

PEDAGOGICAL PRACTICES:
RE-THINKING THE WORLDS OF TEACHING
A CONFERENCE ON TEACHER EDUCATION

11 February 2009; Surrey Campus
WORKSHOP PRESENTATION

SFU

SIMON FRASER UNIVERSITY
THINKING OF THE WORLD

**Introduction to
Integrative Science
&
Two-Eyed Seeing**

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**Canada Research Chair
in Integrative Science**

Professor of Biology, Sydney, Nova Scotia

CAPE BRETON
UNIVERSITY



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Introduction to Integrative Science and Two-Eyed Seeing

(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 uses a view of science that enables cultural inclusivity, namely that science is “dynamic, pattern-based knowledge about our interactions with and within nature”. The workshop will explain and explore the “pattern conceptual framework” developed within Integrative Science. The framework is based in *pattern recognition, transformation, and expression* and it explicitly seeks to enable transit of pedagogy and praxis across boundaries of methodologies, disciplines, and world views. In this regard, it enables understandings as to how the privileging of different “human pattern smarts” creates variations in the ways we assemble and transmit science knowledge. The importance of invoking an understanding of “The Learning Spirit” will also be considered.





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.

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

Integrative Science

CAPE BRETON
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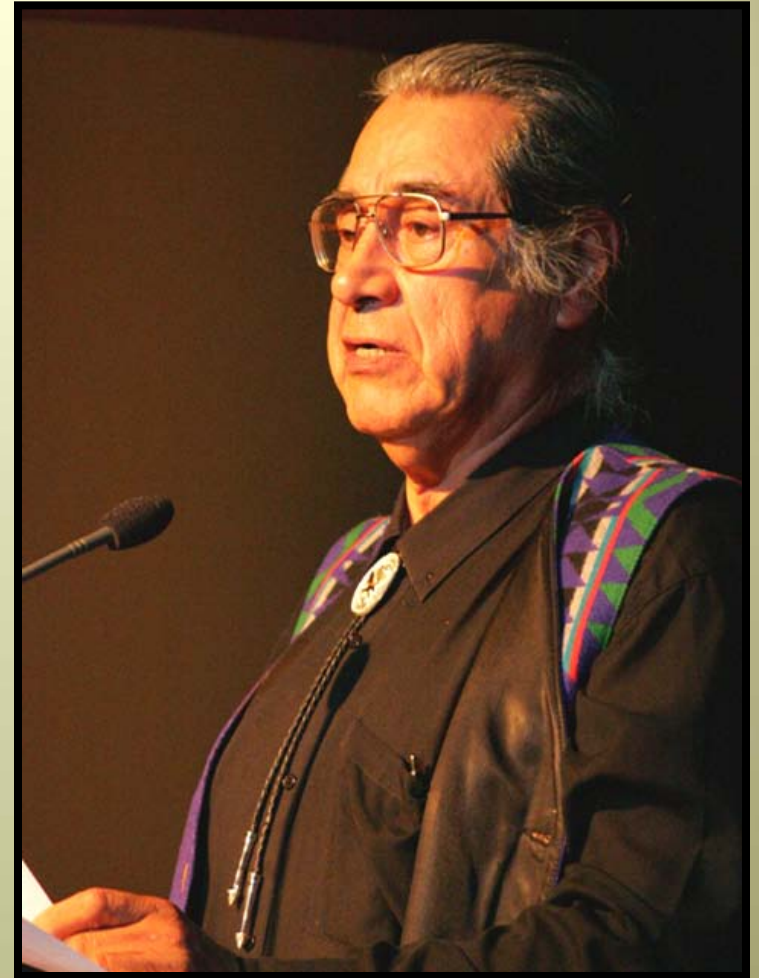
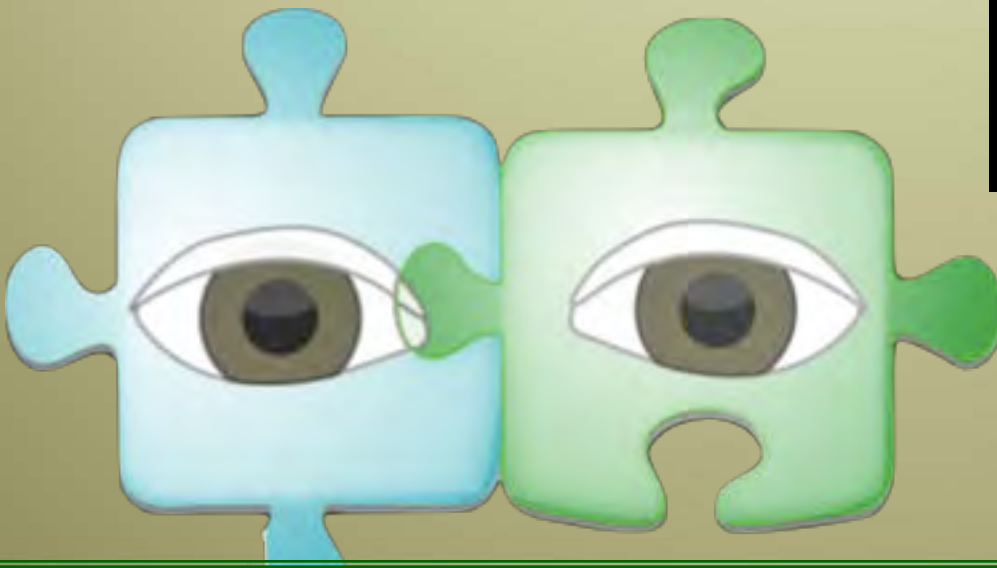
Indigenous

Western

“bringing our sciences together”

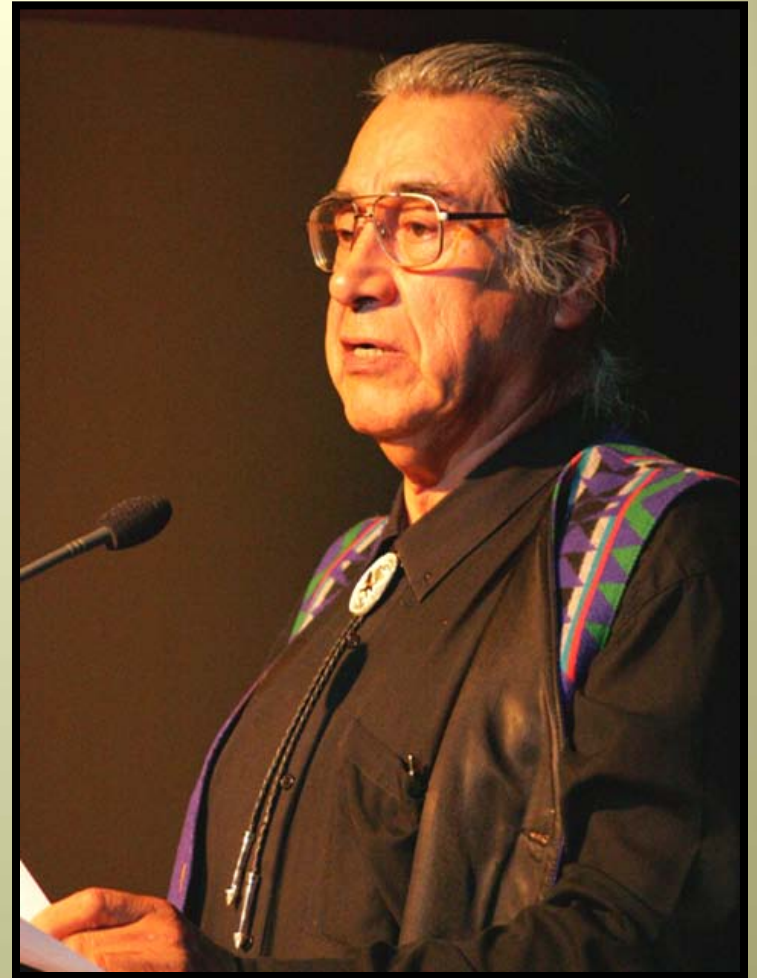
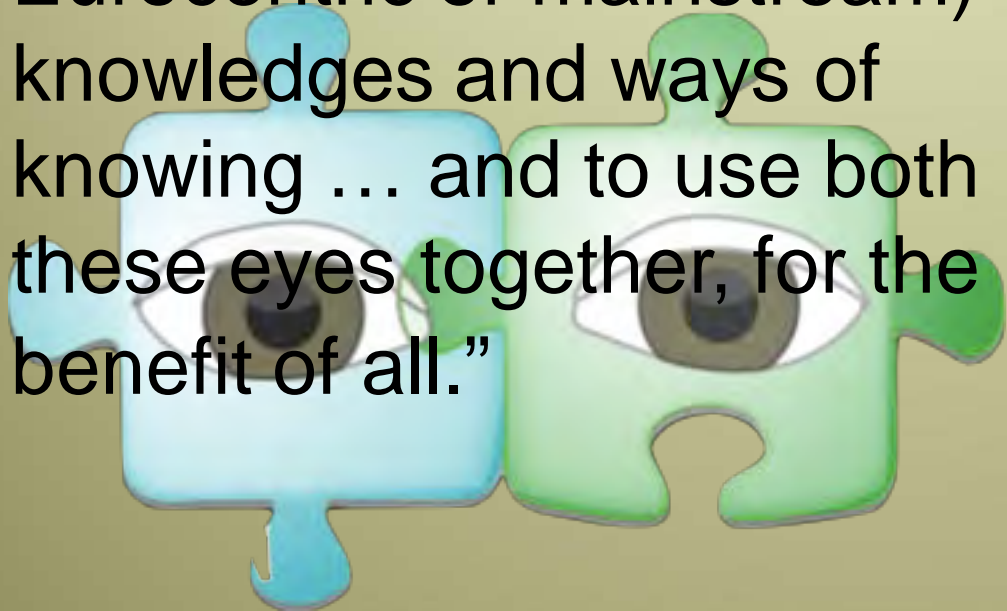


Two-Eyed *Seeing*



Elder Albert Marshall
Eskasoni community
Mi'kmaq Nation

“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.”



Elder Albert Marshall
Eskasoni community
Mi'kmaq Nation

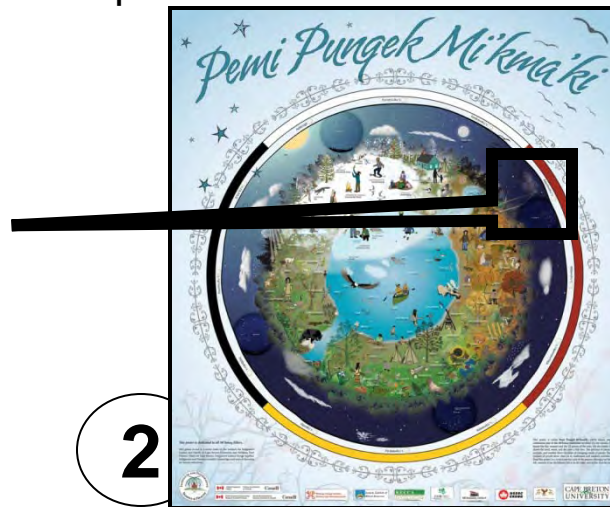
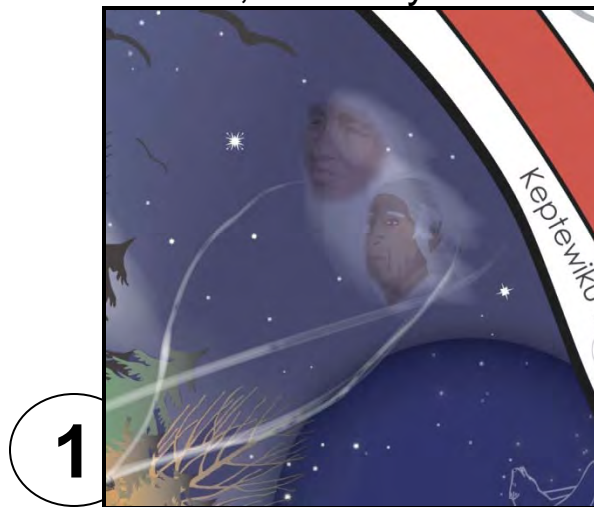
The breath of life versus the embodiment of life: Indigenous knowledge and western research

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

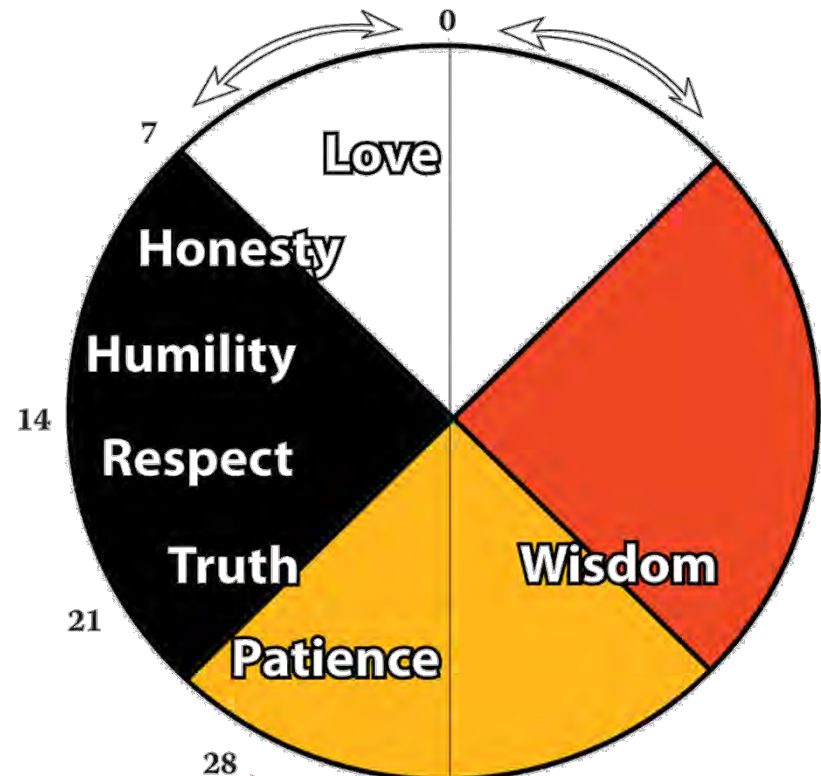
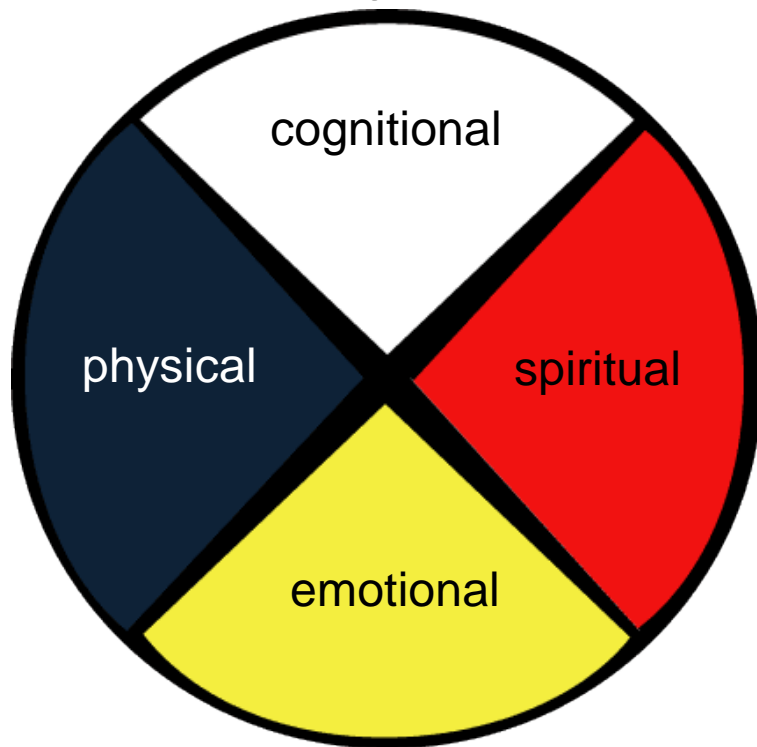
CINDY BLACKSTOCK

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

Despite the diversity of Aboriginal cultures, there are several common fundamental differences between Aboriginal and western epistemologies. **1** 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 situation within more expansive concepts of space and time (Auger, 2001). From these differences, flow very different concepts.

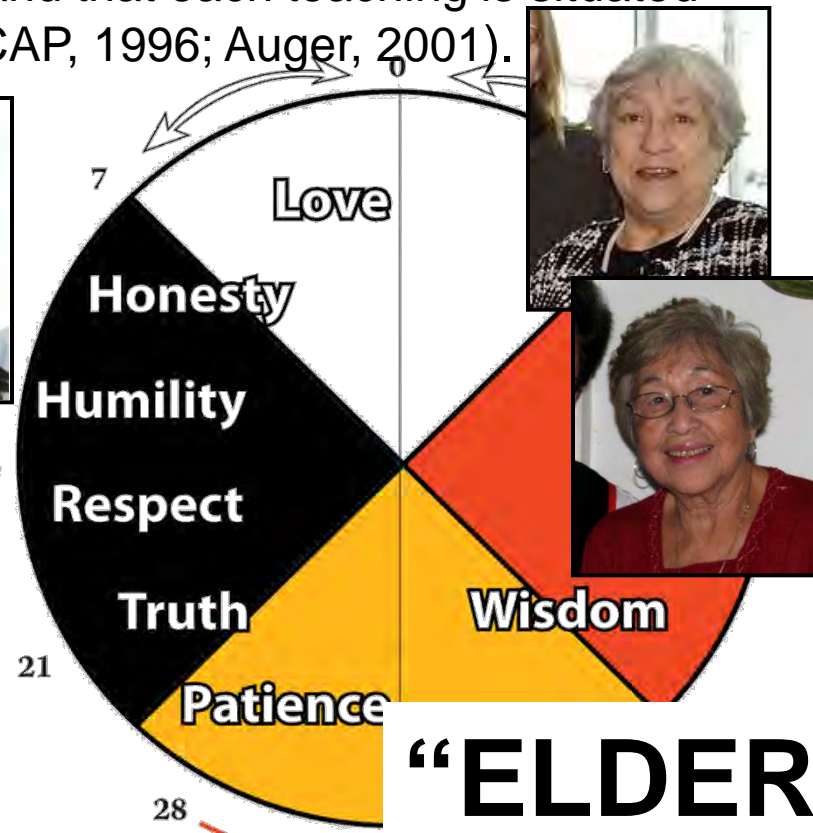
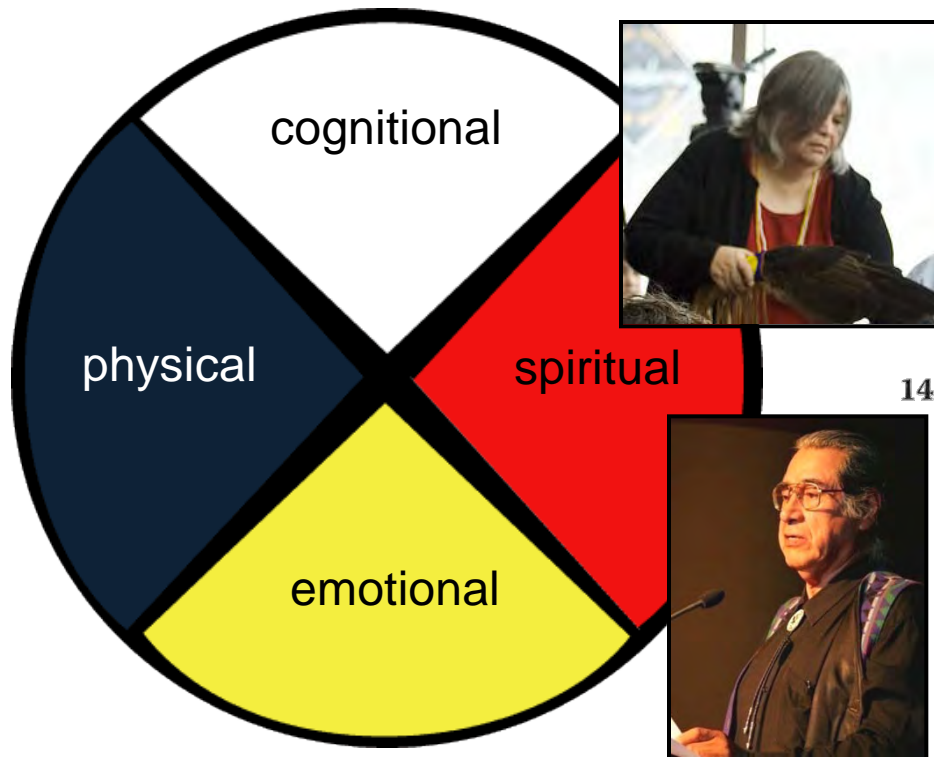


As knowledge trustees, whose job it is to understand and relay knowledge which has been passed down by generations before us, we pay great attention to the detail of the knowledge and the values and spirit embedded in it so that we can pass it on (Auger, 2001; Bennett & Blackstock, 2006). Because knowledge needs to echo across lifetimes and generations, multidimensional standards of rigor are needed to ensure knowledge is understood within the four directions of learning: **spiritual, emotional, physical, and cognitive** [emphasis added] and that each teaching is situated within an interconnected knowledge web (RCAP, 1996; Auger, 2001).



Importance of Ancestors, Elders, Knowledge Holders

As knowledge trustees, whose job it is to understand and relay knowledge which has been passed down by generations before us, we pay great attention to the detail of the knowledge and the values and spirit embedded in it so that we can pass it on (Auger, 2001; Bennett & Blackstock, 2006). Because knowledge needs to echo across lifetimes and generations, multidimensional standards of rigor are needed to ensure knowledge is understood within the four directions of learning: **spiritual, emotional, physical, and cognitive** [emphasis added] and that each teaching is situated within an interconnected knowledge web (RCAP, 1996; Auger, 2001).



“ELDER”



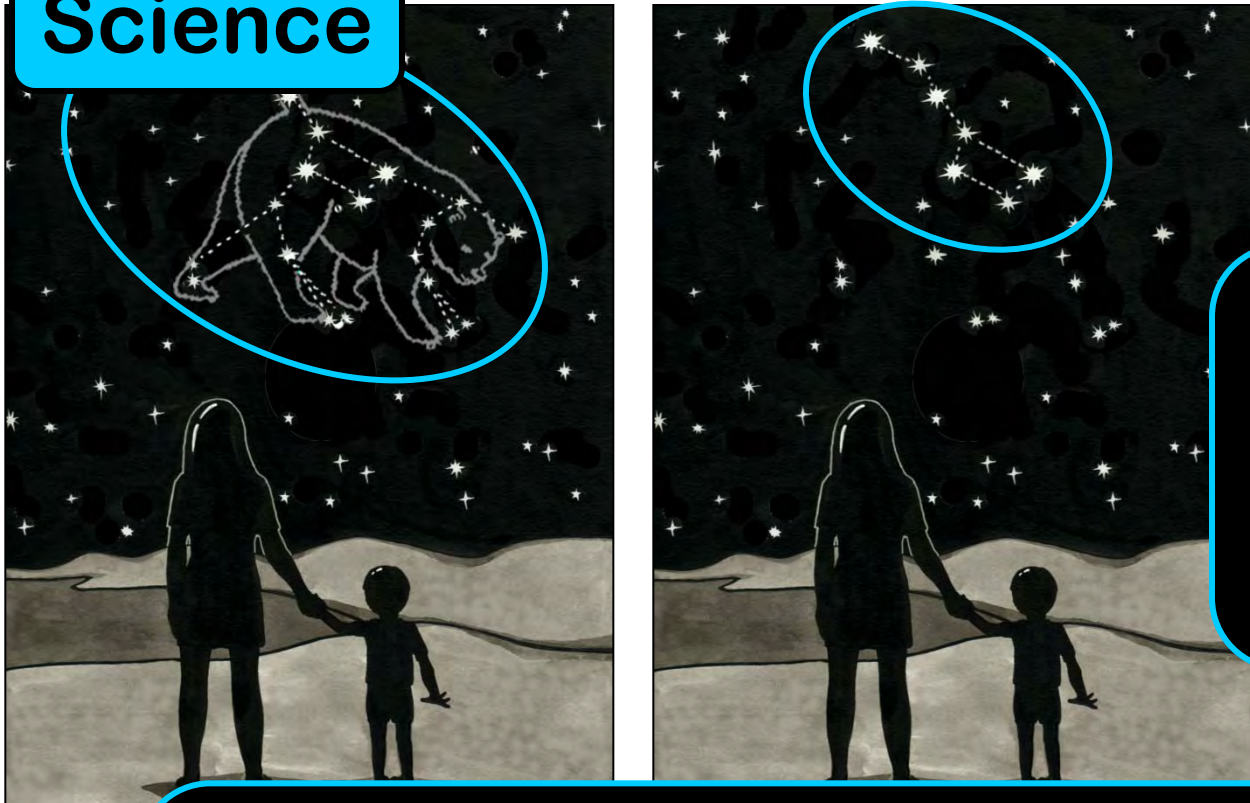
Science is
dynamic,
pattern-based
knowledge.



stories of our interactions with and within nature

stories of our interactions with and within nature

Science



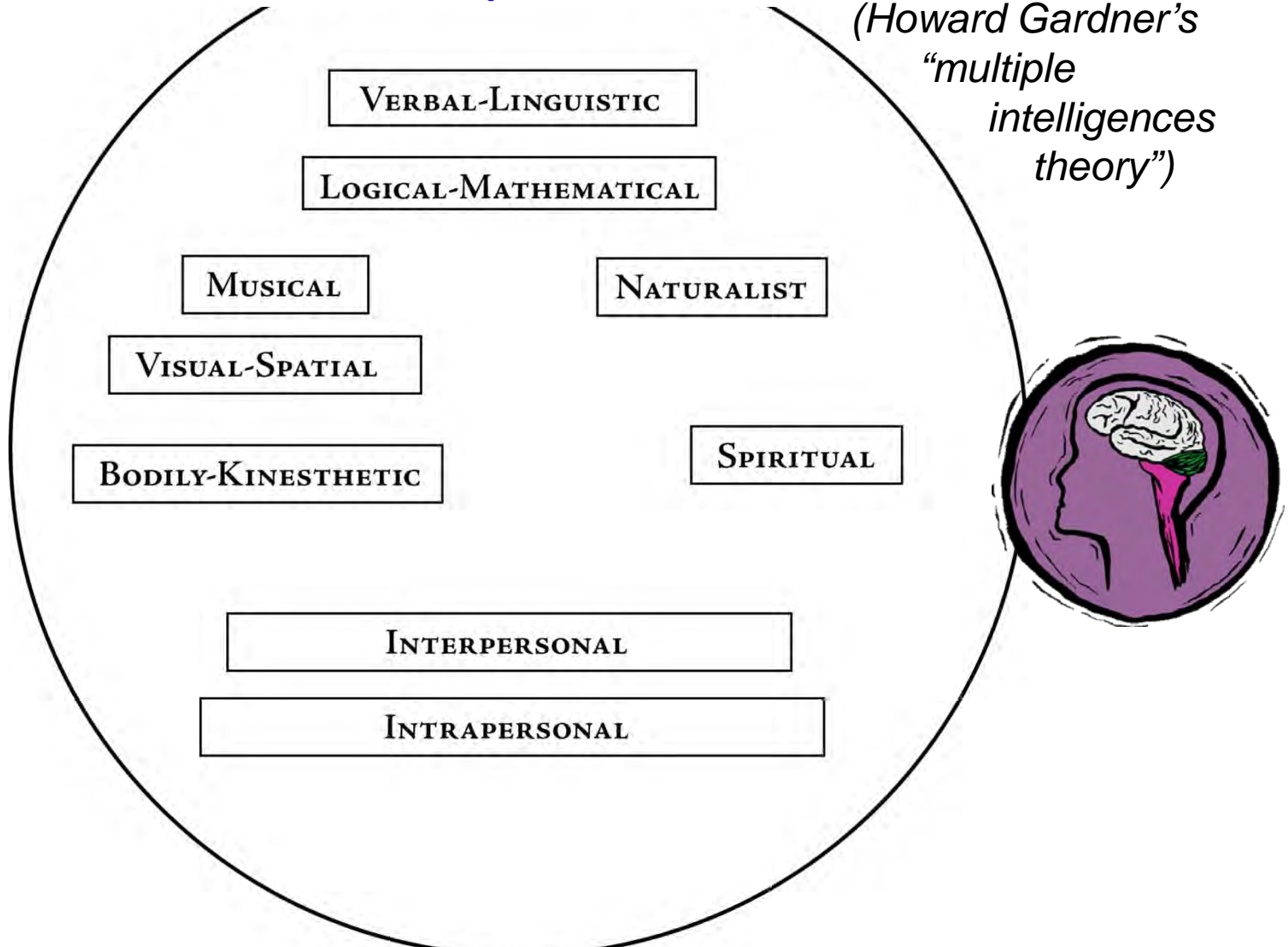
the patterns
that we see
within nature
reflect our ...

**SANCTIONED
PERSPECTIVES & INTELLIGENCES:**
who we are; where we are; where we were;
what we know, do and value

our science stories ...

draw upon our **“pattern smarts”**

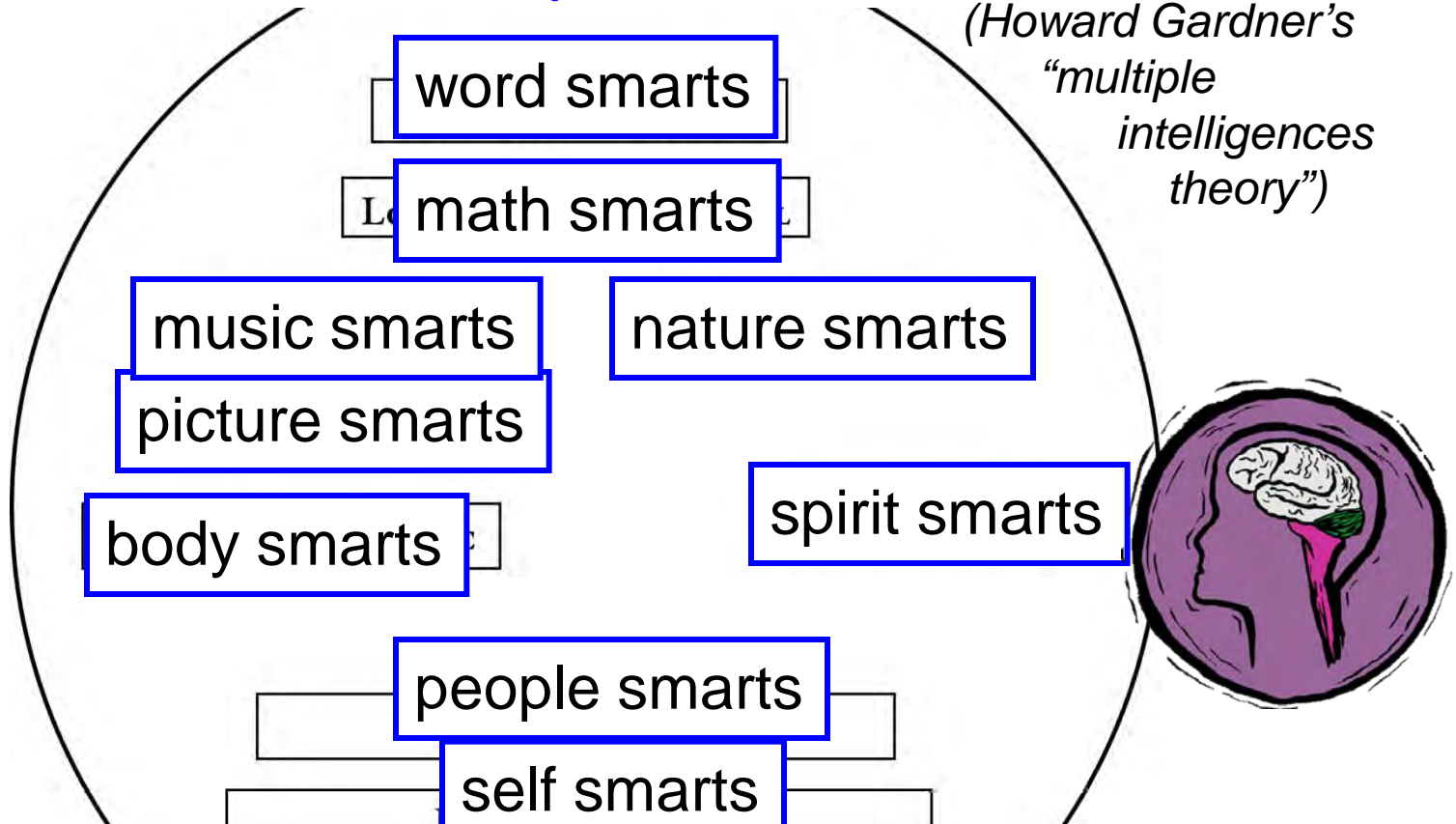
*(Howard Gardner’s
“multiple
intelligences
theory”)*



our science stories ...

draw upon our “**pattern smarts**”

(Howard Gardner’s
“multiple
intelligences
theory”)

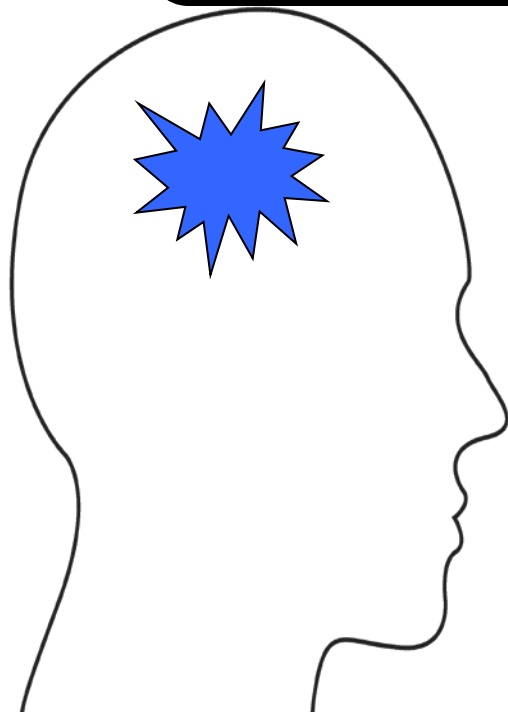


SANCTIONED PERSPECTIVES & INTELLIGENCES:

who we are; where we are; where we were;
what we know, do and value

“pattern smarts”

**sanctioned world views, methodologies,
perspectives, and intelligences**



KNOW

VALUE

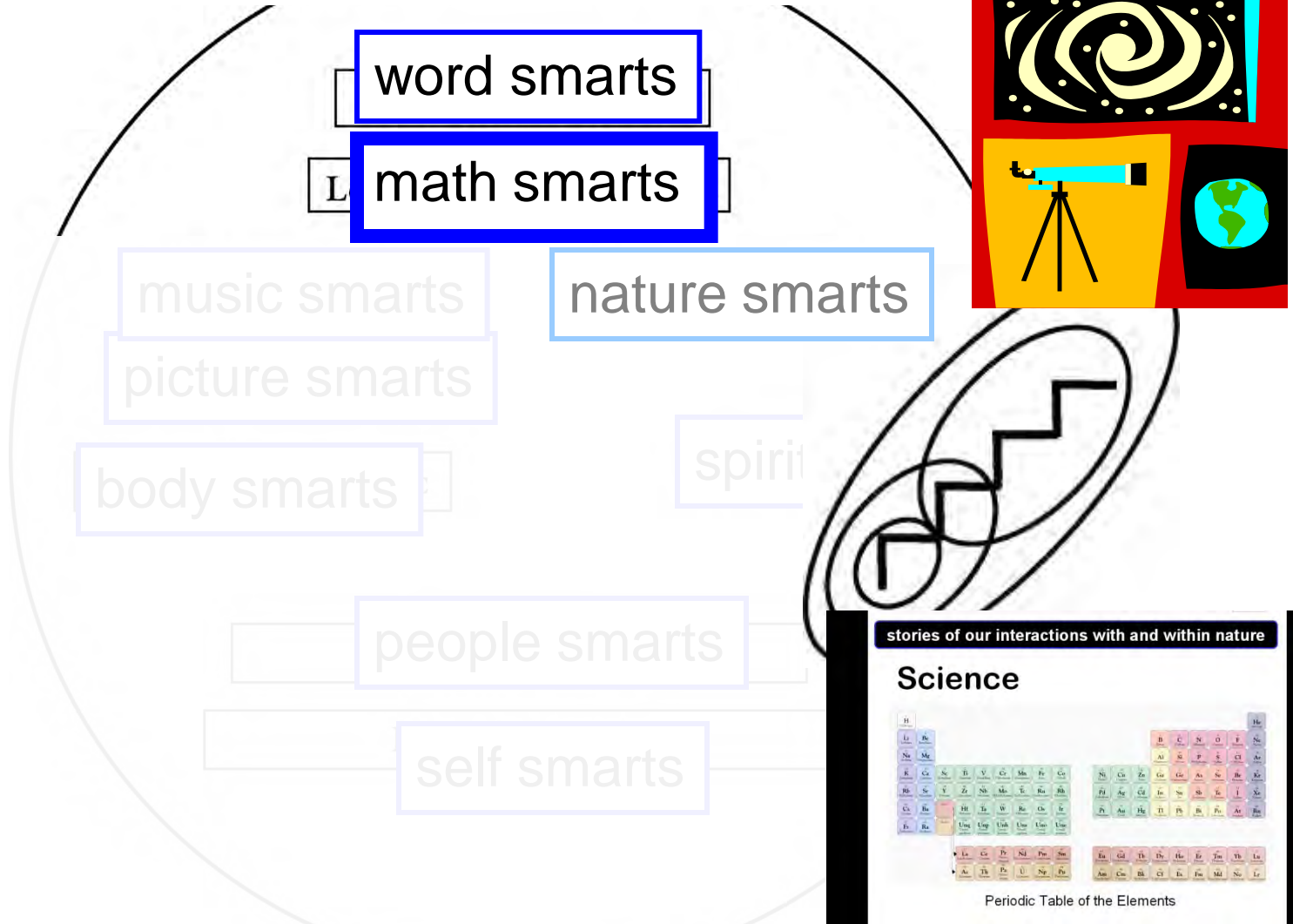
DO

multiple intelligences

SANCTIONED PERSPECTIVES & INTELLIGENCES:

**who we are; where we are; where we were;
what we know, do and value**

our different science stories ... privilege different "pattern smarts"



our different science stories ... privilege different "pattern smarts"



word smarts

math smarts

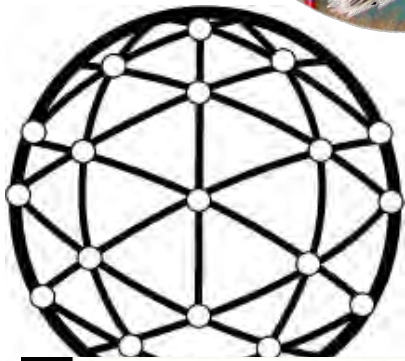
music smarts

nature smarts

picture smarts

body smarts

spirit smarts



stories of our interactions with and within nature

Science



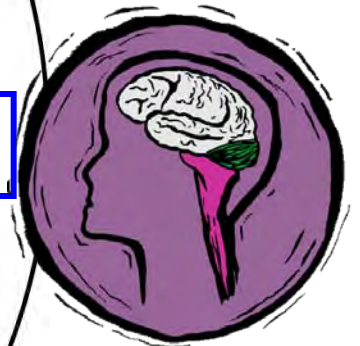
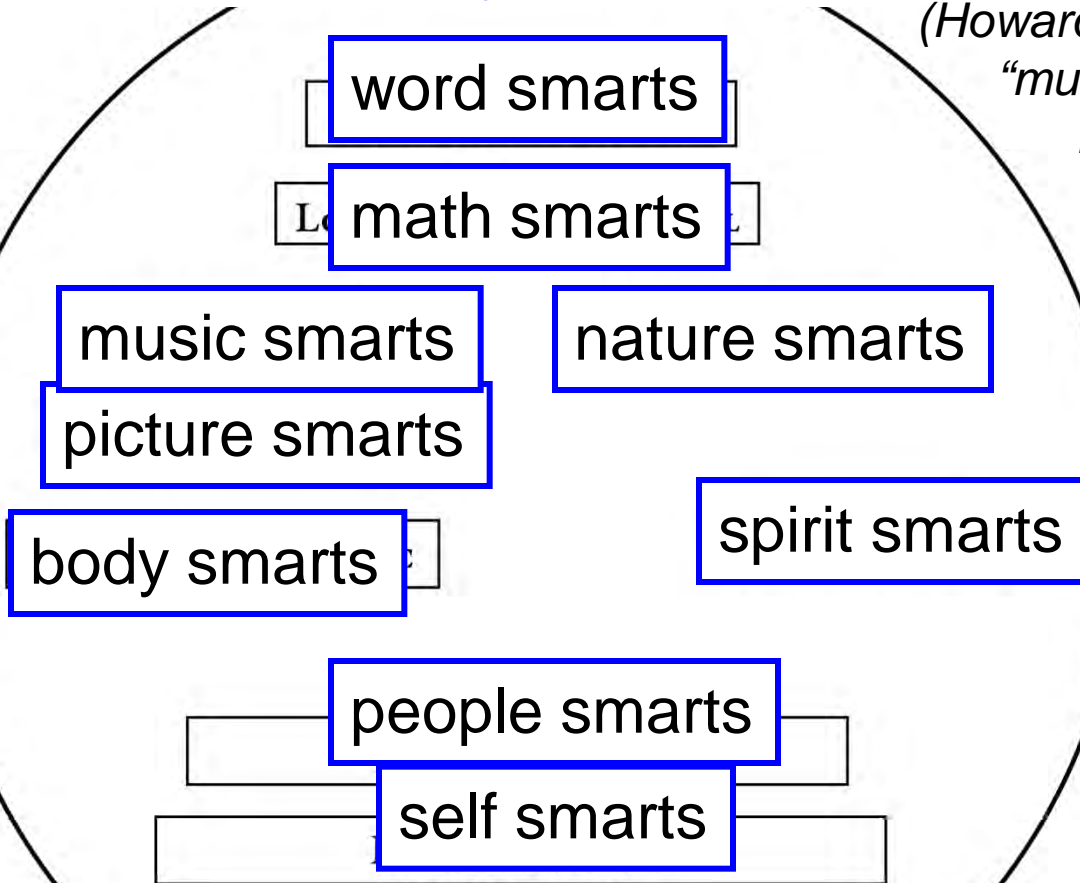
people smarts

self smarts

Life
Love
Land

LEARNING & DOING SCIENCE ... using ALL our "pattern smarts"

(Howard Gardner's
"multiple
intelligences
theory")





MI visual from:
<http://davetgc.freehomepage.com/MImapclrDef1.gif>

FEAR

domain of the
unknown

Land of Eagle



ONE WHO SEES BIG PATTERNS

domain of the
known



“must become
PATTERN-able”

(Douglas J. Cardinal)
architect

PATTERN

Sherman's Lagoon

OKAY, WE'RE HERE AT THE MALL. WHERE'S THIS WATCH YOU WANT TO BUY?

PATIENCE. PATIENCE.

<http://www.shermanslagoon.com>

ONE DOESN'T JUST RUSH INTO THE MALL FOR A QUICK ITEM AND LEAVE. IT'S NOT A CONVENIENCE STORE.

ONE MUST TAKE IT ALL IN. MEASURE THE VIBE. SOAK UP THE AMBIENCE. FIND PATTERNS AND IDENTIFY THE DISTURBANCES.

TRANSLATION?

YOU'RE HERE ALL DAY, PAL.

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PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



PATTERN CONCEPTUAL FRAMEWORK

outer

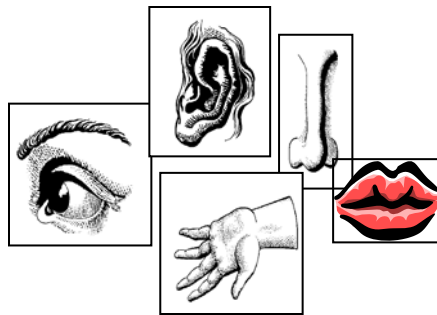
inner

outer

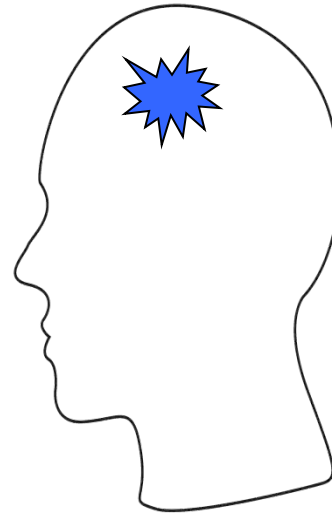
natural

ideal

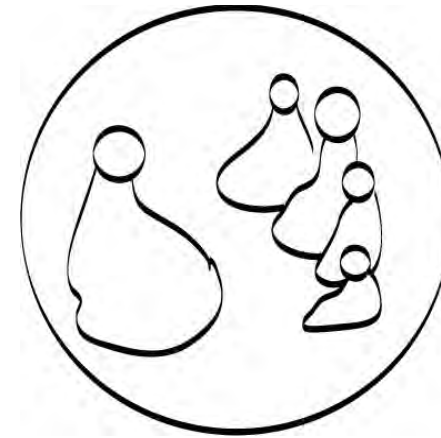
abstract



recognize
pattern



transform
pattern



express
pattern

PATTERN CONCEPTUAL FRAMEWORK

outer

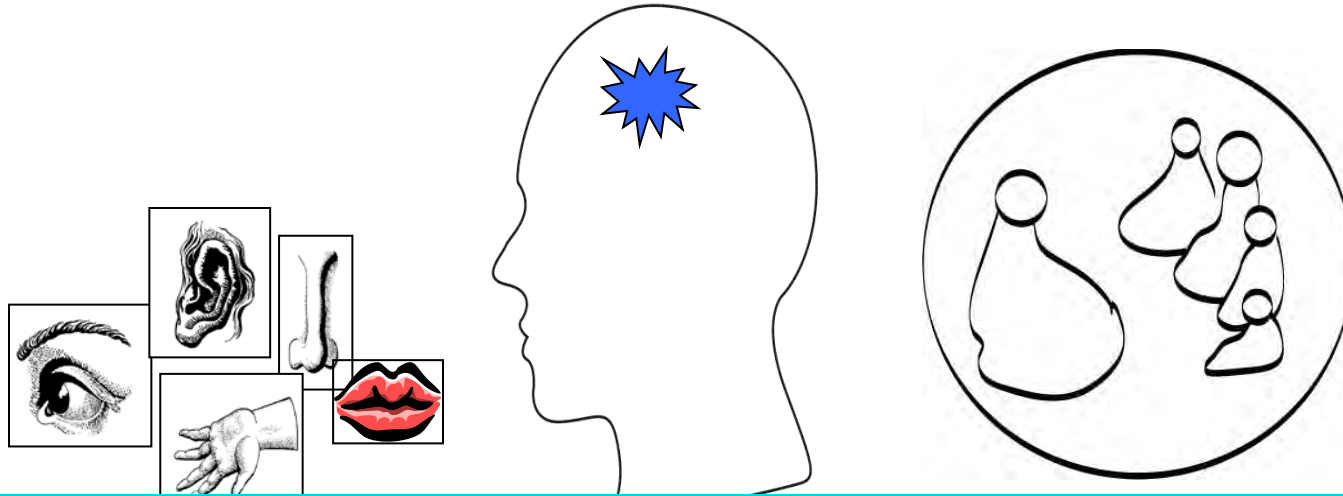
inner

outer

natural

ideal

abstract



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what we know, do and value

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



Ursa major
muin

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



Big Dipper



PATTERN CONCEPTUAL FRAMEWORK

Murdena Marshall
Mi'kmaq Elder

four
plant examples



Sana Kavanagh, Research Assistant

natural



PATTERN CONCEPTUAL FRAMEWORK

outer

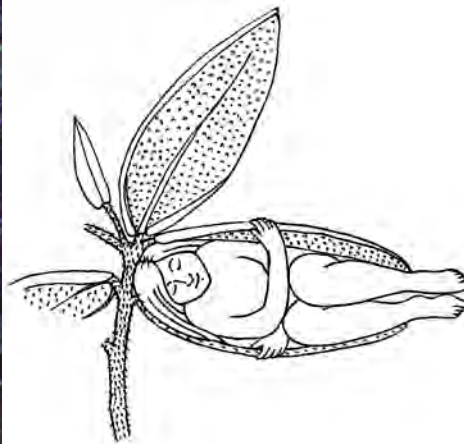
inner

outer

natural

ideal

abstract



Etuiwulnuksit

etui + wul
each side + good

feel + plant
nuk+ sit

PATTERN CONCEPTUAL FRAMEWORK

outer

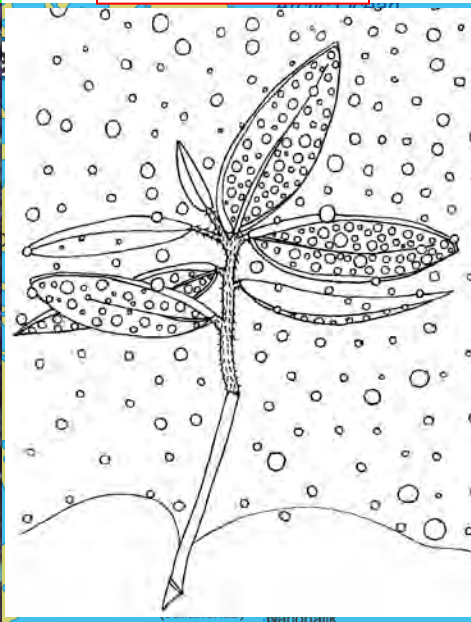
inner

outer

natural

ideal

abstract



Ledum groenlandicum

ledum

oriental shrub

groenlandicum

of Greenland

natural



PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



Altaqiaqwel

Altaqiaq + wel

**creepy crawling +
thing**

PATTERN CONCEPTUAL FRAMEWORK

outer

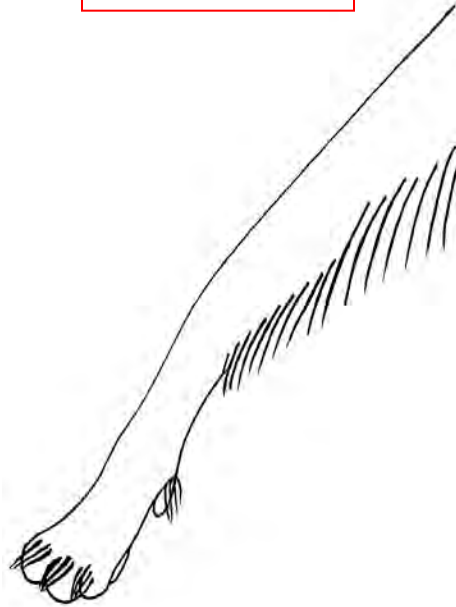
inner

outer

natural

ideal

abstract



Lycopodium

Lyco + podium

wolf foot

natural



© 2000 Janet Novak



PATTERN CONCEPTUAL FRAMEWORK

outer

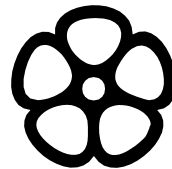
inner

outer

natural



ideal



abstract

Monotropa uniflora

Mono + tropa

one + turn

uni + flora

one + flower

PATTERN CONCEPTUAL FRAMEWORK

outer

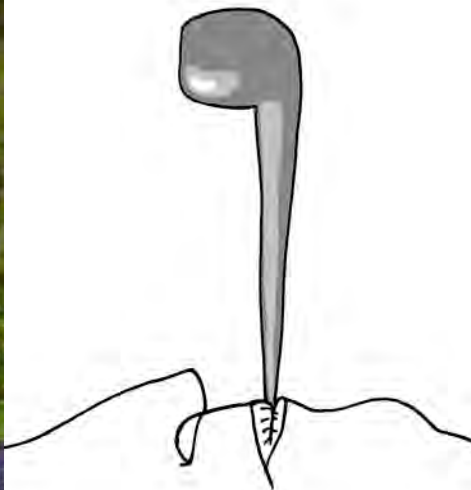
inner

outer

natural



ideal



abstract

Lnuitmaqne'l

Lnui + tmaqne'l

People's + pipe

PATTERN CONCEPTUAL FRAMEWORK

outer

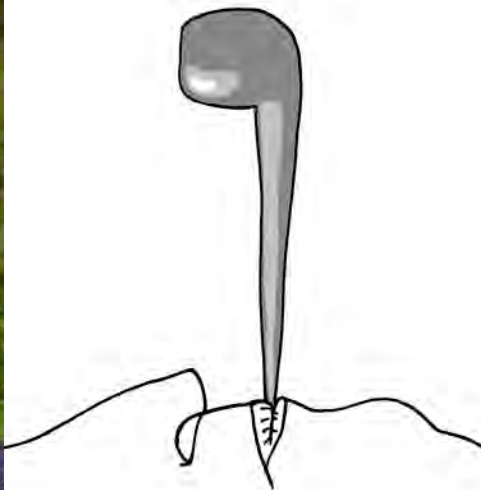
inner

outer

natural



ideal



abstract

Indian
pipe

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



ghost
plant

natural



PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



Gaultheria procumbens

gaultheria

for J. F. Gaultier

Canadian physicist

procumbens

prostrate

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



Kaqawejumanaqsi'l

Kaqawej

crow

uman + aqsi'l

berries + plant

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

natural

ideal

abstract



tea berry

ground tea

petit thé du bois

PATTERN CONCEPTUAL FRAMEWORK

outer

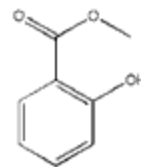
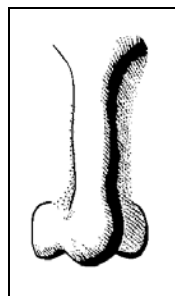
inner

outer

natural

ideal

abstract



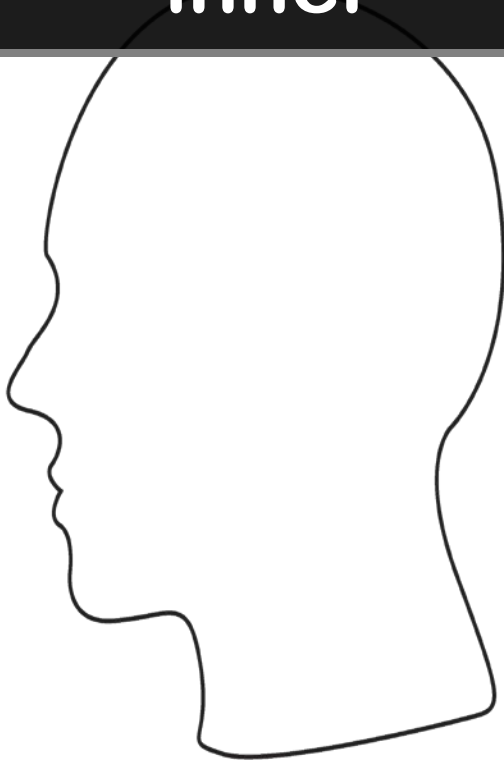
wintergreen

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

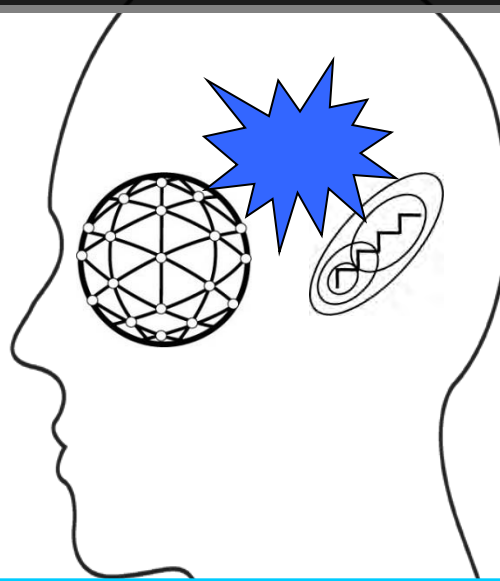


PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



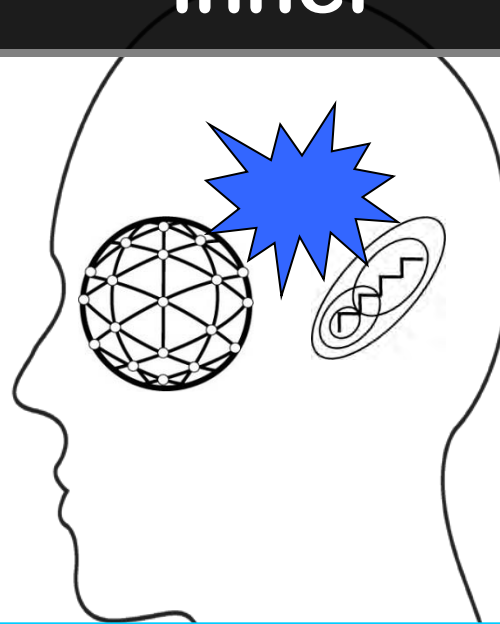
**SANCTIONED
PERSPECTIVES & INTELLIGENCES:**
who we are; where we are; where we were;
what we know, do and value

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1970	100	100	100	100	100	100	100	100	100	100	100	100	1200
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1972	100	100	100	100	100	100	100	100	100	100	100	100	1200
1973	100	100	100	100	100	100	100	100	100	100	100	100	1200
1974	100	100	100	100	100	100	100	100	100	100	100	100	1200
1975	100	100	100	100	100	100	100	100	100	100	100	100	1200
1976	100	100	100	100	100	100	100	100	100	100	100	100	1200
1977	100	100	100	100	100	100	100	100	100	100	100	100	1200
1978	100	100	100	100	100	100	100	100	100	100	100	100	1200
1979	100	100	100	100	100	100	100	100	100	100	100	100	1200
1980	100	100	100	100	100	100	100	100	100	100	100	100	1200
1981	100	100	100	100	100	100	100	100	100	100	100	100	1200
1982	100	100	100	100	100	100	100	100	100	100	100	100	1200
1983	100	100	100	100	100	100	100	100	100	100	100	100	1200
1984	100	100	100	100	100	100	100	100	100	100	100	100	1200
1985	100	100	100	100	100	100	100	100	100	100	100	100	1200
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1988	100	100	100	100	100	100	100	100	100	100	100	100	1200
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1994	100	100	100	100	100	100	100	100	100	100	100	100	1200
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1999	100	100	100	100	100	100	100	100	100	100	100	100	1200
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2011	100	100	100	100	100	100	100	100	100	100	100	100	1200
2012	100	100	100	100	100	100	100	100	100	100	100	100	1200
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2017	100	100	100	100	100	100	100	100	100	100	100	100	1200
2018	100	100	100	100	100	100	100	100	100	100	100	100	1200
2019	100	100	100	100	100	100	100	100	100	100	100	100	1200
2020	100	100	100	100	100	100	100	100	100	100	100	100	1200
2021	100	100	100	100	100	100	100	100	100	100	100	100	1200
2022	100	100	100	100	100	100	100	100	100	100	100	100	1200

SANCTIONED
PERSPECTIVES & INTELLIGENCES:
who we are; where we are; where we were;
what we know, do and value

Physical Direction and Linear Time

detached &
instrumental

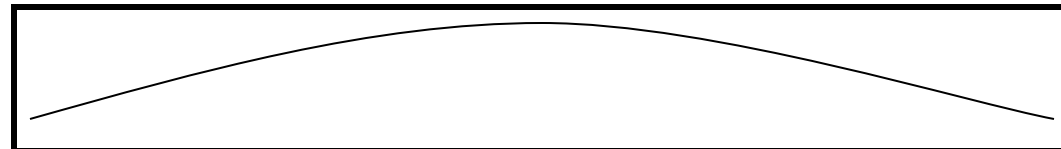
East (sunrise)

... measurement of
the time of sunrise

... for each new day
over the course of
one full year.

SYDNEY, NS												Astronomical Applications Dept.												
Location: W060 11, N46 09												U. S. Naval Observatory												
Rise and Set for the Sun for 2004												Washington, DC 20392-5420												
Zone: 4h West of Greenwich																								
Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
01	0743	1625	0724	1705	0639	1748	0540	1830	0447	1910	0413	1945	0413	1956	0443	1930	0522	1839	0600	1740	0642	1646	0723	1617
02	0743	1626	0723	1706	0637	1749	0538	1831	0445	1911	0412	1946	0414	1955	0444	1929	0523	1837	0601	1738	0644	1644	0724	1616
03	0743	1627	0722	1708	0635	1750	0536	1833	0444	1912	0412	1947	0415	1955	0446	1927	0524	1835	0602	1736	0645	1643	0725	1616
04	0743	1628	0720	1709	0634	1752	0534	1834	0442	1913	0411	1947	0415	1955	0447	1926	0525	1833	0604	1734	0646	1642	0727	1616
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07	0743	1631	0716	1714	0628	1756	0528	1838	0438	1917	0410	1950	0418	1953	0450	1922	0529	1827	0607	1729	0651	1638	0730	1615
08	0743	1632	0715	1715	0626	1757	0527	1839	0437	1919	0410	1950	0418	1953	0452	1920	0530	1825	0609	1727	0652	1636	0731	1615
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30	0727	1702			0544	1827	0448	1908	0414	1943	0413	1956	0441	1933	0519	1842	0558	1742	0639	1649	0722	1617	0743	1624
31	0725	1703			0542	1829			0413	1944			0442	1931	0520	1840			0641	1647			0743	1625

X



y

**participatory &
creative choice**



**Wjipenuk Etek
Lnuimlkikno'ti
- Spirit of the East -**

East (sunrise)

**... a place of
beginnings and
enlightenment**

**... where new
knowledge can be
created or received
to bring about
harmony or right
relations.**

Journey of Life



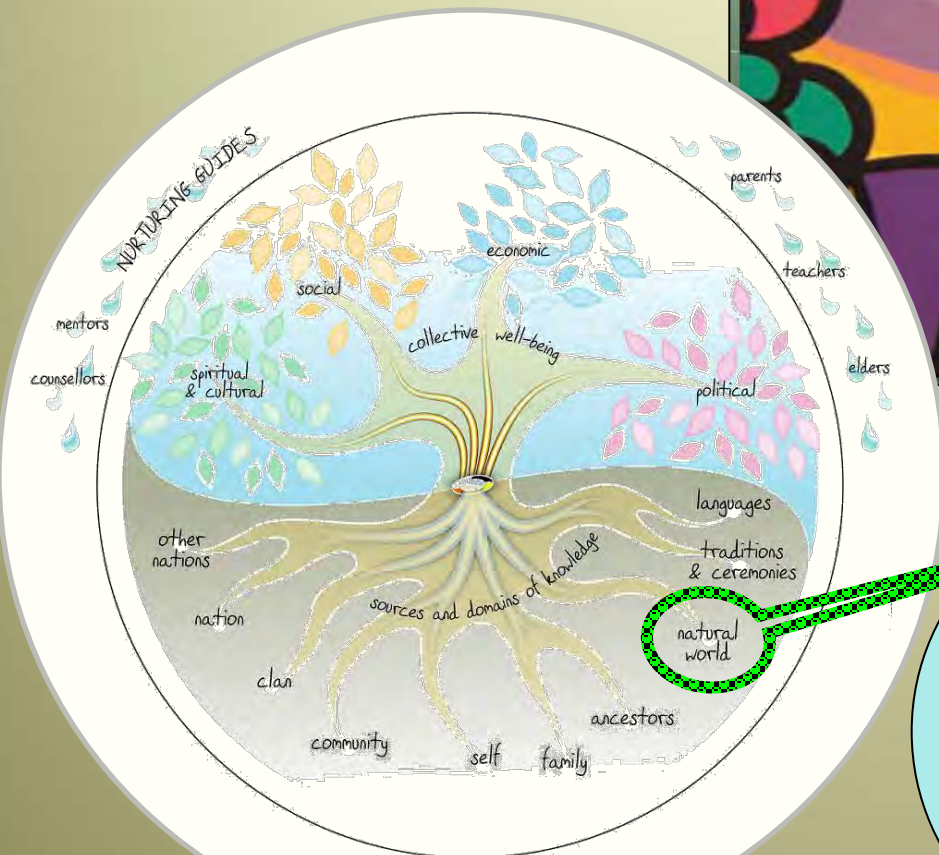
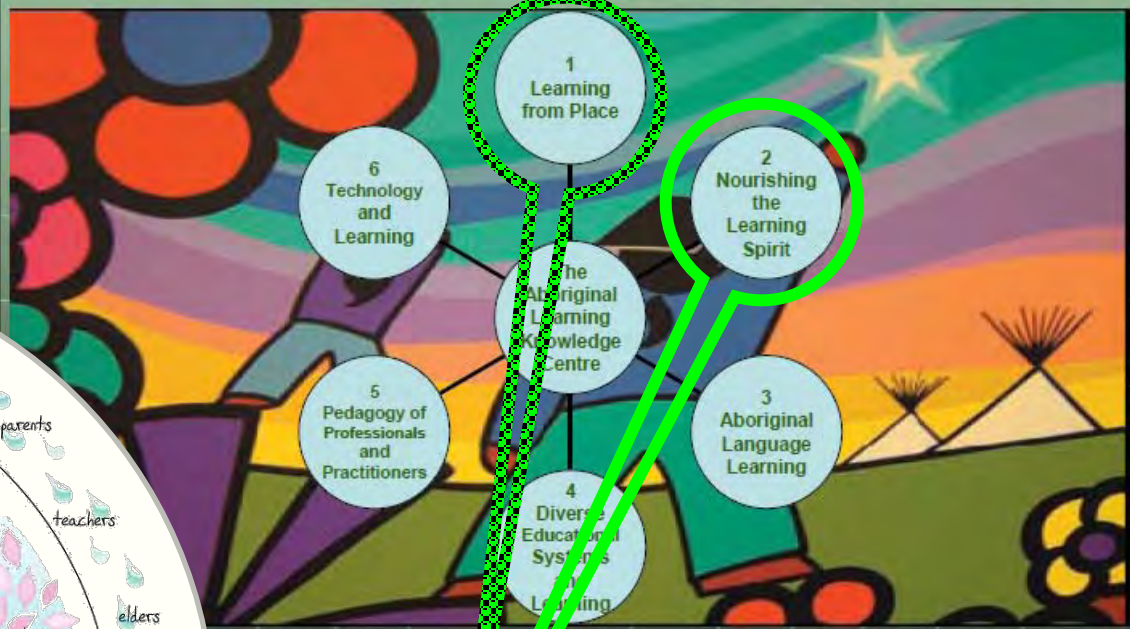
Life Long Learning

Six Animation Theme Bundles Intersecting and Interdependent

from:

Aboriginal Learning Knowledge Centre
Canadian Council on Learning

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



Nourishing the Learning Spirit

First Nations Life Long Learning Model

Six Animation Theme Bundles Intersecting and Interdependent

from:

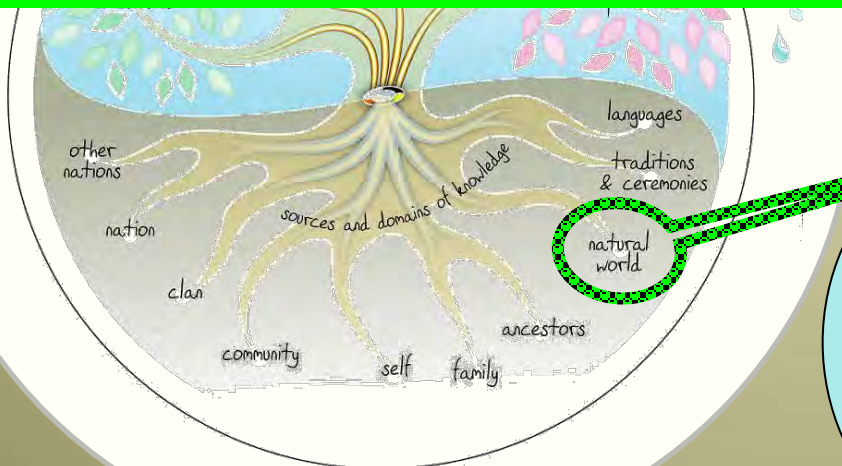
Aboriginal Learning Knowledge Centre
Canadian Council on Learning

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



- **Re-generation of the learning spirit.** (Re-connecting values to Elders' and traditional teachings, connecting to community, to 'place', to Indigenous peoples' languages, building on dreams, visions, mediation, and aspirations contribute to learning. The gauge for this type of learning is performance and service).

Nourishing
the
Learning
Spirit

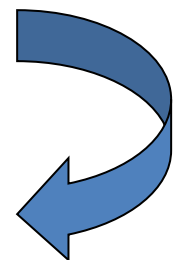
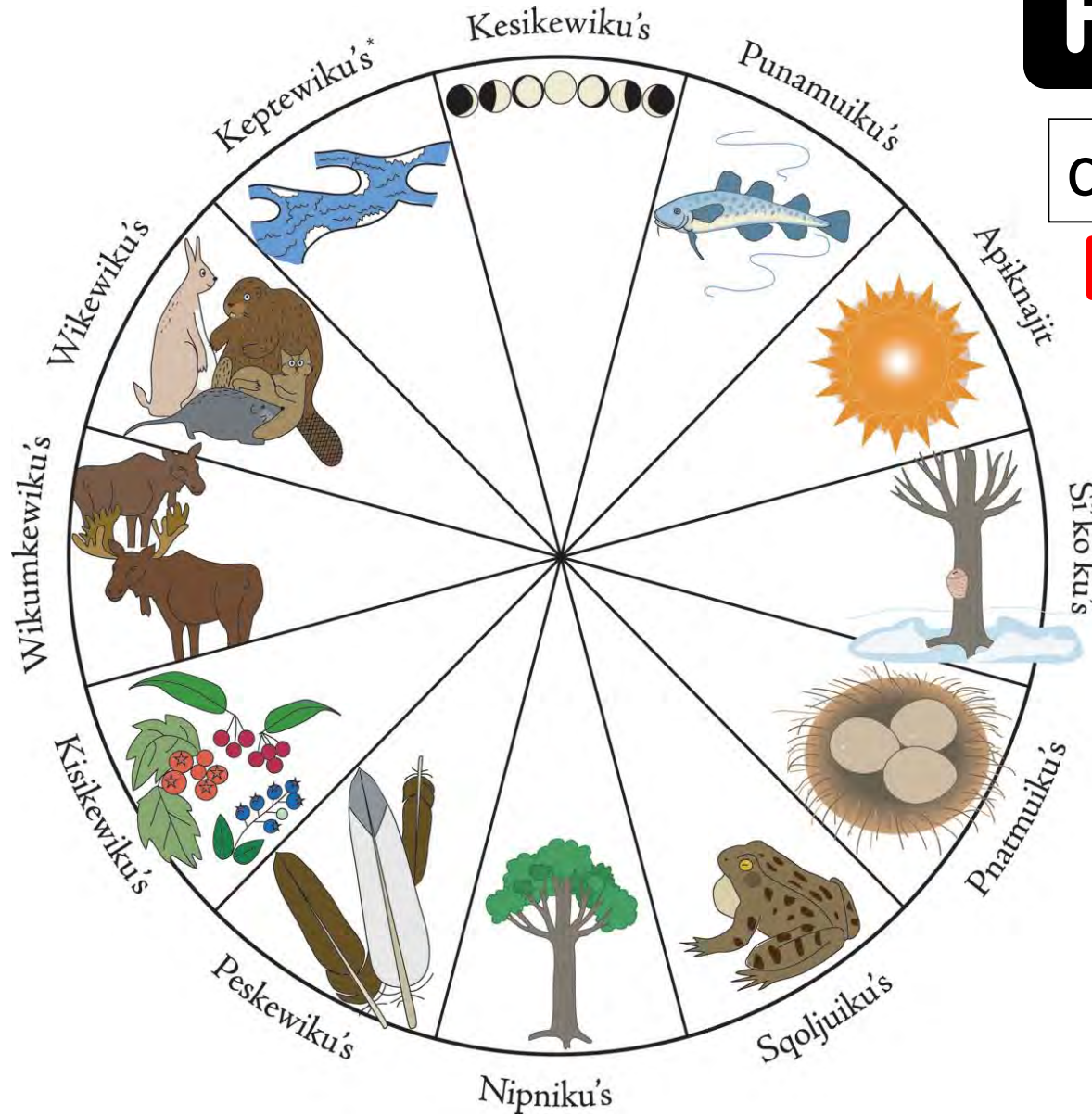


First Nations Life Long Learning Model

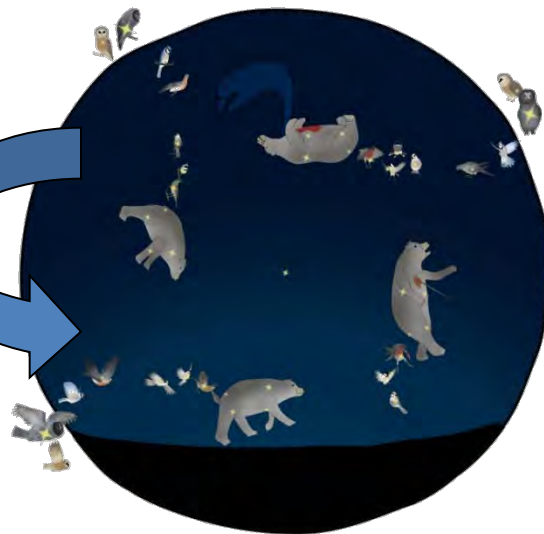
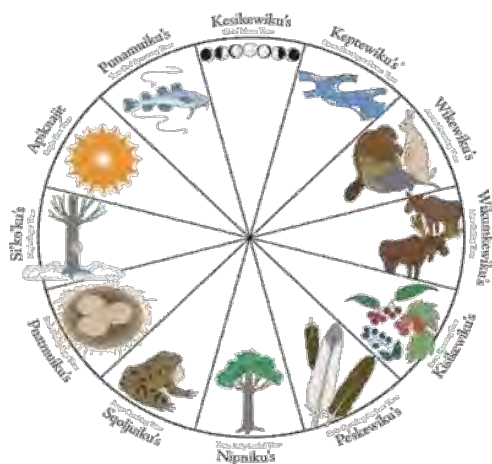
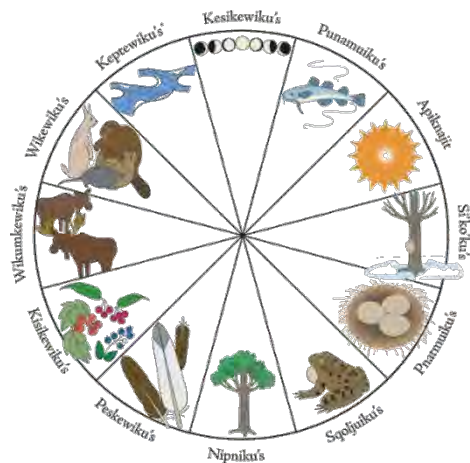
How?

courses

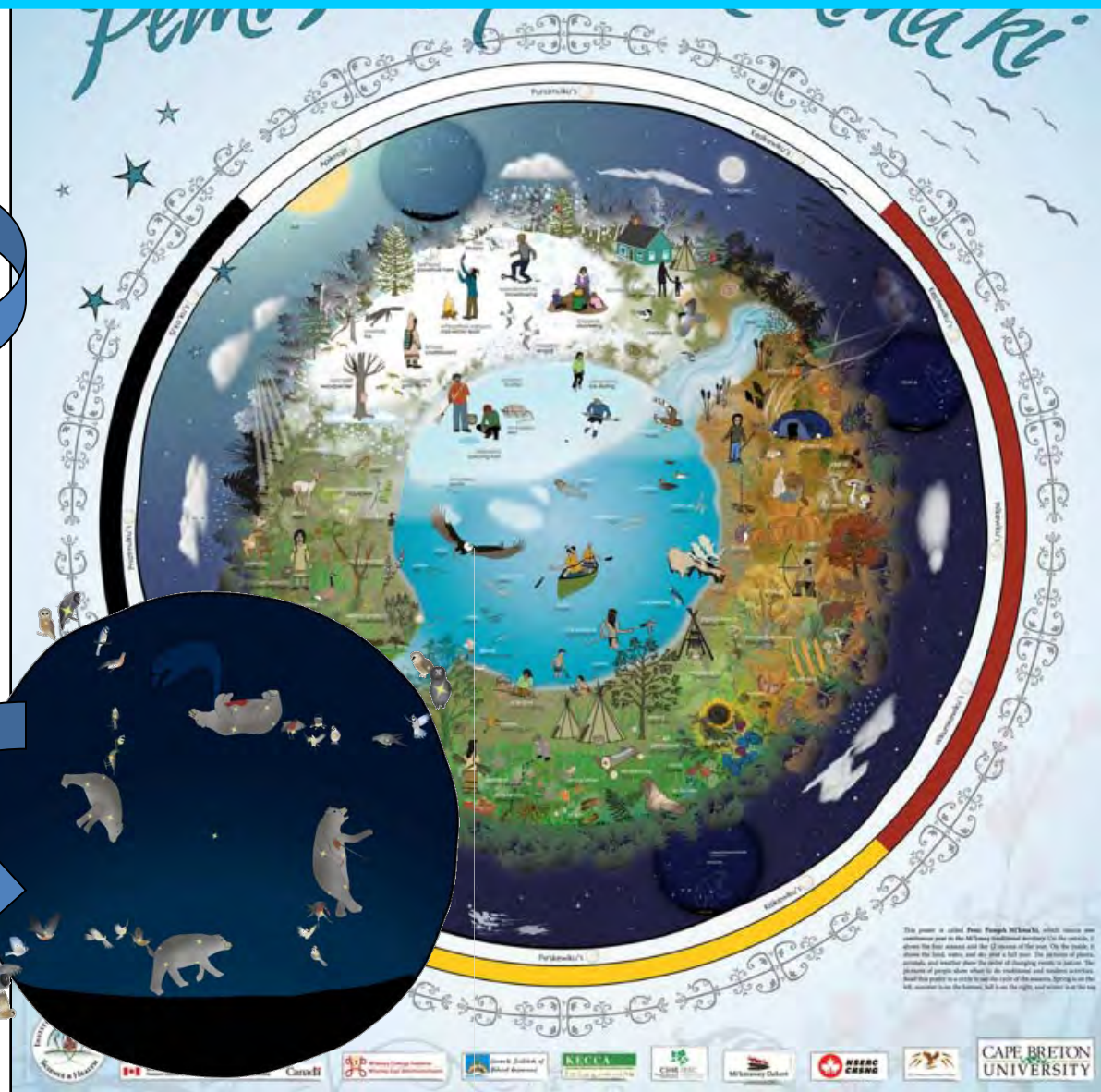
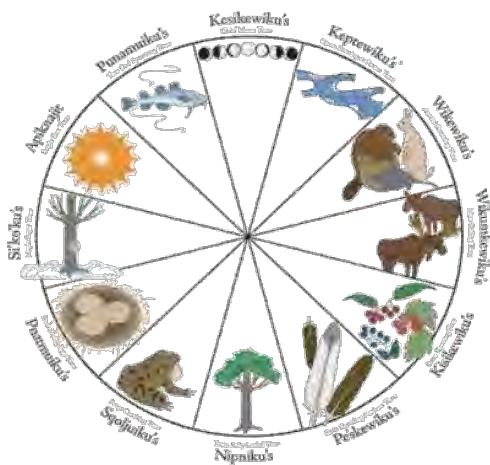
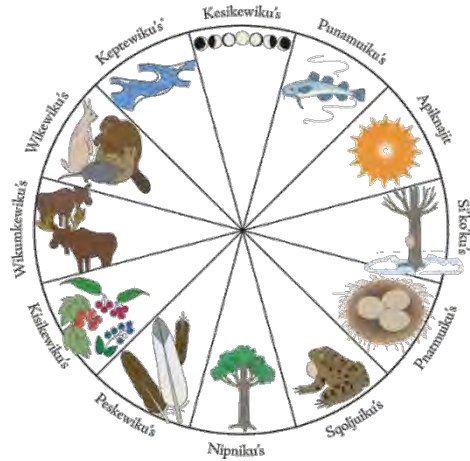
MST



pattern recognition, transformation, expression

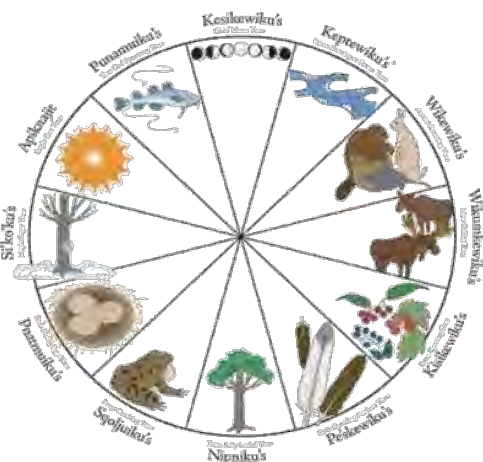
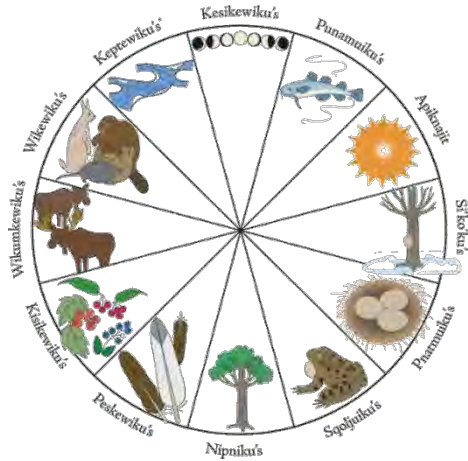


pattern recognition, transformation, expression



This poster is called Peme Sikwa (Mi'kmaq), which means our summer year in the Mi'kmaq traditional calendar. 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 year a full year. The pictures of plants, animals, and people show the cycle of changing seasons in nature. The pictures of people show what to do in traditional and modern activities. Read the words in Mi'kmaq to see the cycle of the seasons. Spring is the 1st, summer is the 4th, fall is the 7th, and winter is the 10th.

pattern recognition, transformation, expression



This poster is called *Pavuk Paqut* (Winter's Spirit), which means our winter spirit in the Inuktitut traditional language. 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 and a full year's cycle. The pictures of people show effort to be traditional and modern activities. Each picture is a story to tell the children of the winter. Spring is the 1st, summer is the 2nd, fall is the 3rd, and winter is the 4th.

THE UNIVERSE
YOURS TO DISCOVER

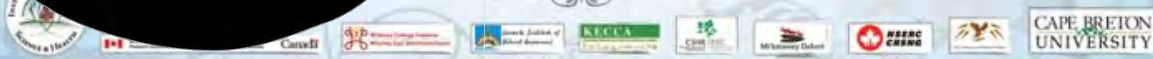


INTERNATIONAL YEAR OF
ASTRONOMY
2009

Pemi Pungek Mi'kma'ki



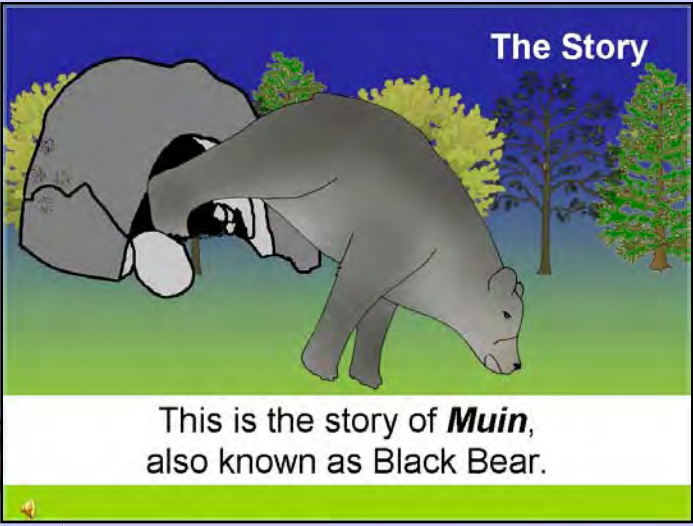
This year is called Pemi Pungek Mi'kma'ki, which means our
summer year in the Mi'kmaq traditional calendar. On the calendar, I
show the first month and the 12 months of the year. On the inside, I
show the birds, water, and sky year a full year. The pictures of plants,
animals, and weather show the signs of changing seasons in nature. The
pictures of people show what to do traditional and modern activities.
Read the words to learn to read the signs of the seasons. Spring is the
1st, summer is the 4th, fall is the 7th, and winter is the 10th.



video of Mi'kmaq Night Sky Story (in Mi'kmaq, English, French) available at:

<http://www.integrativescience.ca>

<http://www.astronomy2009.ca/>



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.**

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

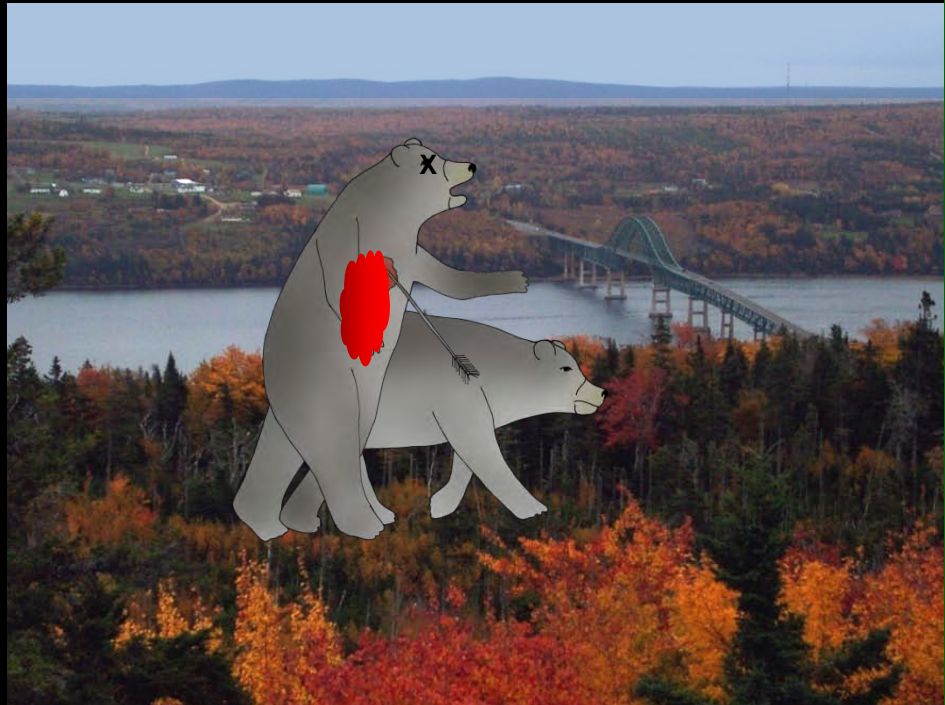


as telescopes help us see the stars in new ways.

southern Alberta / Blackfoot



Nova Scotia / Mi'kmaq



stories of our interactions with and within nature

Science

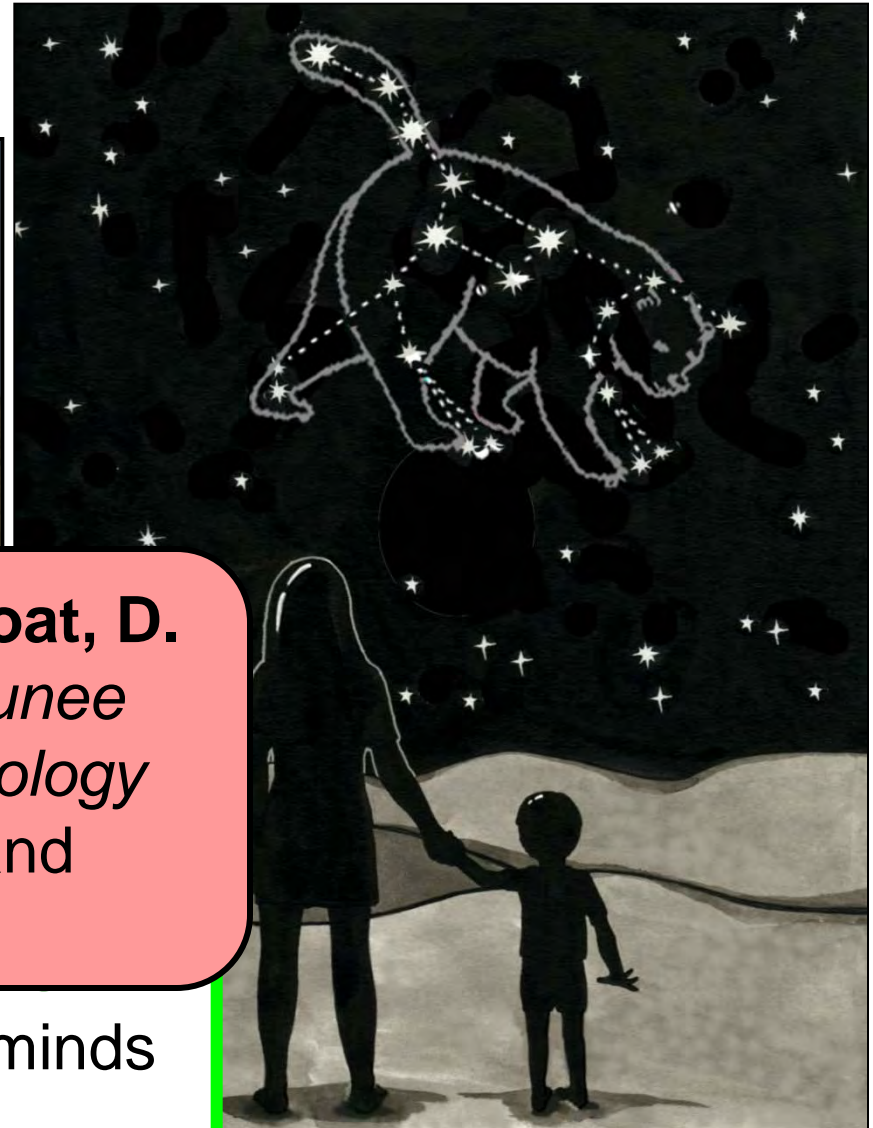


PATTERNS ...

- spirits within ecosystem-wide minds
- ideas in brain-based minds

stories of our interactions with and within nature

Science



Sheridan, J. & Longboat, D.
2006. *The Haudenosaunee
imagination and the ecology
of the sacred*. *Space and
Culture* 9(4): 365-381.

- spirits within ecosystem-wide minds
- ideas in brain-based minds

PATTERN CONCEPTUAL FRAMEWORK

outer

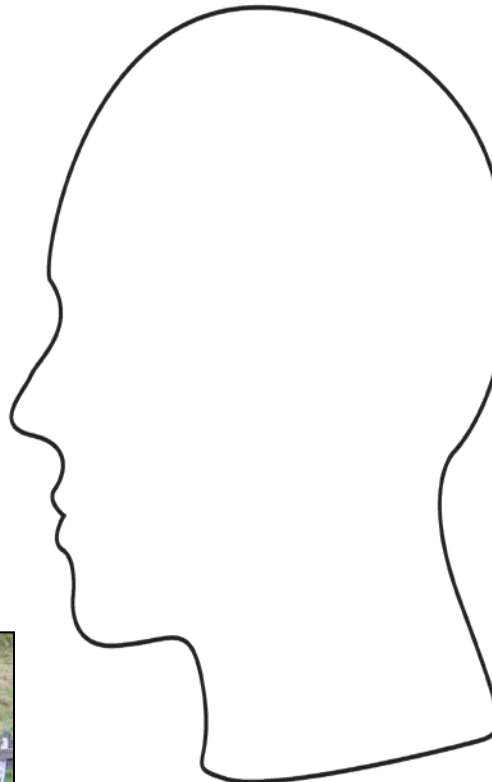
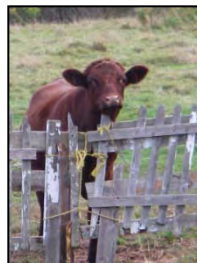
natural

inner

ideal

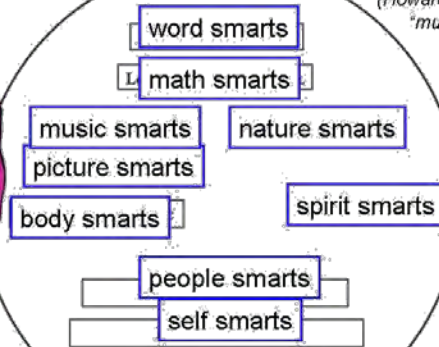
outer

abstract

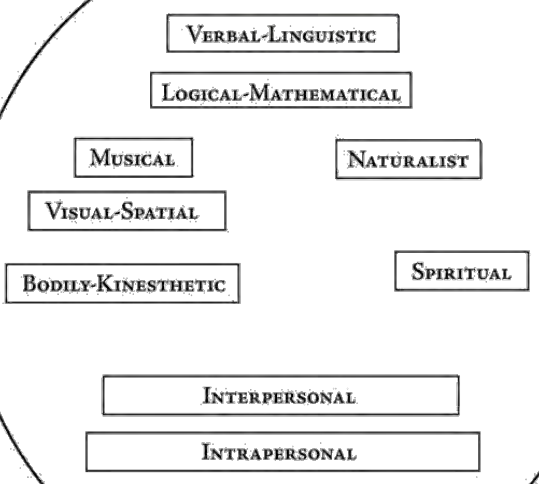
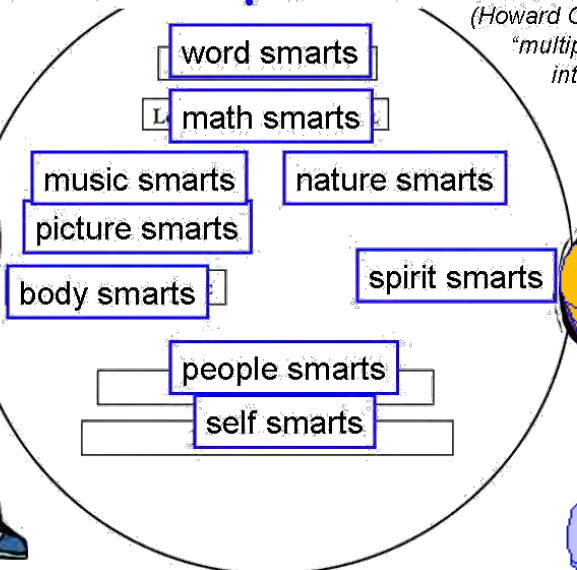


LEARNING & DOING SCIENCE ...
using ALL our "pattern smarts"

(Howard Gardner's
"multiple
intelligences
theory")



LEARNING & DOING SCIENCE ... using ALL our "pattern smarts"



MI visual from:
<http://davetgc.freehomepage.com/MImapclrDef1.gif>

M.J. Smart! jcp
1999

PATTERN CONCEPTUAL FRAMEWORK

outer

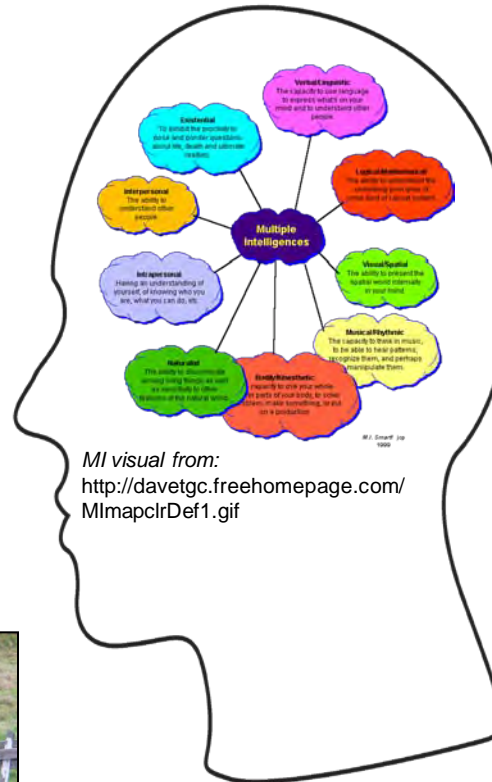
natural

inner

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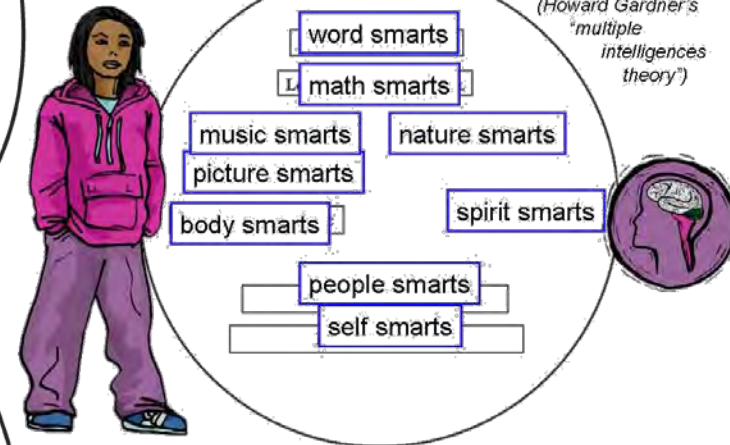
outer

abstract



LEARNING & DOING SCIENCE ...
using ALL our "pattern smarts"

(Howard Gardner's "multiple intelligences theory")

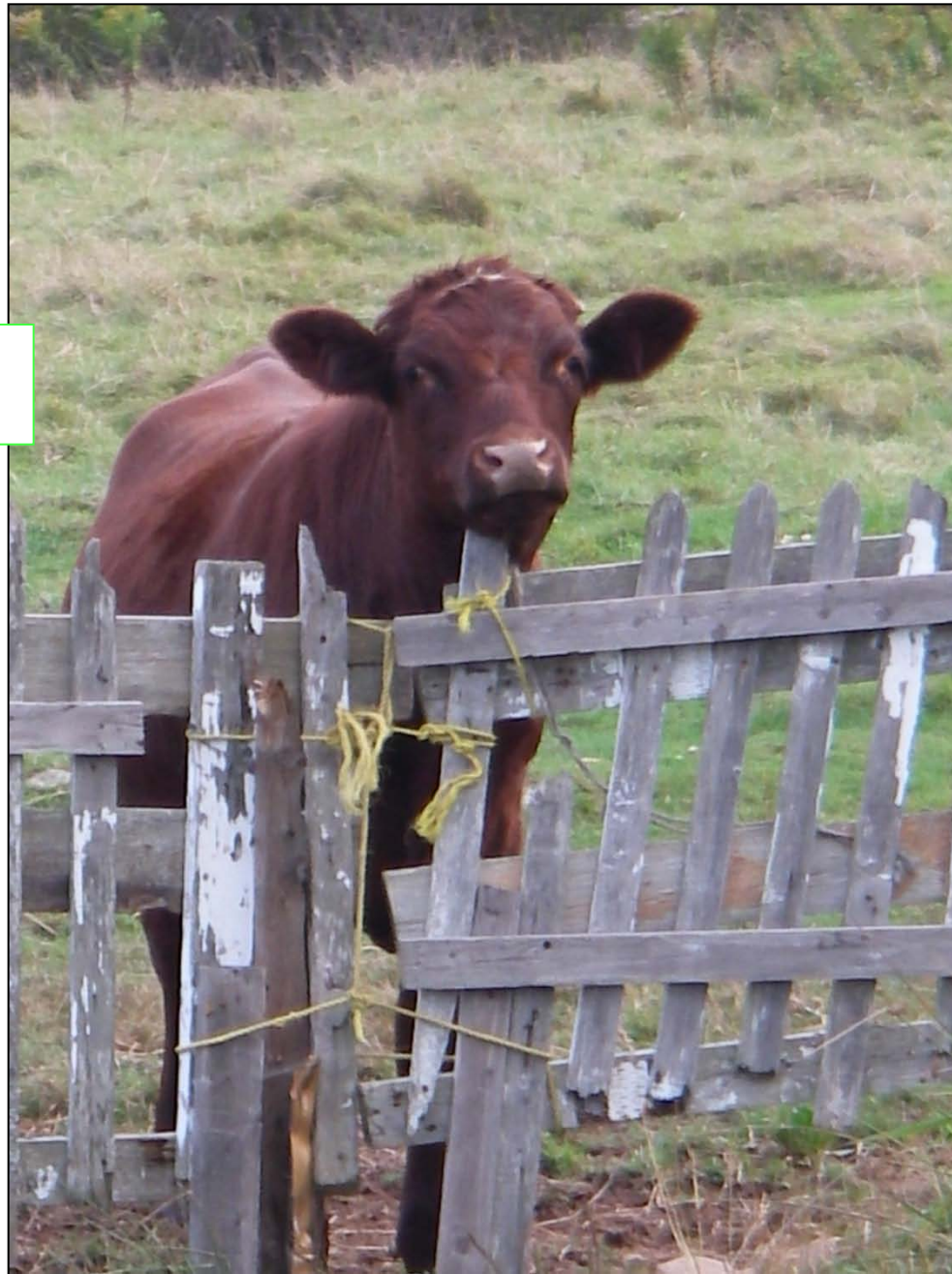


natural



<http://thehive.com/wp-content/uploads/2009/01/miracle-hudson-river-plane-crash-10.jpg>

natural



natural



natural



natural



http://www.cycleducation.com.au/img/Raynie_decend_Fling08.jpg

natural



natural



natural



natural





Canada Research
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Chaires de recherche
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Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
sciences humaines du Canada

Canada
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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



Membertou
Elementary



Mi'kmawey Debert



IWK Health Centre
Foundation



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of Nova Scotia



Eskasoni First Nation Detachment
Royal Canadian Mounted Police Gendarmerie royale
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Mi'kmaq College Institute
Mi'kmaq Espi Kina'matno'kuom

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