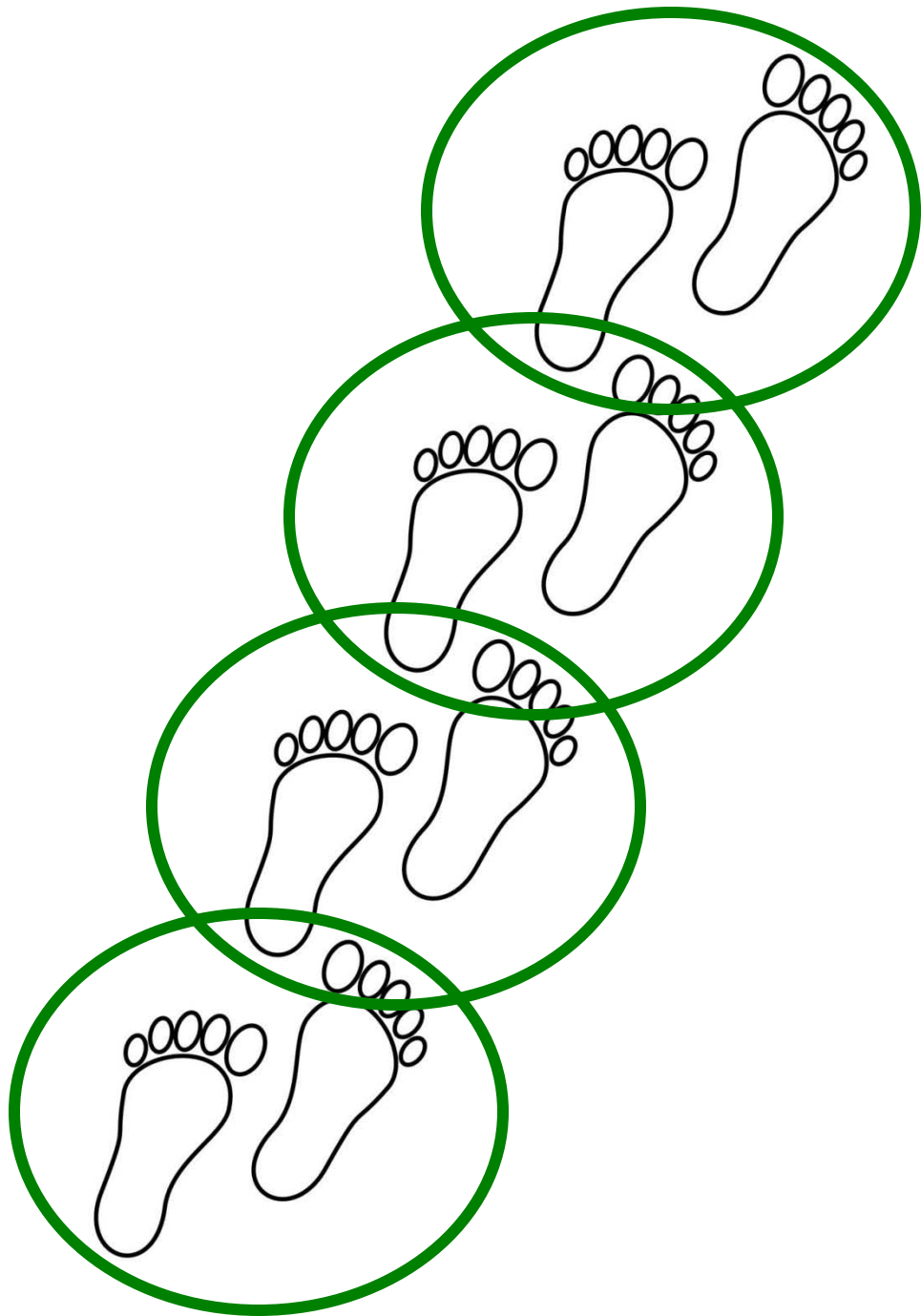
Science

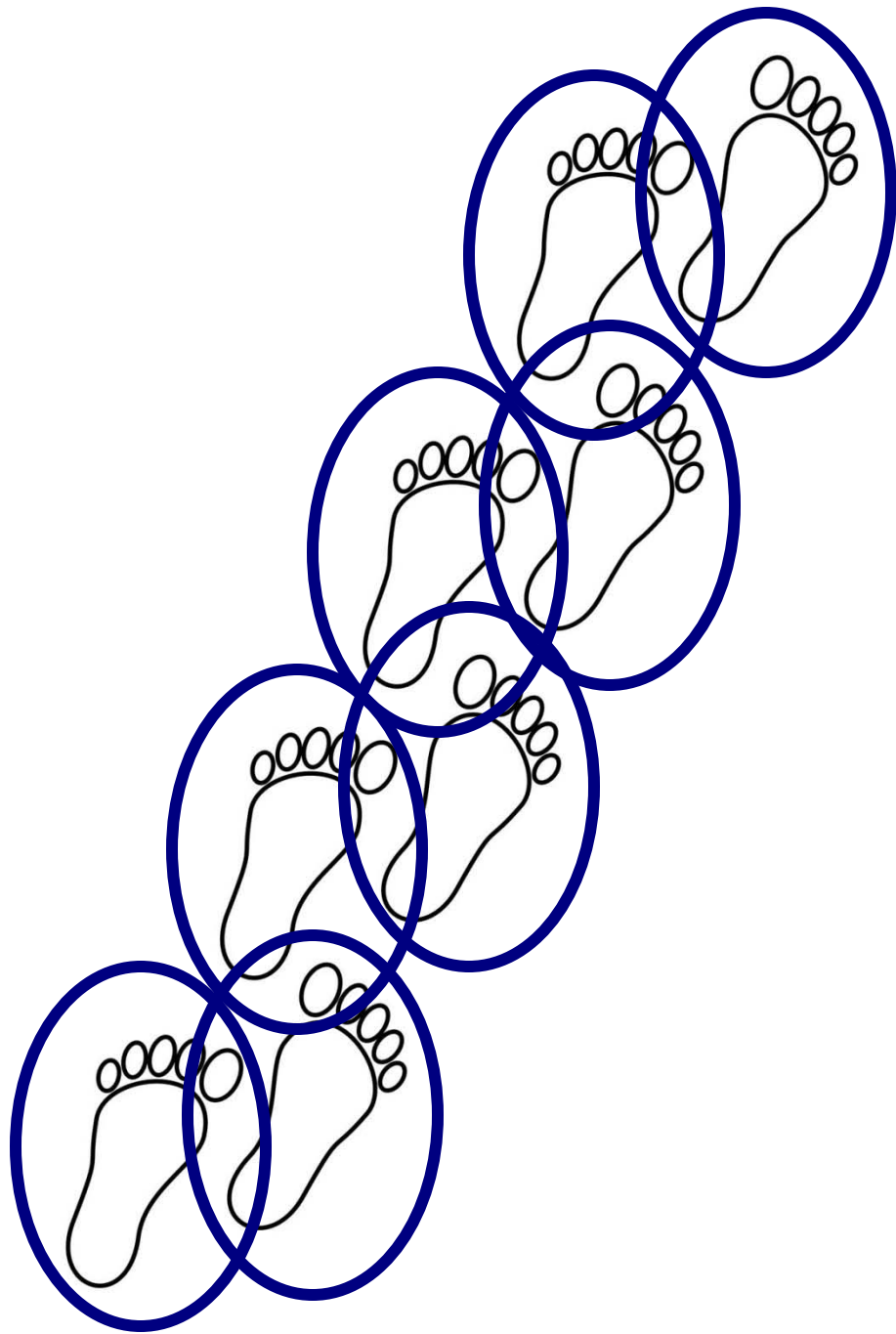
PATTERN

**conceptual
space
shifting**

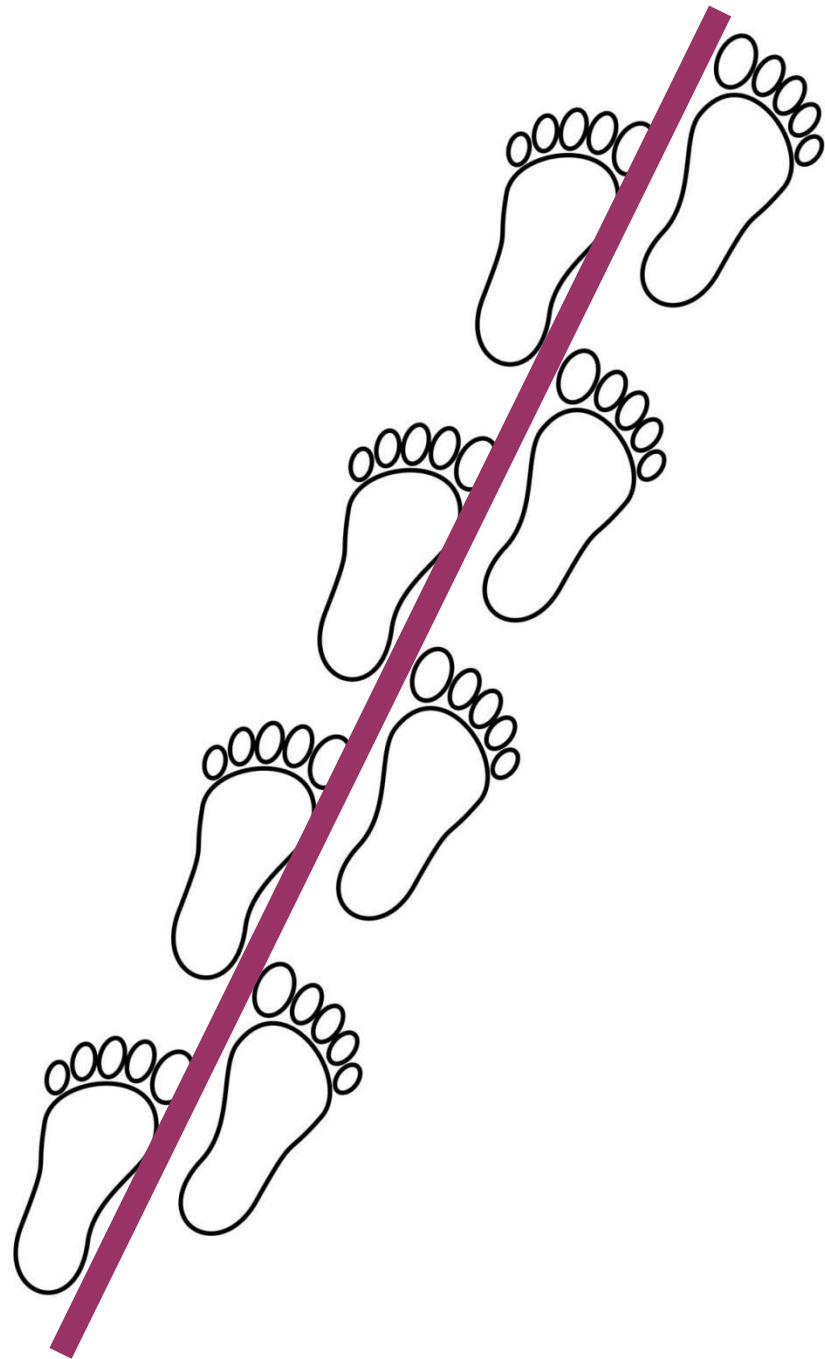


4 Years



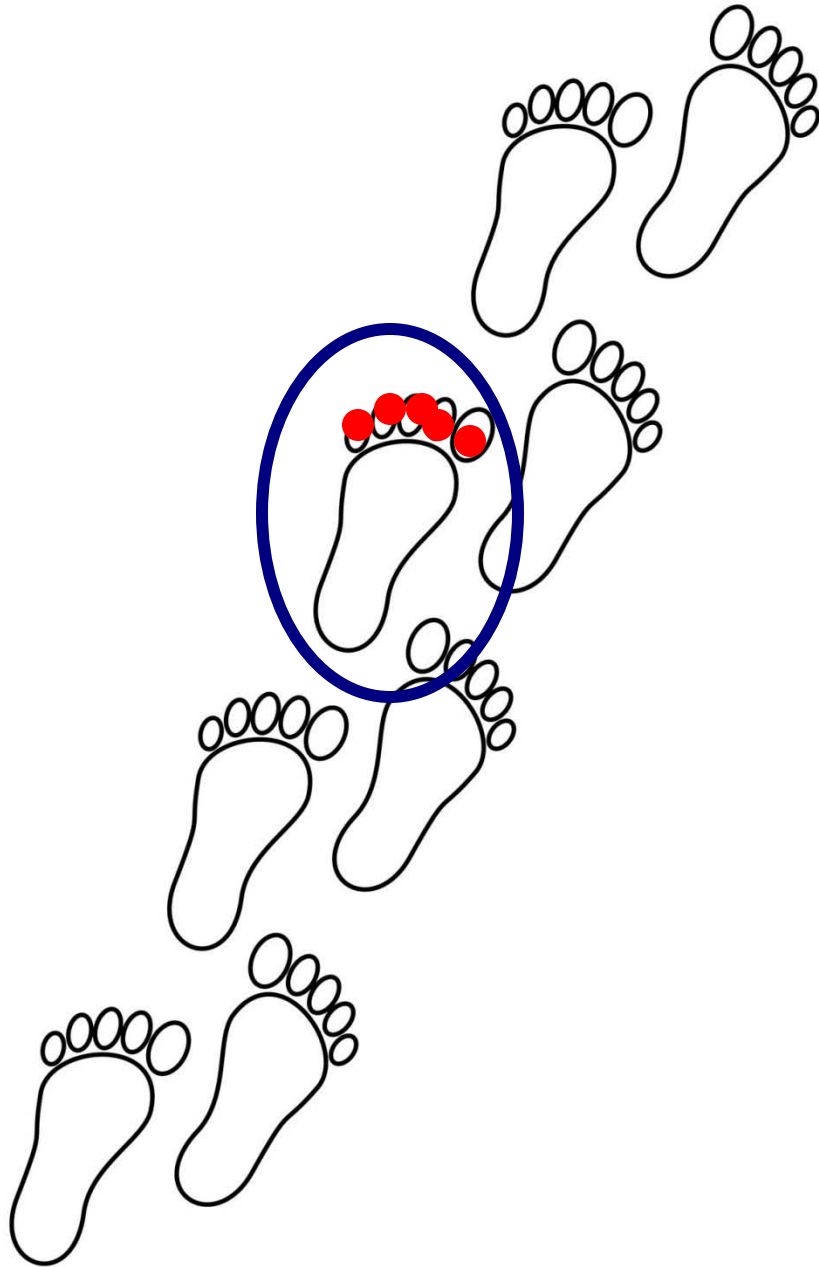


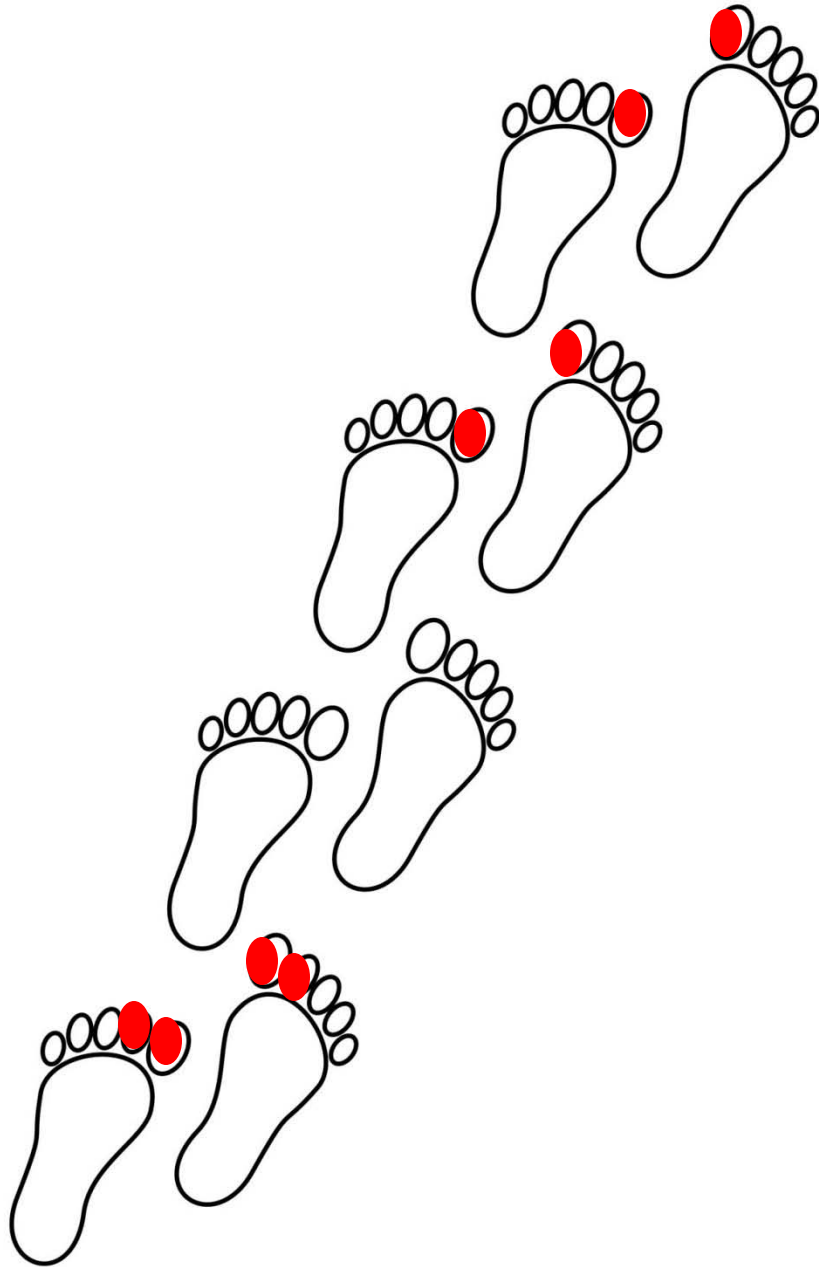
Fall terms
Winter terms



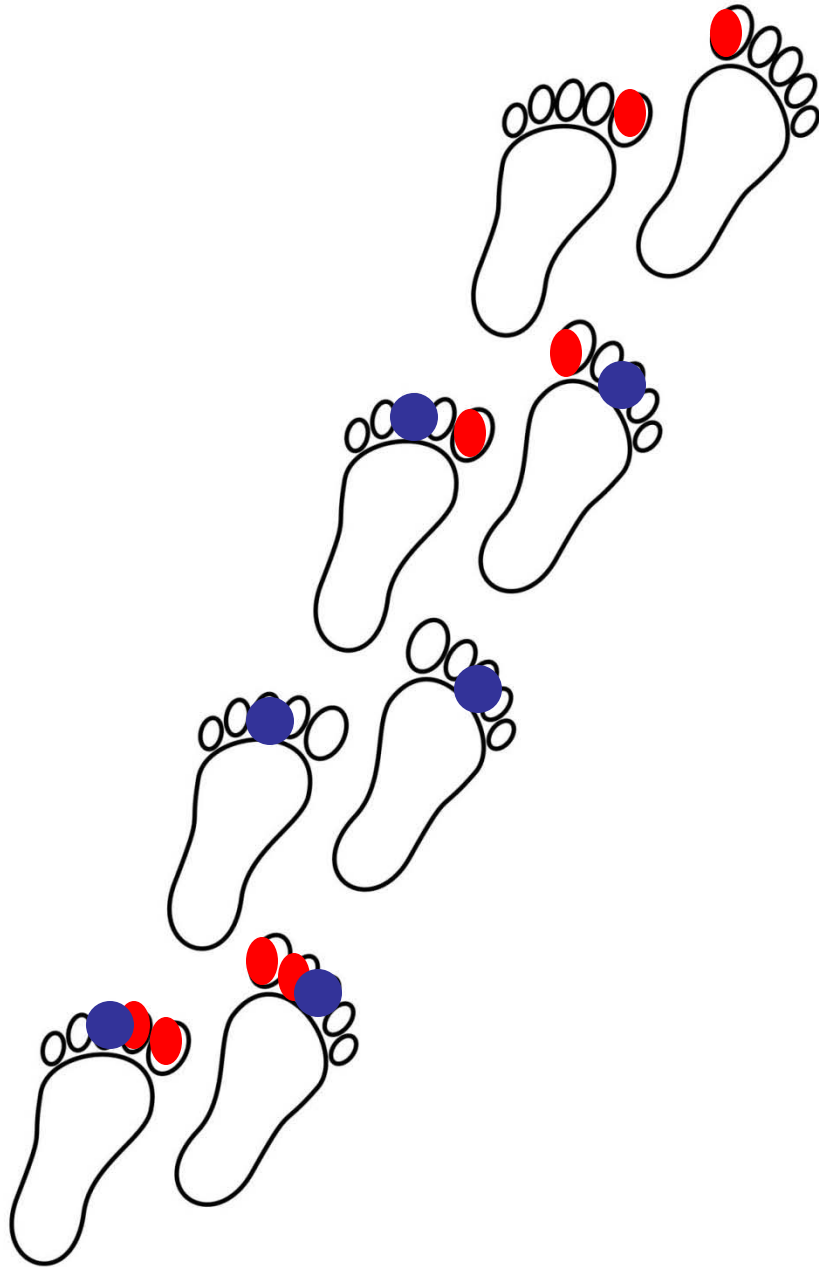
**Christmas
break**

**Each term
= 5 courses**





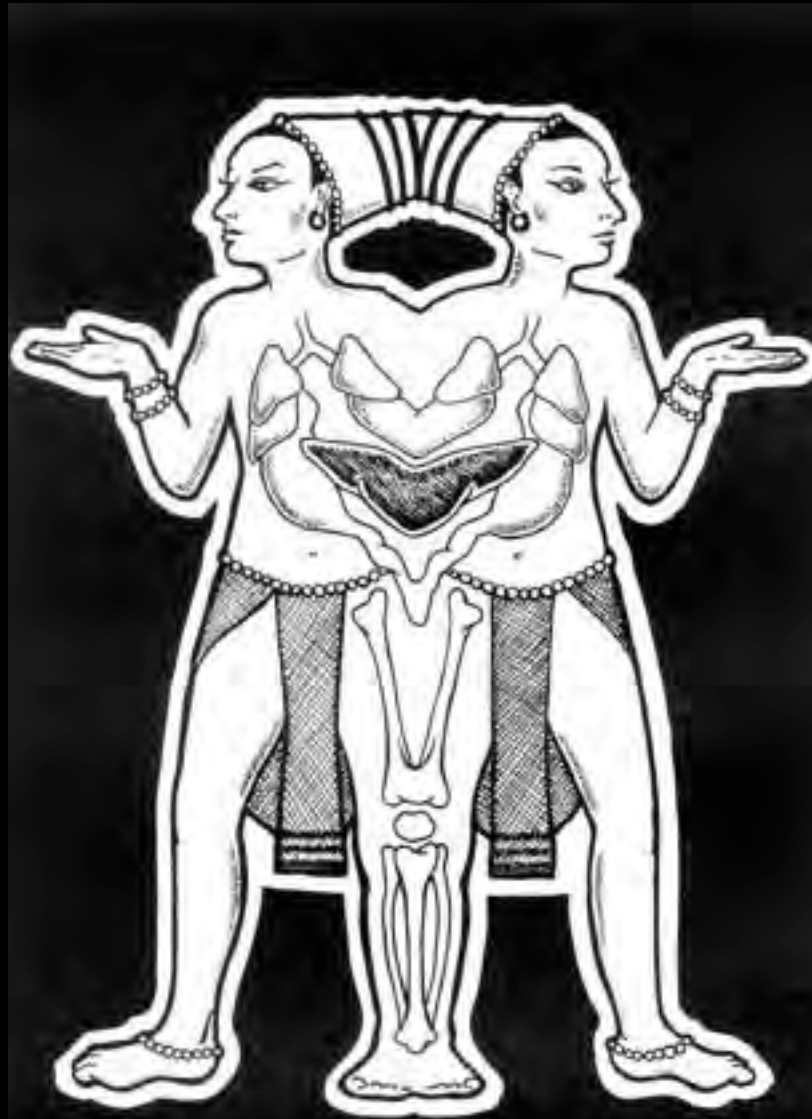
MST **science** **courses**



**MST
science
courses**

**PCS
courses**

... curricular contents??

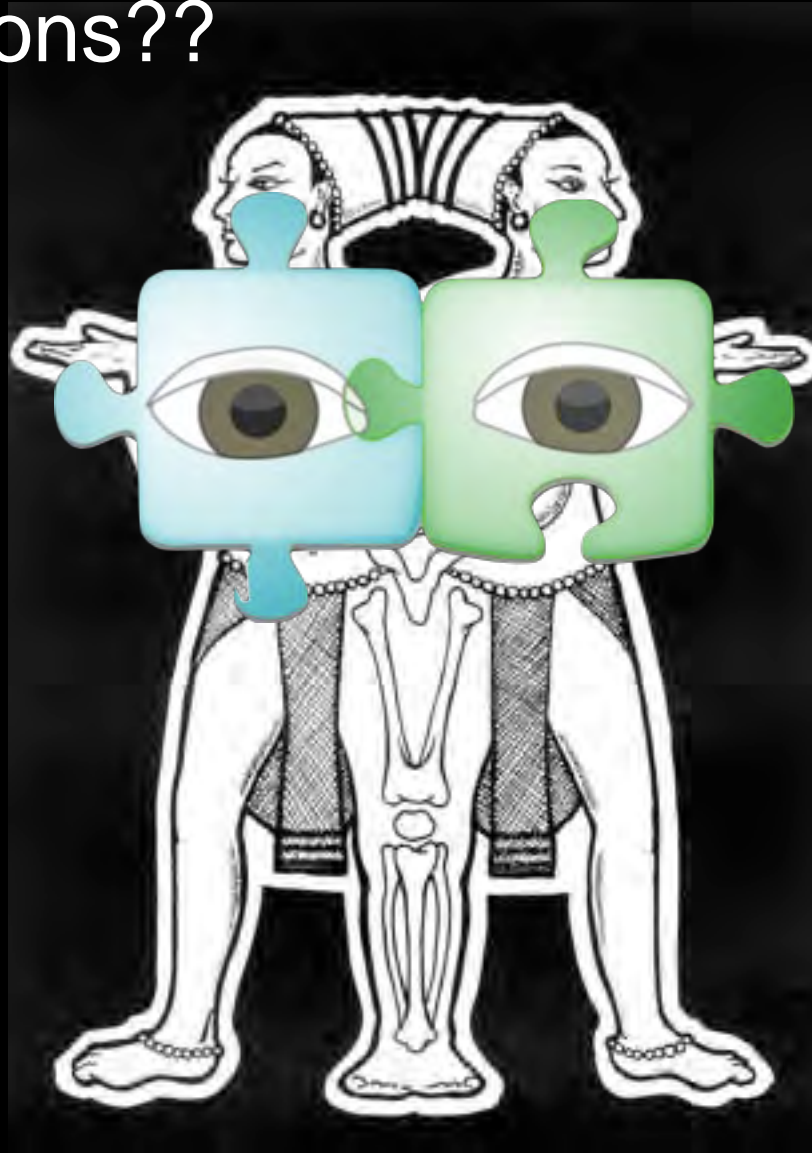


How?

courses

MS+T

... curricular contents??
... proportions??

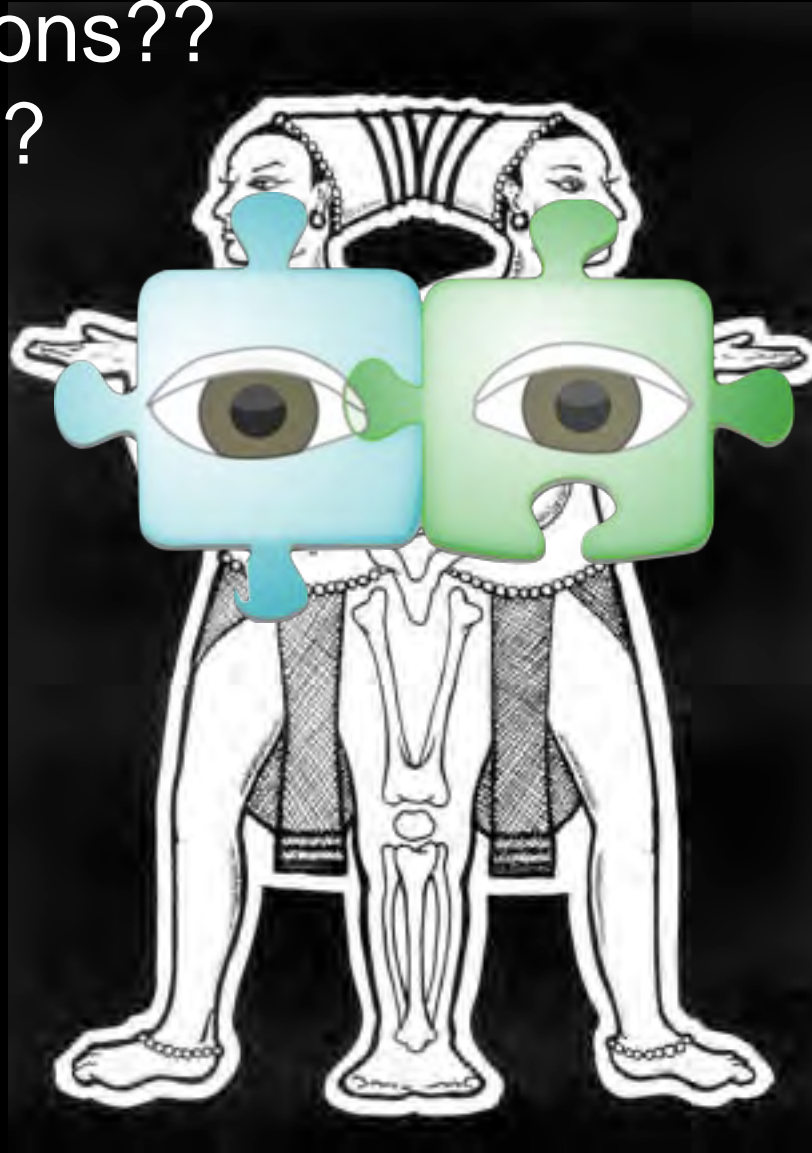


How?

courses

MS+T

... curricular contents??
... proportions??
... means??



How?

courses

MS+T

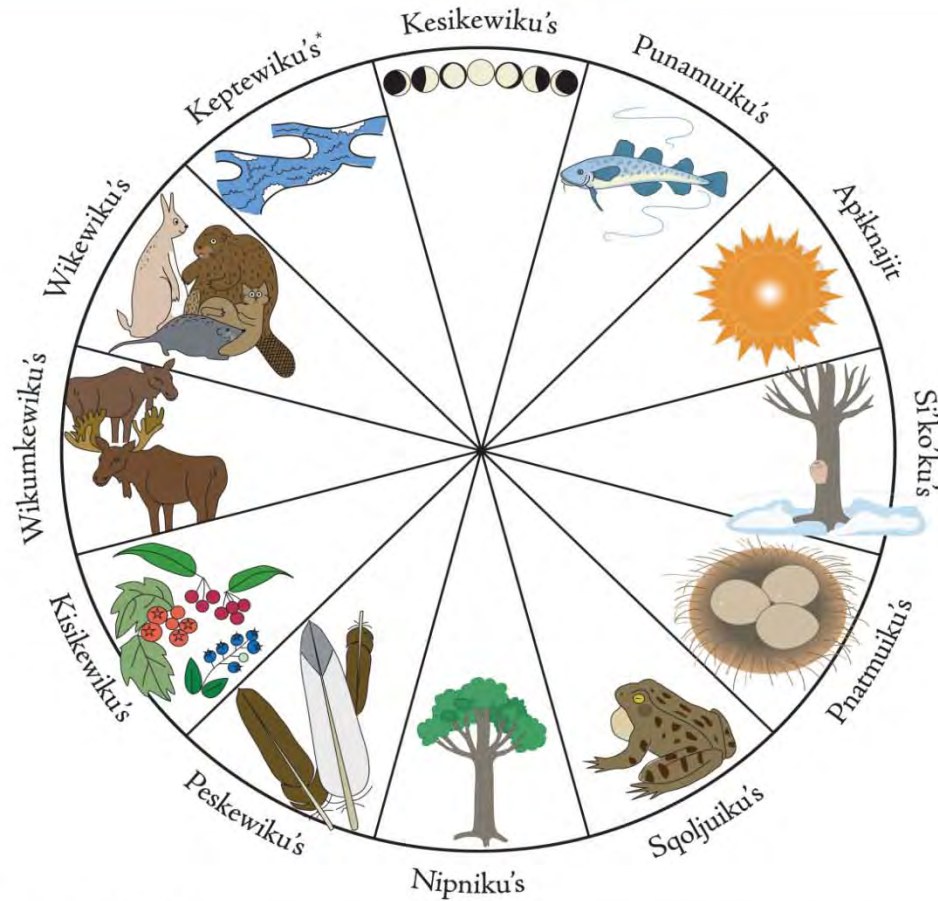


How?

Mi'kmawe'k Tepknusetk

courses

MST

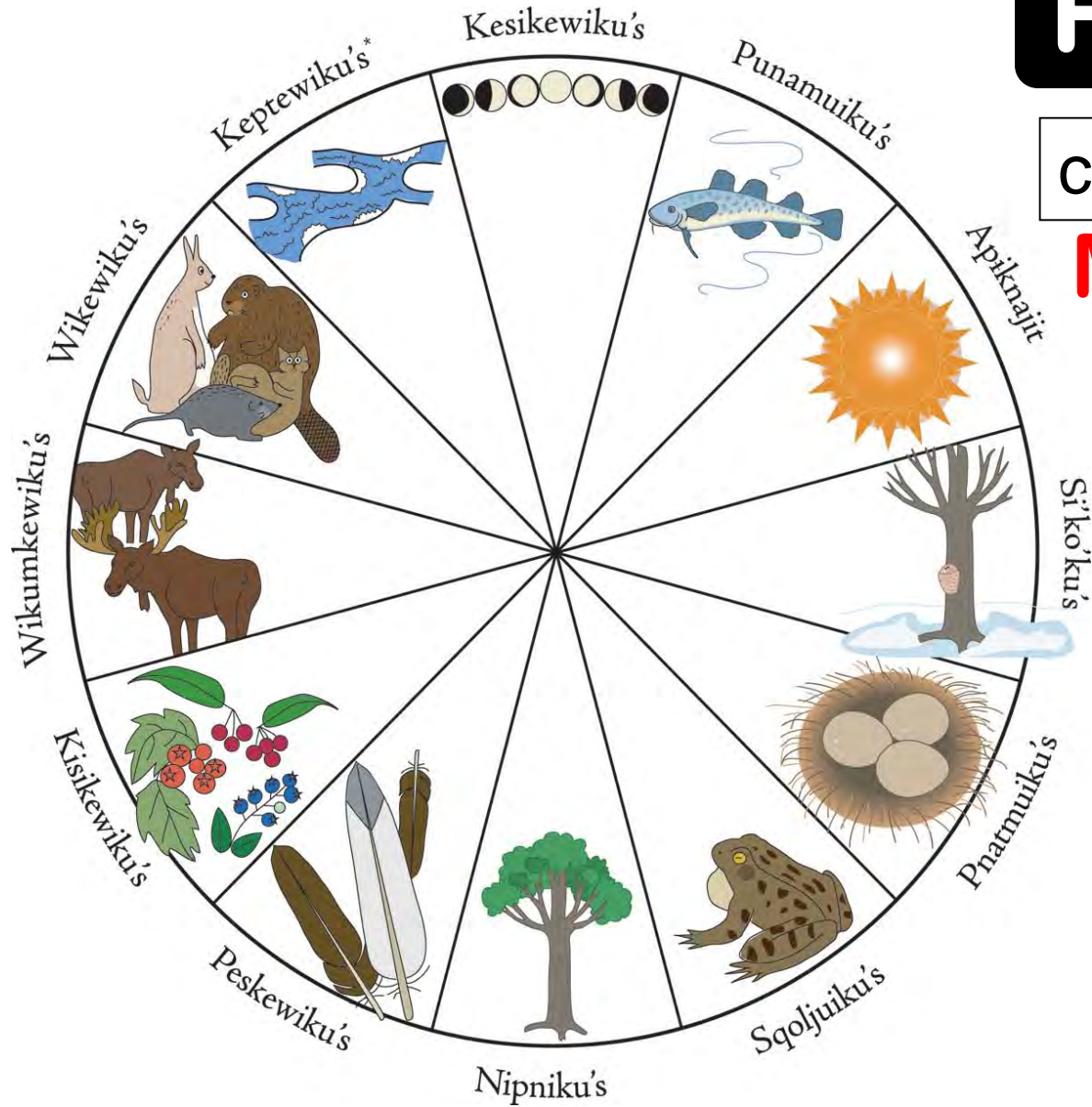


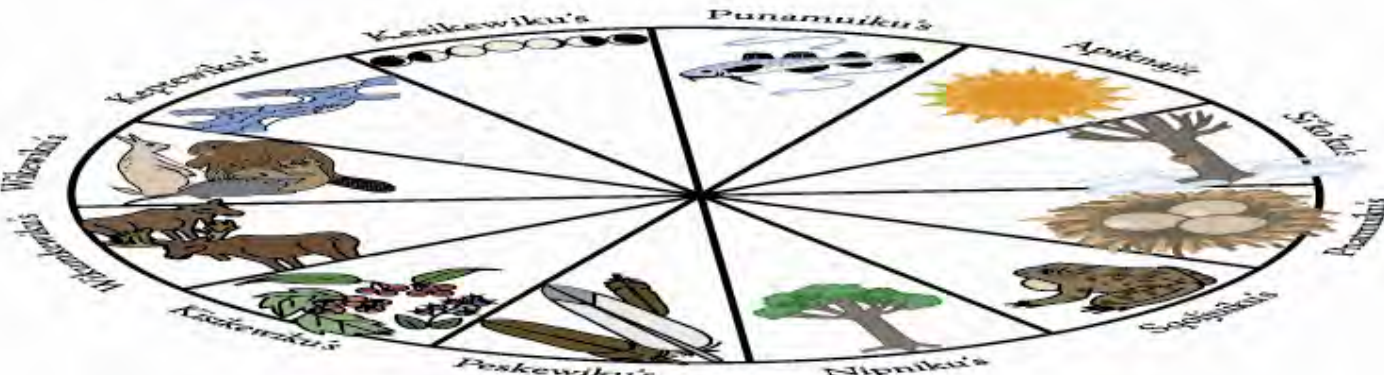
*Alternative – Kept'kewiku's

How?

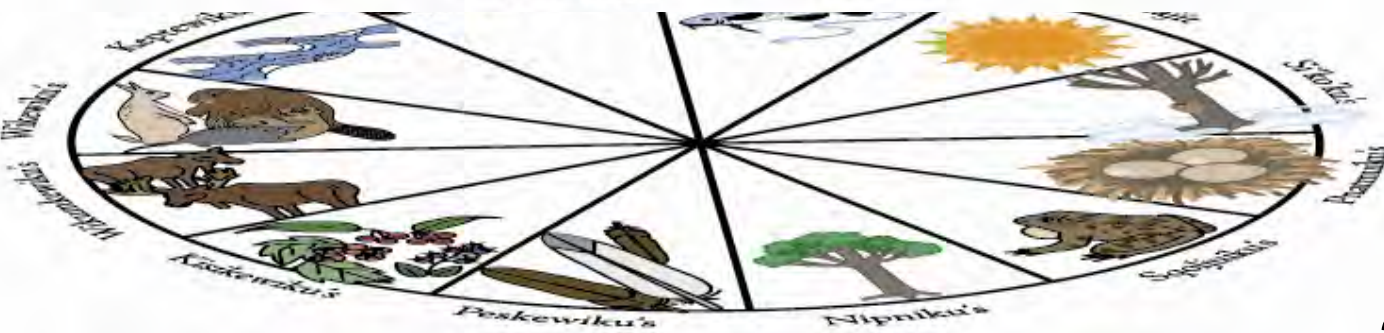
courses

MST

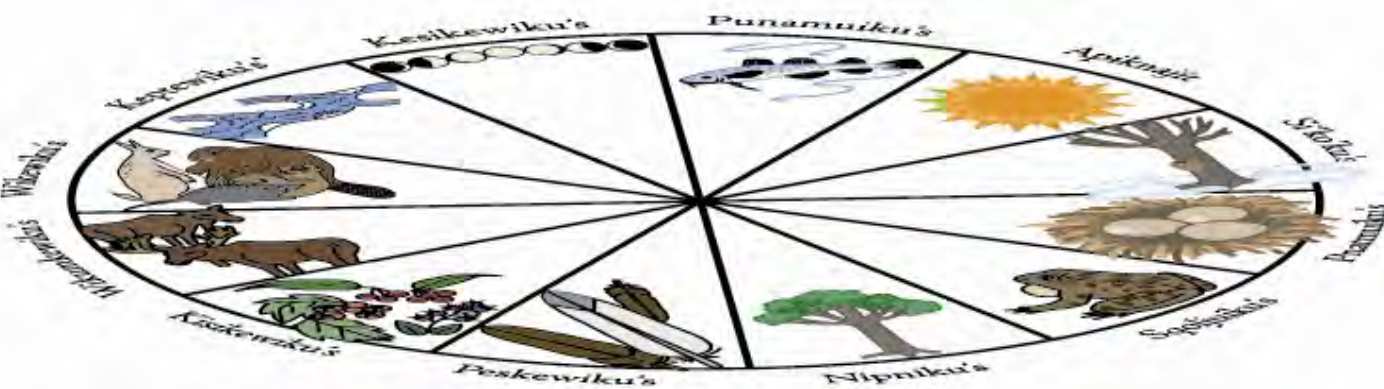




4



3

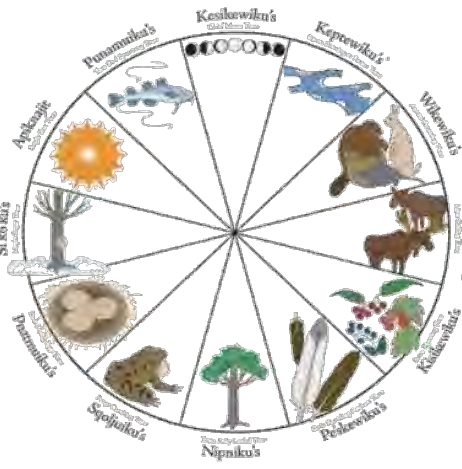
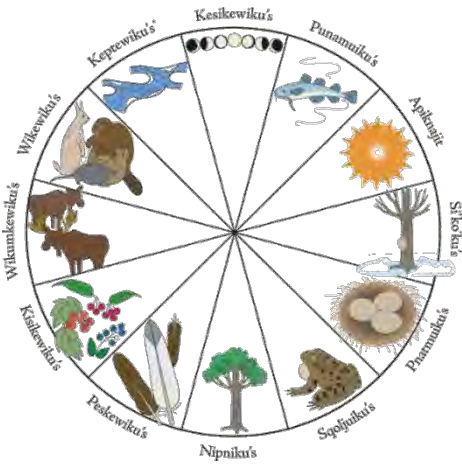


2



1





pattern recognition, breaking, reshaping

THE UNIVERSE
YOURS TO DISCOVER



INTERNATIONAL YEAR OF
ASTRONOMY
2009

Pemi Pungek Mi'kma'ki



This year is called Pemi Pungek Mi'kma'ki, which means our
summer year in the Mi'kmaq traditional calendar. On the calendar, I
show the first month and the 12 months of the year. On the inside, I
show the birds, water, and sky year a full year. The pictures of plants,
animals, and weather show the signs of changing seasons. I believe
the pictures of people show what is in traditional and modern activities.
I hope this calendar will be useful to you in the year of the summer. Spring is the
1st month, then the summer, fall is on the right, and winter is on the left.



Stories help us see the stars in new ways ...



as telescopes help us see the stars in new ways.

INTERNATIONAL YEAR OF ASTRONOMY 2009



**Let us reconnect with our
Night Sky Stories.**



**Reconnections
will be legacies for children
long after the close of
International Year of Astronomy.**

Students, Mi'kmaq Nation





Challenges

conceptual (science?)

- political (systemic racism? +?)
- ~~jurisdictional (whose program?)~~

structural (what kind of program?)

- ~~financial (resources?)~~
- ~~instructional (who can / should?)~~
- ~~physical (where?)~~

pedagogical (how?)

- ~~recruitment (who and how?)~~

audience (whose interests / needs?)

~~pragmatic (within context of students' lives?)~~

definitional (what is "success"?)

pragmatic (graduates do what?)

capacity development (how nurture & make sustainable?)



	Academic Year																					
	99-00		00-01		01-02		02-03		03-04		04-05		05-06		06-07		07-08		08-09			
1st yr Route of Entry	MSAP		MSAP & other		MSAP & other		other		MSAP		MSAP & other		other		other		other		other		BA cohort Indian Brook -08	
MSAP Coordinator																						
MSIT courses 1st year core • 101 / 103 # students enrolled # year end passes	21 15	21 12	22 20	22 12	20 14	15 12	5 4	5 3	26 17	24 11	11 9	9 4	9 5	6 5	5 2	3 3	4 2	0 0	2 0	4 cancelled	29 23 17 <i>Note</i>	29 14 12 <i>Note</i>

	99-00		00-01		01-02		02-03		03-04		04-05		05-06		06-07		07-08		08-09	
MSIT courses 3rd year core • 301 / 303 # students enrolled # year end passes	n/a		n/a		5 5	5 4	4 1	5 3	9 6	10 4	7 3	4 0	1 1	3 3	2 2	2 1	2 1	4 3	0	0

MSIT courses 4th yr core • 401 / 403 # students enrolled # year end passes	n/a		n/a		n/a		5 5	6 5	4 4	4 4	7 6	4 3	4 1	3 2	5 5	2 0	2 1	3 2	4 inc	4 n/a
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Mi'kmaq Science Graduates 2003-2008 (with some relationship to Integrative Science)

	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09
Graduates				2003	2004	2005	2006	2007	2008	2008
BScCS Integrative Science				2		2	3	1	2	1
BSc Biology							2		1	
BSc Nursing					1		1	1	2	
BSc Psychology							1			
BTech Public Health									1	
BTech Environ Studies							2			

23

TOTAL

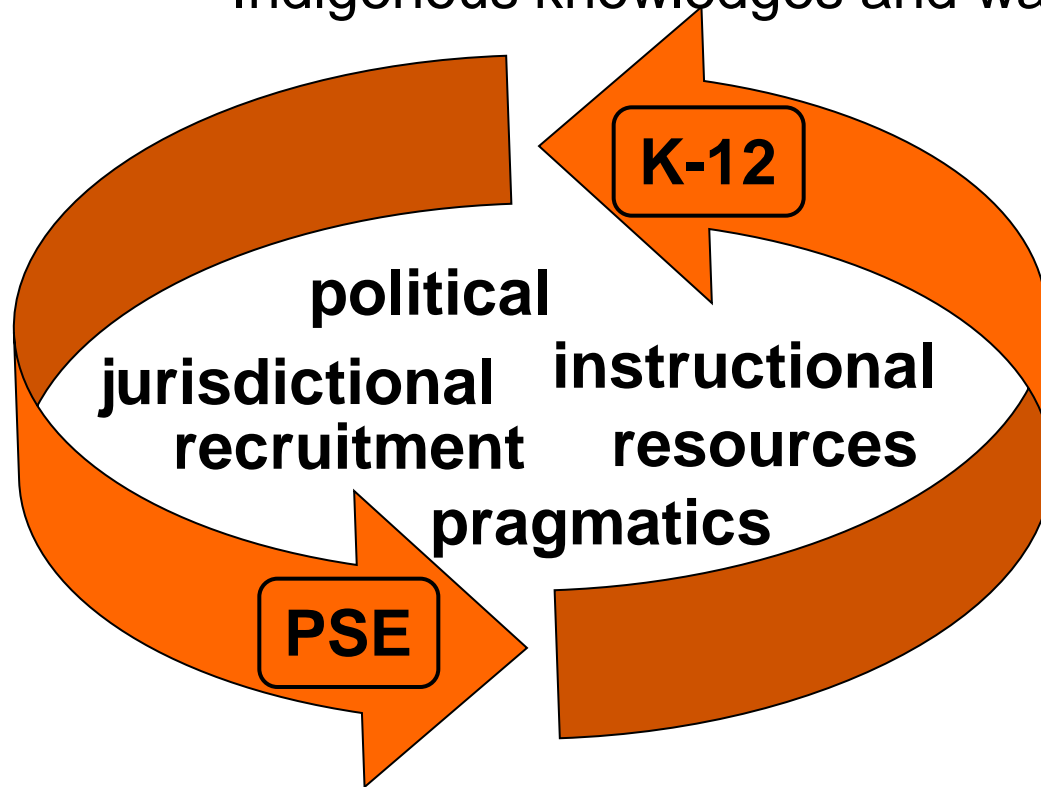


Challenges

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- ~~pragmatic (within context of students' lives?)~~
- definitional (what is "success"?)
- pragmatic (graduates do what?)
- capacity development (how nurture & make sustainable?)



The program of my Canada Research Chair in Integrative Science serves an overall two-fold, long-term goal: to help Aboriginal individuals and Indigenous knowledges become increasingly and actively involved in science in the 21st century AND to help mainstream science better engage with Indigenous knowledges and ways of knowing.



- capacity development (how nurture & make sustainable?)



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

Mi'kmaq Elders



CIHR IRSC

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



**NSERC
CRSNG**

Canada Foundation
for Innovation

Fondation canadienne
pour l'innovation



Mi'kmawey Debert



Membertou
Elementary



**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.



Wela'lioq

Thank you