

# **Toqwa'tu'kl Kijitaqnn Integrative Science**

**expanding our perspectives  
via science knowledge inclusivity**

**Presentation to:**

**Aboriginal Health Sciences Advisory Committee  
Dalhousie University; 30 November 2006**

**Cheryl Bartlett, PhD**

**Tier 1 Canada Research Chair  
in Integrative Science**

**Professor of Biology**

**Director, Institute for Integrative Science & Health**



Canada Research Chairs / Chaires de recherche du Canada / Canada

Social Sciences and Humanities Research Council of Canada / Conseil de recherches en sciences humaines du Canada

Canada Foundation for Innovation / Fondation canadienne pour l'innovation

CAPE BRETON UNIVERSITY



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



IWK Health Centre Foundation

IAPH

ATLANTIC ABORIGINAL Health Research Program

Mi'kmaq Elders

NOVA SCOTIA Health Research FOUNDATION

SABLE OFFSHORE ENERGY INCORPORATED

UNAMA'KI INSTITUTE OF NATURAL RESOURCES

KECCA Knowledge: Education and Cultural Consultant Associates

NSERC CRSNG

Mi'kmawey Debert

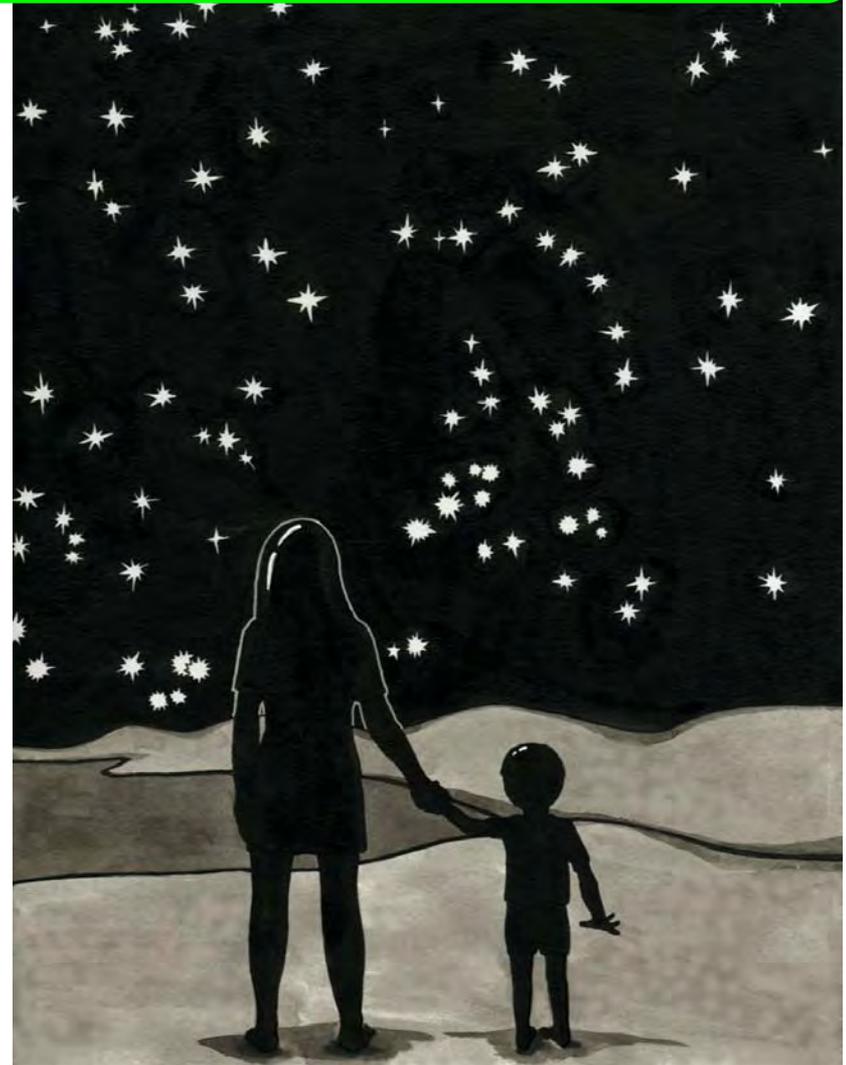
Royal Canadian Mounted Police / Gendarmerie royale du Canada

# stories of our interactions with and within nature

## Science

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

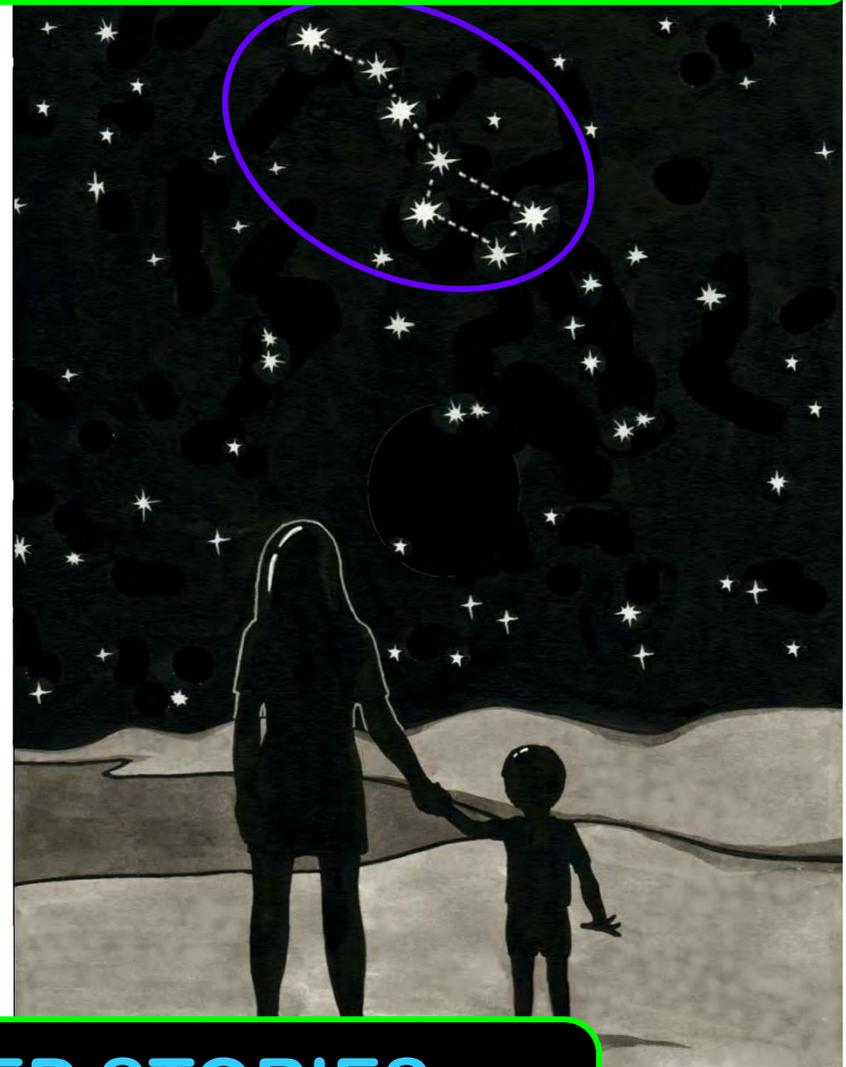
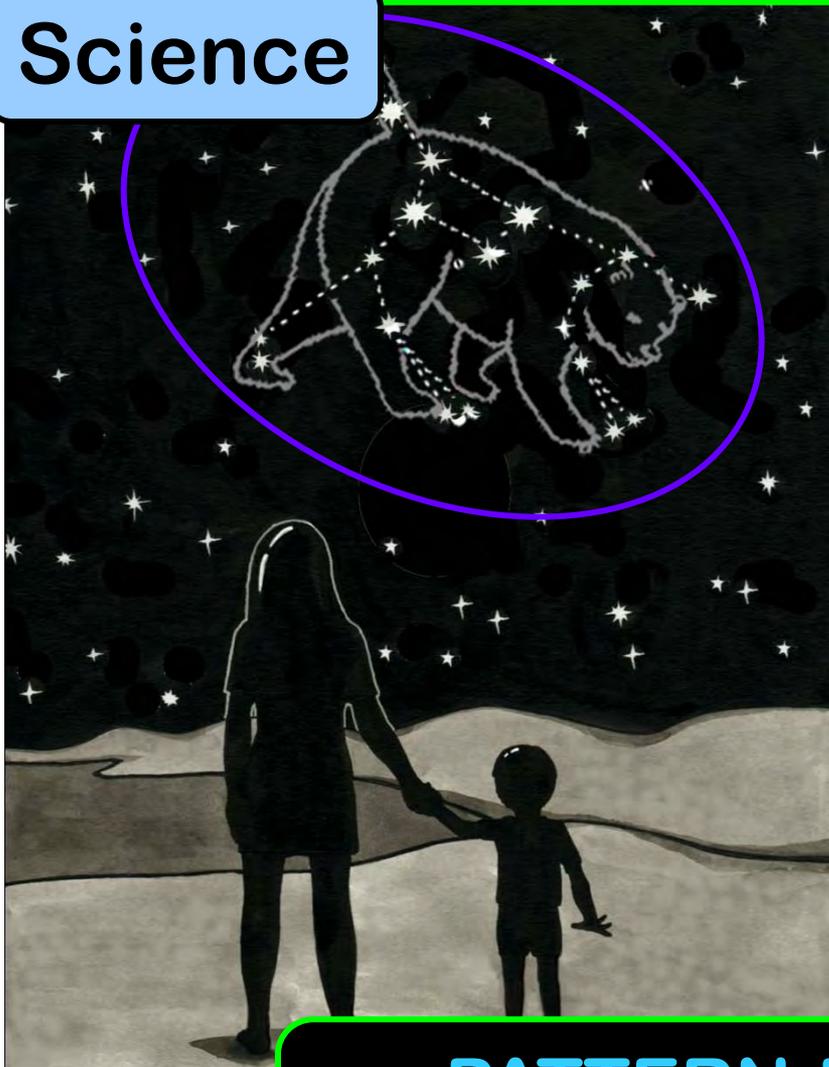
Both result from the same intellectual process of creating “order”, i.e. pattern stories.



**Science is pattern-based knowledge.**

# stories of our interactions with and within nature

Science



**PATTERN-BASED STORIES**  
recognition, transformation, expression

# stories of our interactions with and within nature

## Science

recognition - making – breaking – transformation - communication

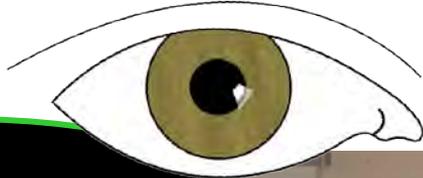
# PATTERN

**Periodic Table of the Elements**

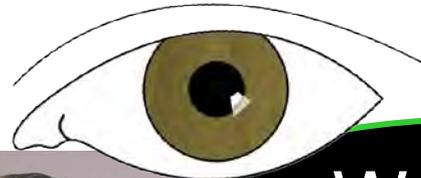
1 H Hydrogen																	2 He Helium
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Cesium	56 Ba Barium	57-71 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89-103 Unq Unbiunium	104 Unp Unbinium	105 Unh Unhennium	106 Uns Unseptium	107 Uno Unoctium	108 Uue Unennium										
		89 La Lanthanum	90 Ce Cerium	91 Pr Praseodymium	92 Nd Neodymium	93 Pm Promethium	94 Sm Samarium										
		95 Eu Europium	96 Gd Gadolinium	97 Tb Terbium	98 Dy Dysprosium	99 Ho Holmium	100 Er Erbium	101 Tm Thulium	102 Yb Ytterbium	103 Lu Lutetium							
		95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium							

stories of our interactions with and within nature

“two-eyed seeing”



Indigenous



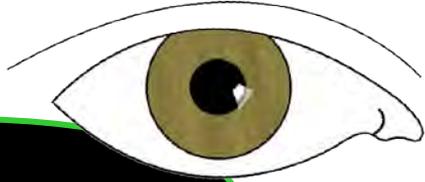
Western



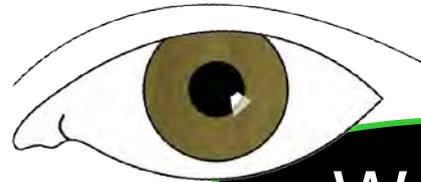
Albert Marshall, Mi'kmaq Elder  
Eskasoni First Nation

stories of our interactions with and within nature

“two-eyed seeing”



Indigenous



Western

Science

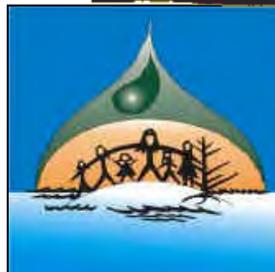


stories of our interactions with and within nature

# Science

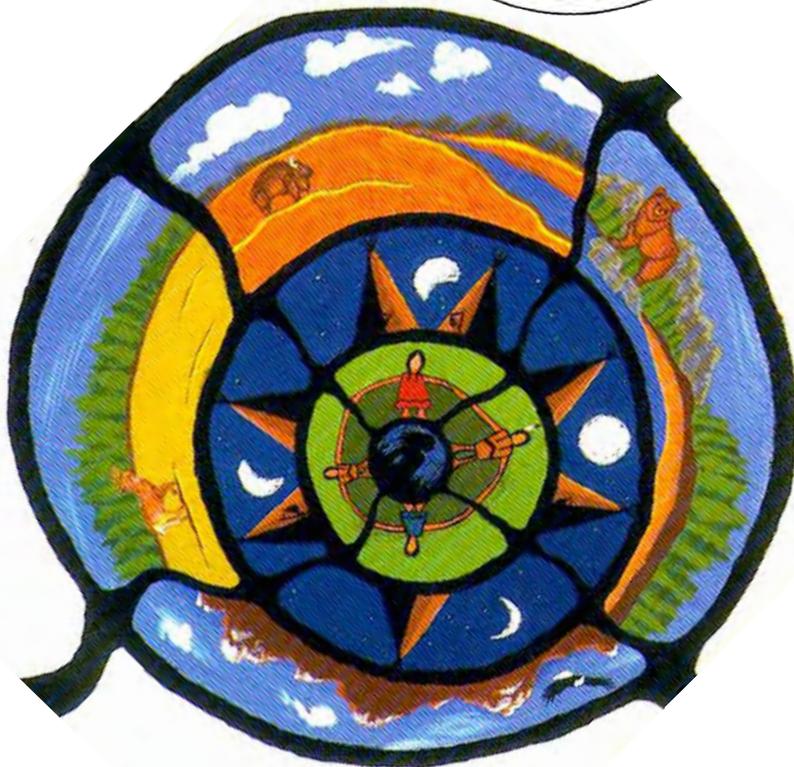
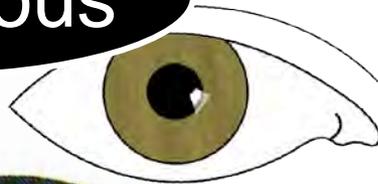


Life  
Love  
Land

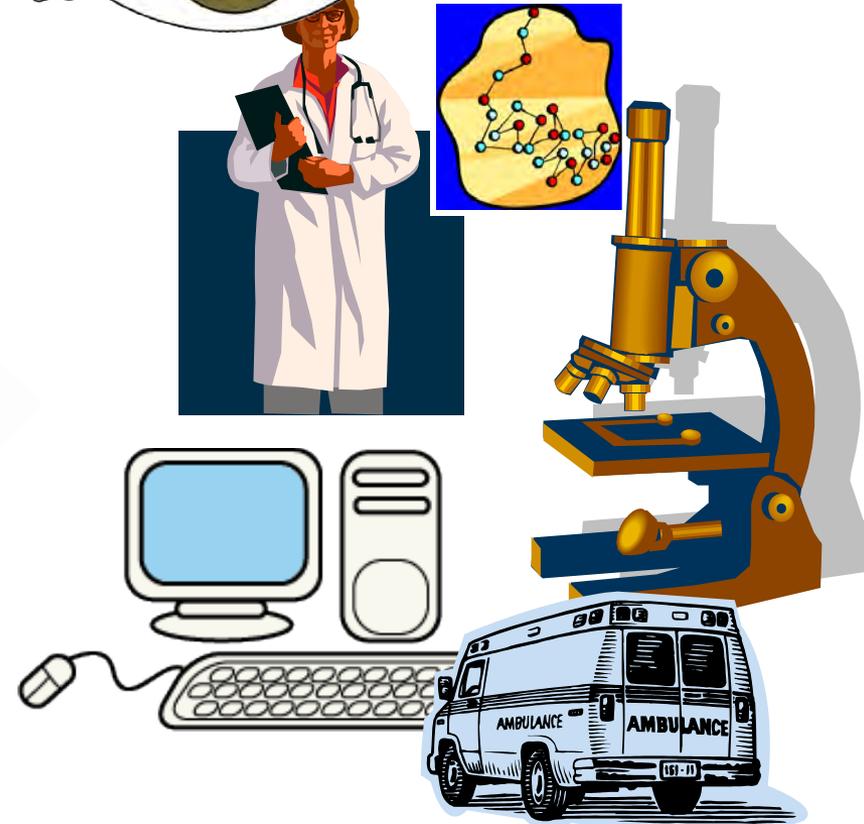
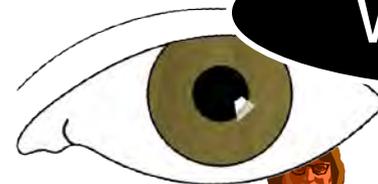


**HEALTH SCIENCES: education, research, and application  
... enriching our understandings via “Two-Eyed Seeing”**

**Indigenous**

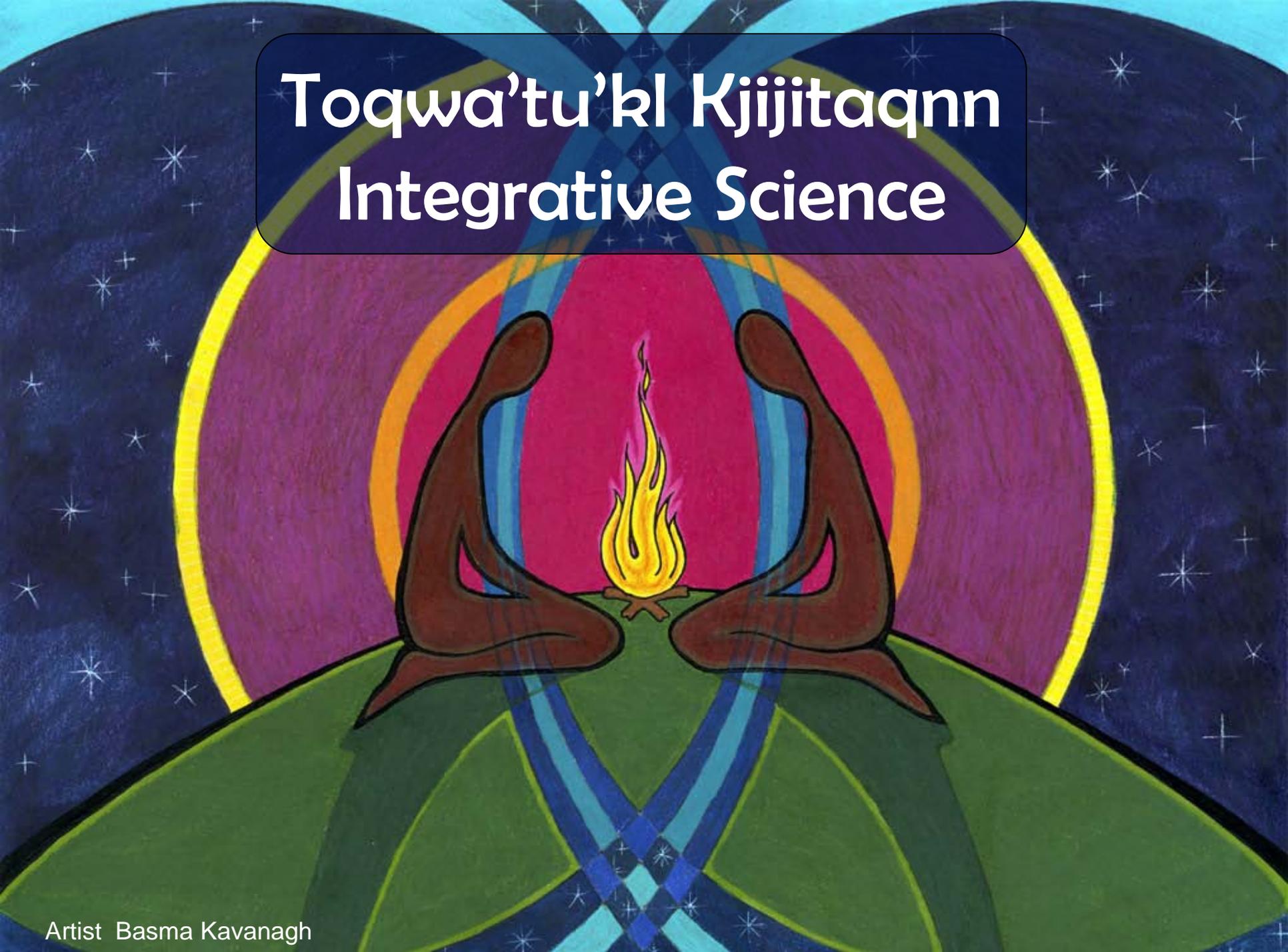


**Western**



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

# Toqwa'tu'kl Kijitaqnn Integrative Science



Artist Basma Kavanagh

# Toqwa'tu'kl Kjjitaqnn Integrative Science



**What**

**Why**

**How**

**Who**

# Toqwa'tu'kl Kijitaqnn Integrative Science

## SCIENCE

education, research, applications,  
youth and community outreach

Indigenous our knowledges Western  
our world views

“bringing our stories together”

# Toqwa'tu'kl Kijitaqnn Integrative Science



**What**

**Why**

**How**

**Who**

**Why?**

1

2

3

# Why?

# 1



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

**Why?**

**1**

**mid 1990's**

# CAPE BRETON UNIVERSITY

**no Mi'kmaq students in science**

**MI'KMA'KI**

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

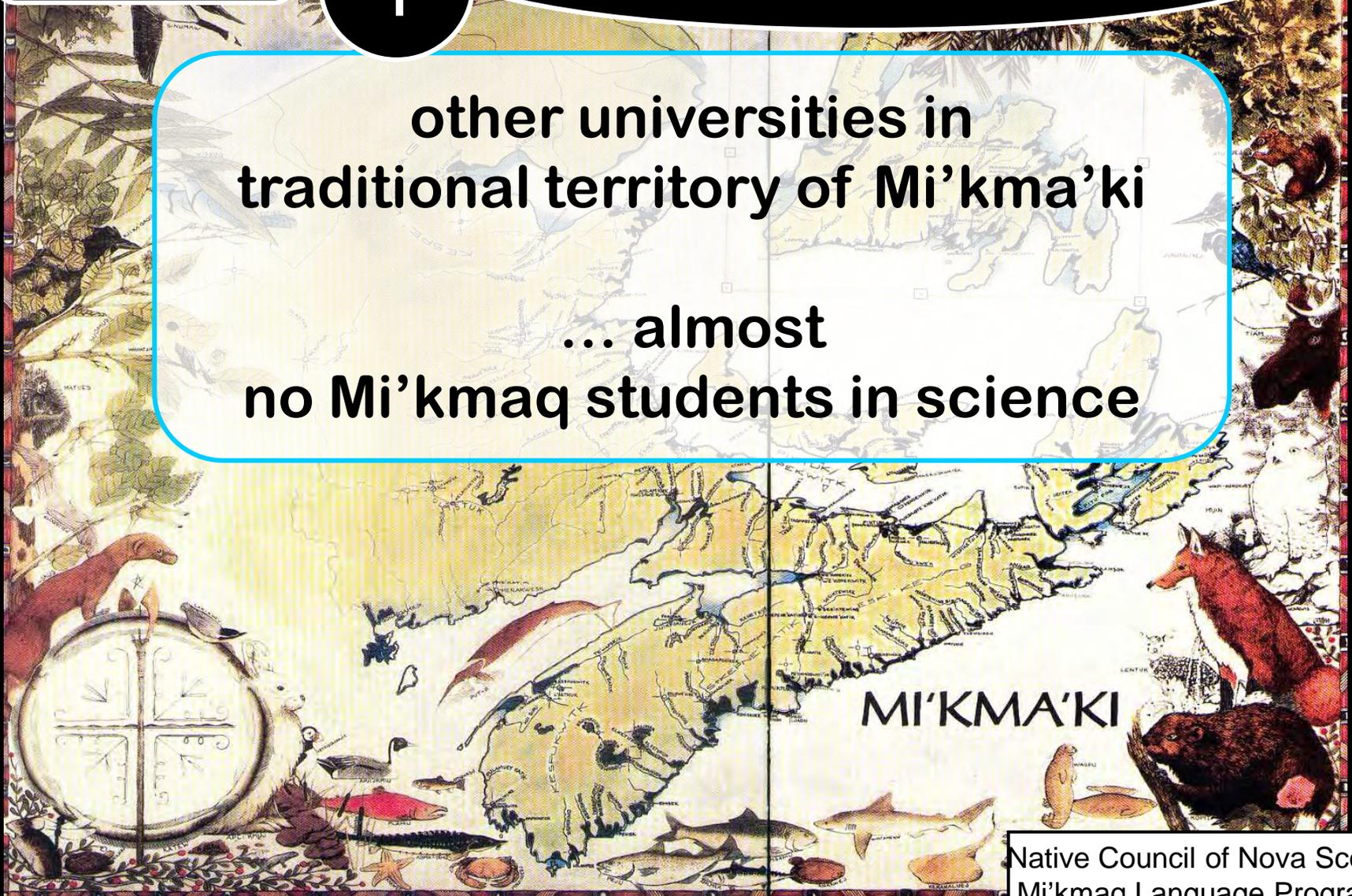
**Why?**

**1**

**mid 1990's & now**

**other universities in  
traditional territory of Mi'kma'ki**

**... almost  
no Mi'kmaq students in science**



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

**Why?**

1

mid 1990's & now



**Mi'kma'ki**

same picture other Aboriginal students  
... universities across Canada  
and throughout North America

# Why?

# 2



... and many, many youth



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, scientist & educator, Univ. of New Mexico

# Toqwa'tu'kl Kijitaqnn Integrative Science



What

Why

How

Who

PSE sciences with few Aboriginal students

# Who?



CAPE BRETON  
UNIVERSITY

1999-2006

-----  
> 100 Mi'kmaq  
students have  
experienced  
1<sup>st</sup> year science





**2005-2006:**

**Mi'kmaq Int Sci  
students (approx.)**

- 1<sup>st</sup> yr: 5
- 2<sup>nd</sup> yr: 5
- 3<sup>rd</sup> yr: 5
- 4<sup>th</sup> yr: 7



- **grads: 6**  
(total)



**2006-2007:**

**Mi'kmaq Int Sci  
students (approx.)**

- 1<sup>st</sup> yr: 5
- 2<sup>nd</sup> yr: ?
- 3<sup>rd</sup> yr: 2
- 4<sup>th</sup> yr: 6



- **grads: 11**  
(total)

CAPE BRETON  
UNIVERSITY

2005-2006:

Mi'kmaq Int Sci  
students (approx.)

- 1st yr:
- 2nd yr:
- 3rd yr:
- 4th yr:

---

• grads: 6  
(total)

CAPE BRETON  
UNIVERSITY

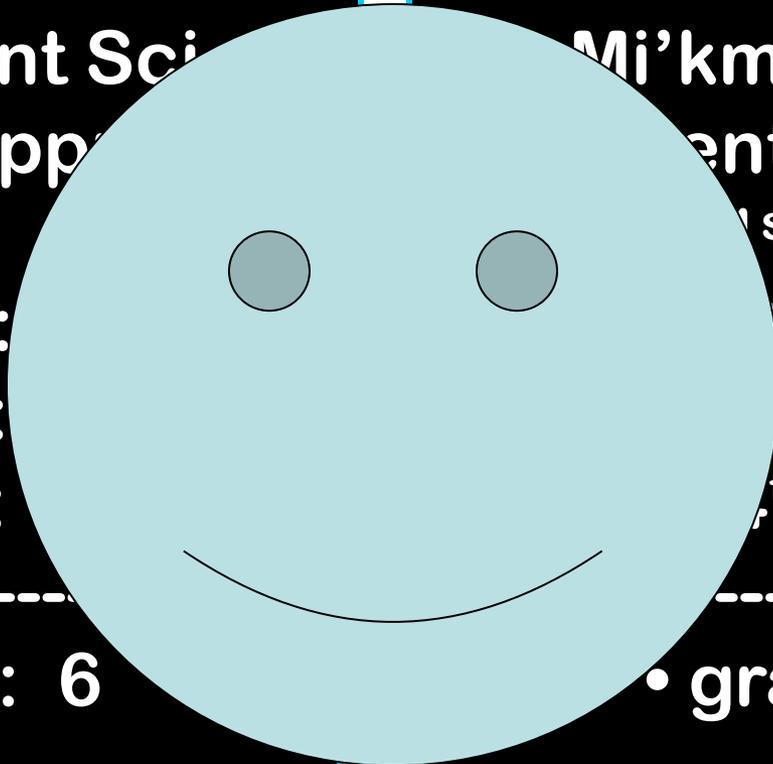
2006-2007:

Mi'kmaq Int Sci  
students (approx.)

- 1st yr: 5
- 2nd yr: ?
- 3rd yr: 2
- 4th yr: 6

---

• grads: 11  
(total)



## Number of students enrolled in & passing core MSIT courses

Course Number	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
	N / passes						
MSIT 101	21 / 15	22 / 20	20 / 14	5 / 4	26* / 17	11 / 9*	9 / 7****
							[ 2 INC ]
MSIT 103	21 / 12	22 / 12	15 / 12	5 / 3	24 / 11	9 / 4	
MSIT 201	21 / 15	21 / 19	16 / 11	6 / 5*	26* / 12	10 / 3	5 / 2
							[ 3 INC ]
MSIT 203	21 / 12	21 / 12	12 / 5	6 / 4*	24 / 7	10 / 2	
MSIT 301			5 / 5	4 / 2	11 / 6	7 / 3	1 / 1
MSIT 303			5 / 4	4 / 3	8 / 4	4 / 0	
MSIT 401				5 / 5	4 / 4**	7 / 4***	4 / 1
							[ 3 INC ]
MSIT 403				6 / 5	4 / 4**	6 / 3	

\* includes one non-native student

\*\* includes two non-native students

\*\*\* does not include two additional listed as incomplete as of 20 January 2005

\*\*\*\* includes four hospitality students

# Toqwa'tu'kl Kijitaqnn Integrative Science



**What**

**Why**

**How**

**Who**

science curricula lack Aboriginal perspectives

# 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

# 4 yr Science Degree Program

## Bachelor of Science Community Studies

*Degree Profile for:*  
**Toqwa'tu'kl Kijjitaqnn /  
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)

#### a) University (8 courses)

- 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

#### b) Technology (6 courses)

- 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)

- |                     |                      |
|---------------------|----------------------|
| 1) 3 credits: _____ | 6) 3 credits: _____  |
| 2) 3 credits: _____ | 7) 3 credits: _____  |
| 3) 3 credits: _____ | 8) 3 credits: _____  |
| 4) 3 credits: _____ | 9) 3 credits: _____  |
| 5) 3 credits: _____ | 10) 3 credits: _____ |

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

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_

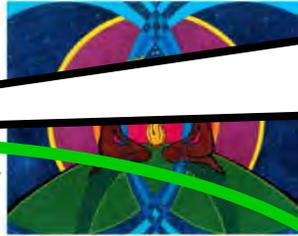
**An overall average of 60% (in courses  
over your four years) is required for  
graduation.**



# 4 yr Science Degree Program

## Bachelor of Science Community Studies

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



1) core

### 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)

- |                           |   |
|---------------------------|---|
| a) University (8 courses) | b) Technology (6 courses)                                   |
| 1) 3 credits: MSIT 101    | 1 + 2) 6 credits: Chem 121 + 122                            |
| 2) 3 credits: MSIT 103    |   |
| 3) 3 credits: MSIT 201    | 3 + 4) 6 credits: Math 131 + 132, or                        |
| 4) 3 credits: MSIT 203    | Phys 100, or Phys 111 + 112                                 |
| 5) 3 credits: MSIT 301    | 5 + 6) 6 credits (at least 3 credits must be at 300 level): |
| 6) 3 credits: MSIT 303    | - Geol 111  |
| 7) 3 credits: MSIT 401    | - any PubH at 200 level or higher                           |
| 8) 3 credits: MSIT 401    | - any Envi at 200 level or higher                           |

### Student's Electives (30 credits)

- |                     |                      |
|---------------------|----------------------|
| 1) 3 credits: _____ | 6) 3 credits: _____  |
| 2) 3 credits: _____ | 7) 3 credits: _____  |
| 3) 3 credits: _____ | 8) 3 credits: _____  |
| 4) 3 credits: _____ | 9) 3 credits: _____  |
| 5) 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.**



**CREDITS: 48**

**Science: PCS (3 full courses)**

**Topics: perspectives\* & skills\***

# 4 yr Science Degree Program

## 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

**2) concentration**

### Science Area of Concentration (42 credits)

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

### Student's Electives (10 credits)

- |                     |                      |
|---------------------|----------------------|
| 1) 3 credits: _____ | 6) 3 credits: _____  |
| 2) 3 credits: _____ | 7) 3 credits: _____  |
| 3) 3 credits: _____ | 8) 3 credits: _____  |
| 4) 3 credits: _____ | 9) 3 credits: _____  |
| 5) 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.**



**CREDITS: 42**

**Science: university & applied (tech)**

**MSIT  
courses  
(core)  
24 credits**

# 4 yr Science Degree Program

## 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)

- |                                  |   |
|----------------------------------|---|
| a) <u>University</u> (8 courses) | b) <u>Technology</u> (6 courses)                        |
| 1) 3 credits: MSIT 101           | 1 + 2) 6 credits: Chem 121 + 122                        |
| 2) 3 credits: MSIT 103           |   |
| 3) 3 credits: MSIT 201           | 3 + 4) 6 credits: Math 131 + 132, or                    |
| 4) 3 credits: MSIT 203           | Phys 100, or Phys 111 + 112                             |
|                                  | 5) 6 credits (at least 3 credits must be at 300 level): |
|                                  | - Geol 111  |
|                                  | - any PubH at 200 level or higher                       |

**3) electives**

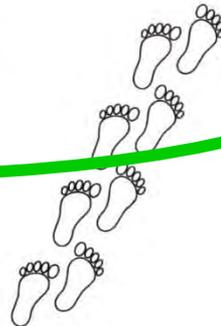
### Student's Electives (30 credits)

- |                     |                      |
|---------------------|----------------------|
| 1) 3 credits: _____ | 6) 3 credits: _____  |
| 2) 3 credits: _____ | 7) 3 credits: _____  |
| 3) 3 credits: _____ | 8) 3 credits: _____  |
| 4) 3 credits: _____ | 9) 3 credits: _____  |
| 5) 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.**



**CREDITS: 30**

**Science: all, some, none**

# 4 yr Science Degree Program

## 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"><li>1) 3 credits: MSIT 101</li><li>2) 3 credits: MSIT 103</li><li>3) 3 credits: MSIT 201</li><li>4) 3 credits: MSIT 203</li><li>5) 3 credits: MSIT 301</li><li>6) 3 credits: MSIT 303</li><li>7) 3 credits: MSIT 401</li><li>8) 3 credits: MSIT 401</li></ol> | <p>b) <u>Technology</u> (6 courses)</p> <p>1 + 2) 6 credits: Chem 121 + 122</p> <p>3 + 4) 6 credits: Math 131 + 132, or<br/>Phys 100, or Phys 111 + 112</p> <p>5 + 6) 6 credits (at least 3 credits must be at 300 level):<br/>- Geol 111<br/>- any PubH at 200 level or higher<br/>- any Envi at 200 level or higher</p> |
|---|---|

### Student's Electives (30 credits)

- 1) 3 credits: \_\_\_\_\_
- 6) 3 credits: \_\_\_\_\_

**4) work placements**

### 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.**

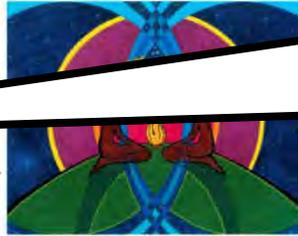
**CREDITS: 0**

**Science: experience**

# 4 yr Science Degree Program

## Bachelor of Science Community Studies

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



1) core

### 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

**CREDITS: 48**

**Science: PCS (3 core)**

**Topics: perspectives\*  
& skills\***

2) concentration

### Science Area of Concentration (42 credits)

- |                                  |   |
|----------------------------------|---|
| a) <b>University</b> (8 courses) | b) <b>Technology</b> (6 courses)  |
| 1) 3 credits: MSIT 101           | 1 + 2) 6 credits: Chem 121 + 122  |
| 2) 3 credits: MSIT 103           |   |
| 3) 3 credits: MSIT 201           | 3 + 4) 6 credits: Math 131 + 132, or<br>Phys 100, or Phys 111 + 112   |
| 4) 3 credits: MSIT 203           | 5) 6 credits (at least 3 credits must be at 300 level):<br>- Geol 111<br>- any PubH at 200 level or higher<br>- any _____ |

**CREDITS: 42**

**Science: university &  
applied (tech)**

3) electives

### Student's Electives (30 credits)

- 1) 3 credits: \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_
- 6) 3 credits: \_\_\_\_\_

**CREDITS: 30**

**Science: all, some, none**

4) work placements

### 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.**

**CREDITS: 0**

**Science: experience**



# 4 yr Science Degree Program

## Bachelor of Science Community Studies

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



1) core

18

**CREDITS: 48**  
**Science: PCS (3 core)**  
**Topics: perspectives\*  
& skills\***

2) concentration

42

**CREDITS: 42**  
**Science: university &  
applied (tech)**

3) electives

30

**CREDITS: 30**  
**Science: all, some, none**

4) work placements

max. 105

min. 60  
(18+42)

**CREDITS: 0**  
**Science: experience**

### 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

### Science Area of Concentration (42 credits)

- a) University (8 courses)
  - 1) 3 credits: MSIT 101
  - 2) 3 credits: MSIT 103
  - 3) 3 credits: MSIT 201
  - 4) 3 credits: MSIT 202
- b) Technology (6 courses)
  - 1 + 2) 6 credits: Chem 121 + 122
  - 3 + 4) 6 credits: Math 131 + 132, or Phys 100, or Phys 111 + 112
  - 5) 6 credits (at least 3 credits must be at 300 level):
    - Geol 111
    - any PubH at 200 level or higher
    - any other

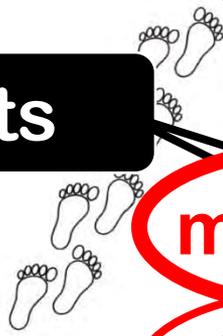
### Student's Electives (30 credits)

- 1) 3 credits: \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_
- 6) 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.



# Bachelor of Science Community Studies

## Degree Profile for: Toqwa'tu'kl Kijjitaqnn / 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)

- |                                  |   |
|----------------------------------|---|
| a) <u>University</u> (8 courses) | b) <u>Technology</u> (6 courses)                            |
| 1) 3 credits: MSIT 101           | 1 + 2) 6 credits: Chem 121 + 122                            |
| 2) 3 credits: MSIT 103           |   |
| 3) 3 credits: MSIT 201           | 3 + 4) 6 credits: Math 131 + 132, or                        |
| 4) 3 credits: MSIT 203           | Phys 100, or Phys 111 + 112                                 |
| 5) 3 credits: MSIT 301           | 5 + 6) 6 credits (at least 3 credits must be at 300 level): |
| 6) 3 credits: MSIT 303           | - Geol 111  |
| 7) 3 credits: MSIT 401           | - any PubH at 200 level or higher                           |
| 8) 3 credits: MSIT 401           | - any Envi at 200 level or higher                           |

### Student's Electives (30 credits)

- |                     |                      |
|---------------------|----------------------|
| 1) 3 credits: _____ | 6) 3 credits: _____  |
| 2) 3 credits: _____ | 7) 3 credits: _____  |
| 3) 3 credits: _____ | 8) 3 credits: _____  |
| 4) 3 credits: _____ | 9) 3 credits: _____  |
| 5) 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

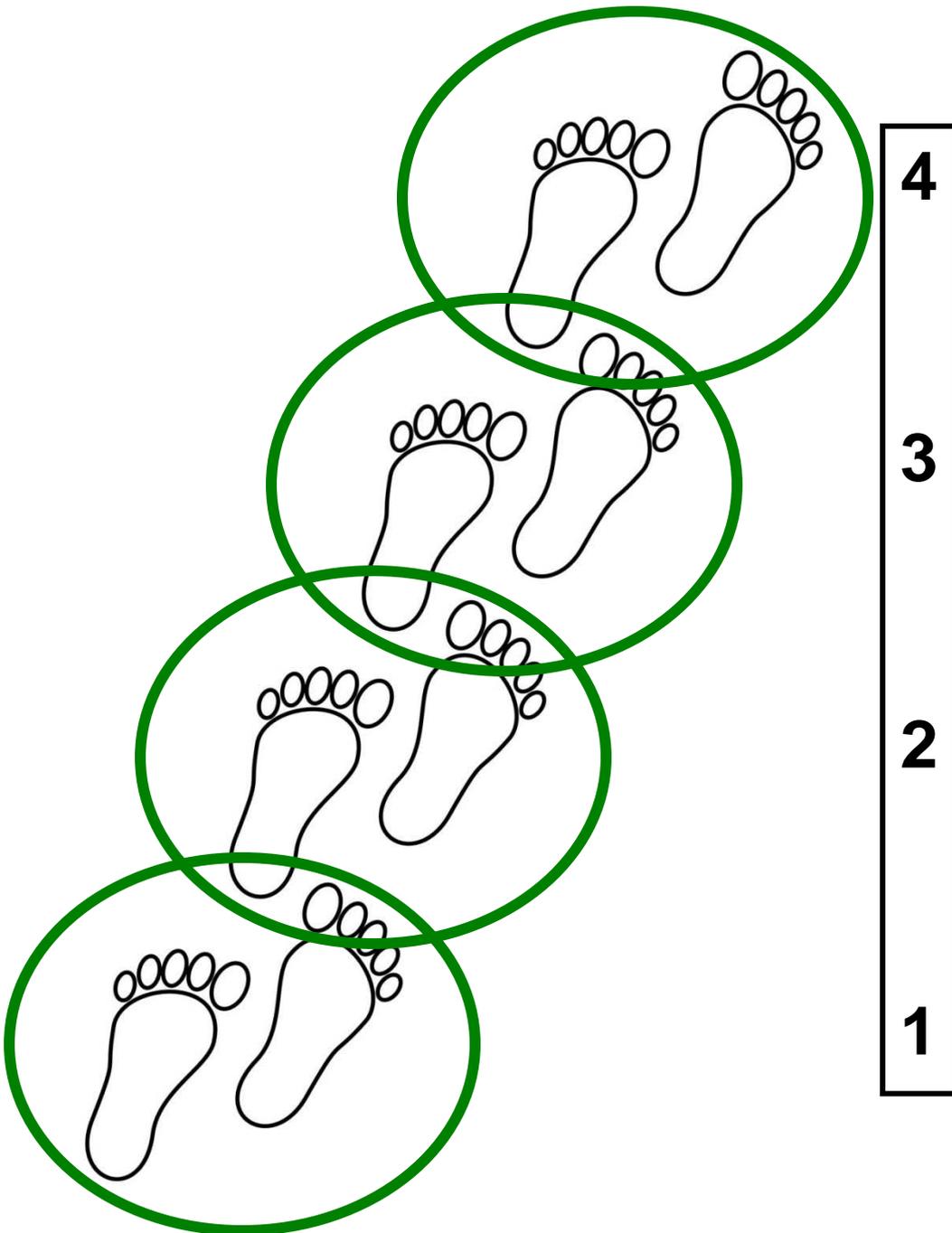
# Science

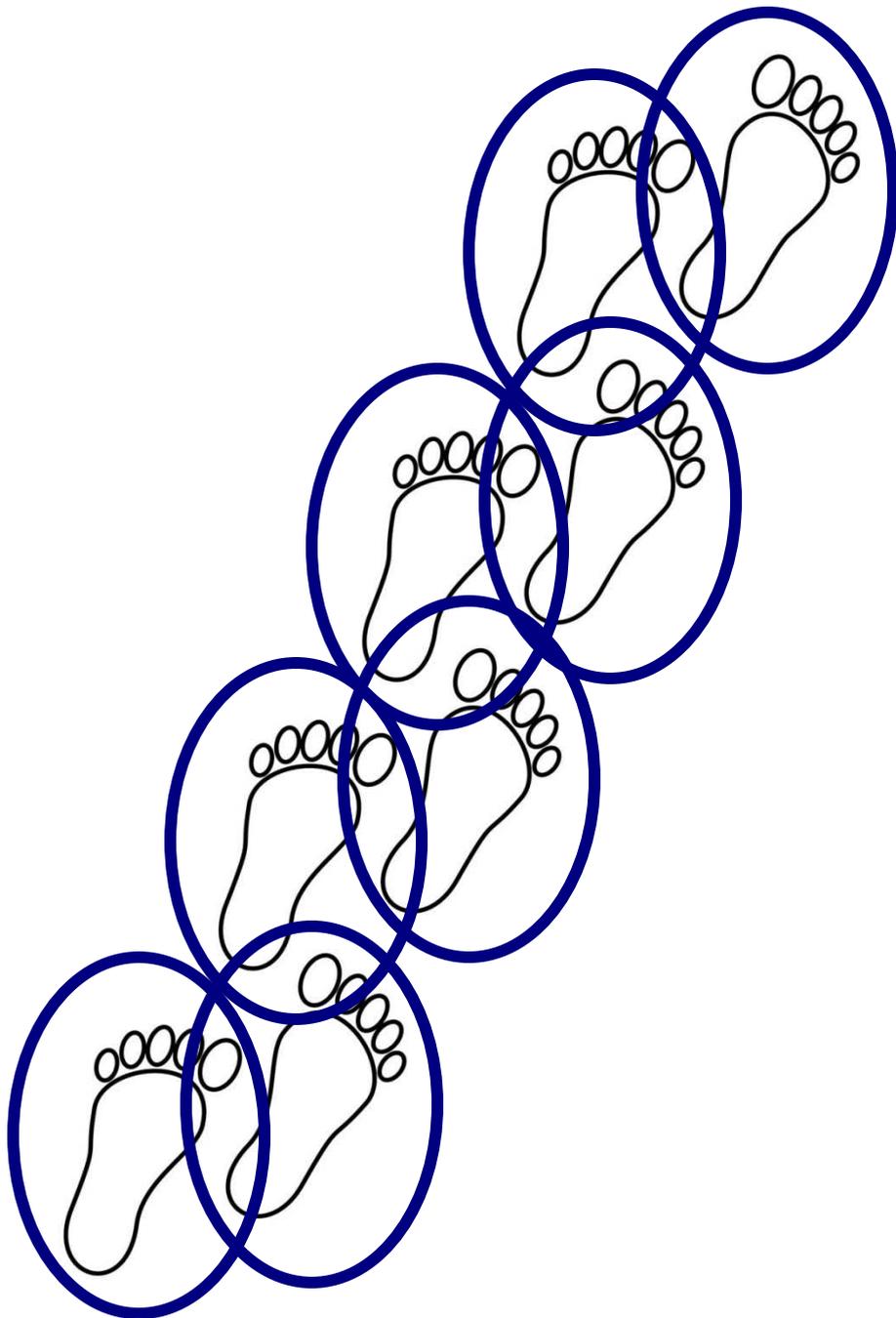
**PATTERN**

**conceptual  
space  
shifting**



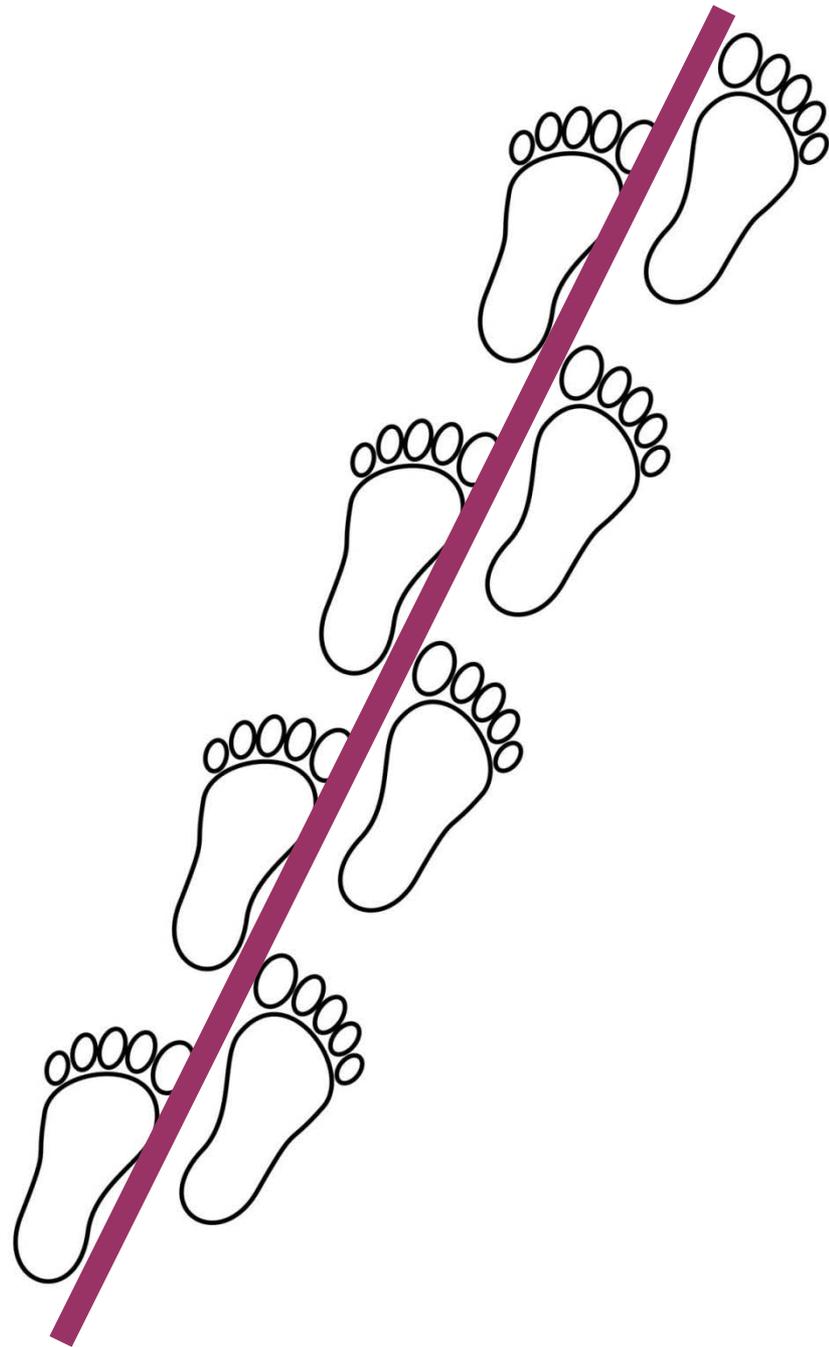
**4 Years**





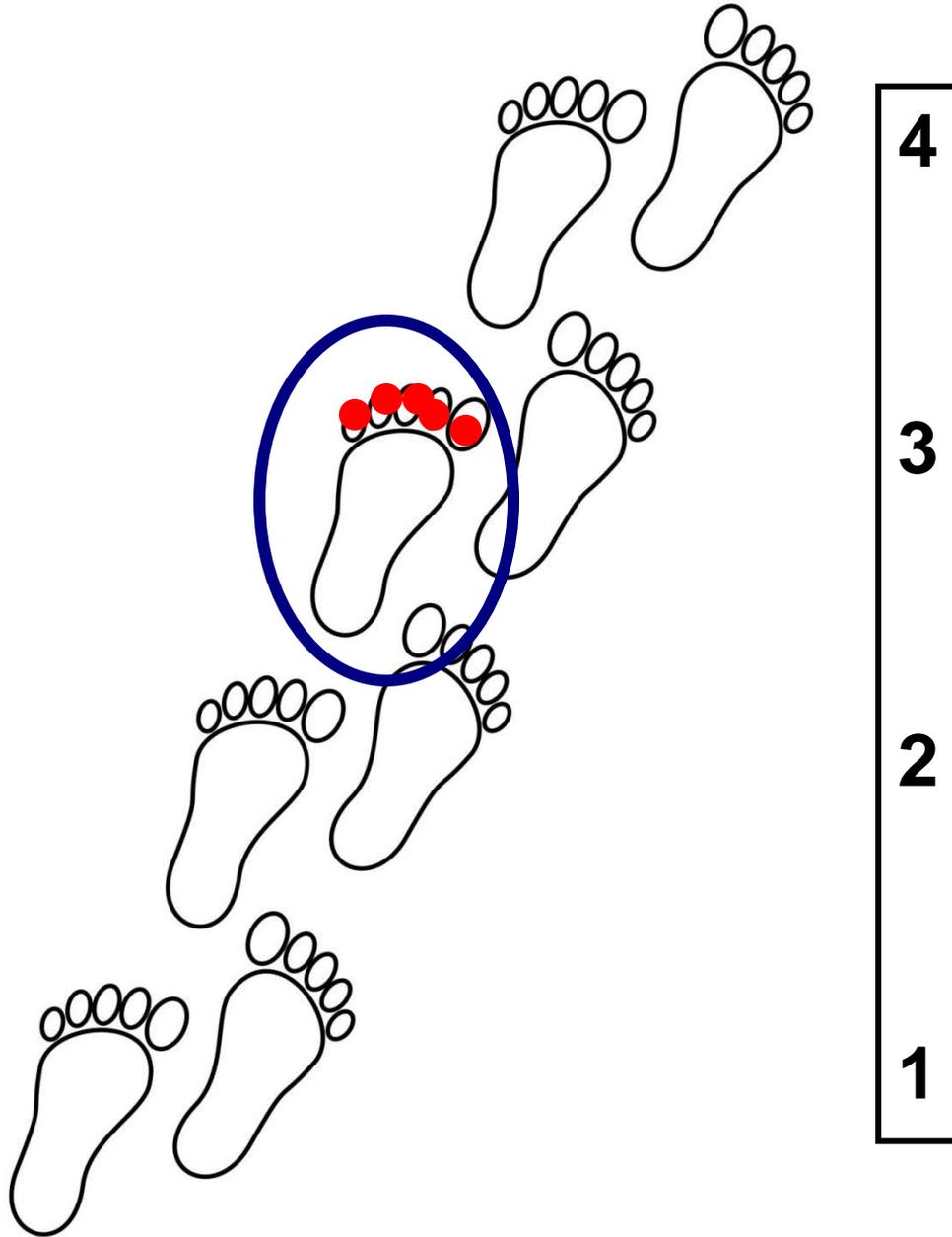
- 4
- 3
- 2
- 1

**Fall terms**  
**Winter terms**

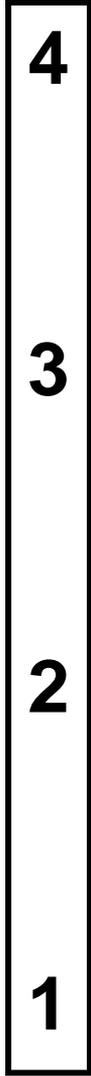
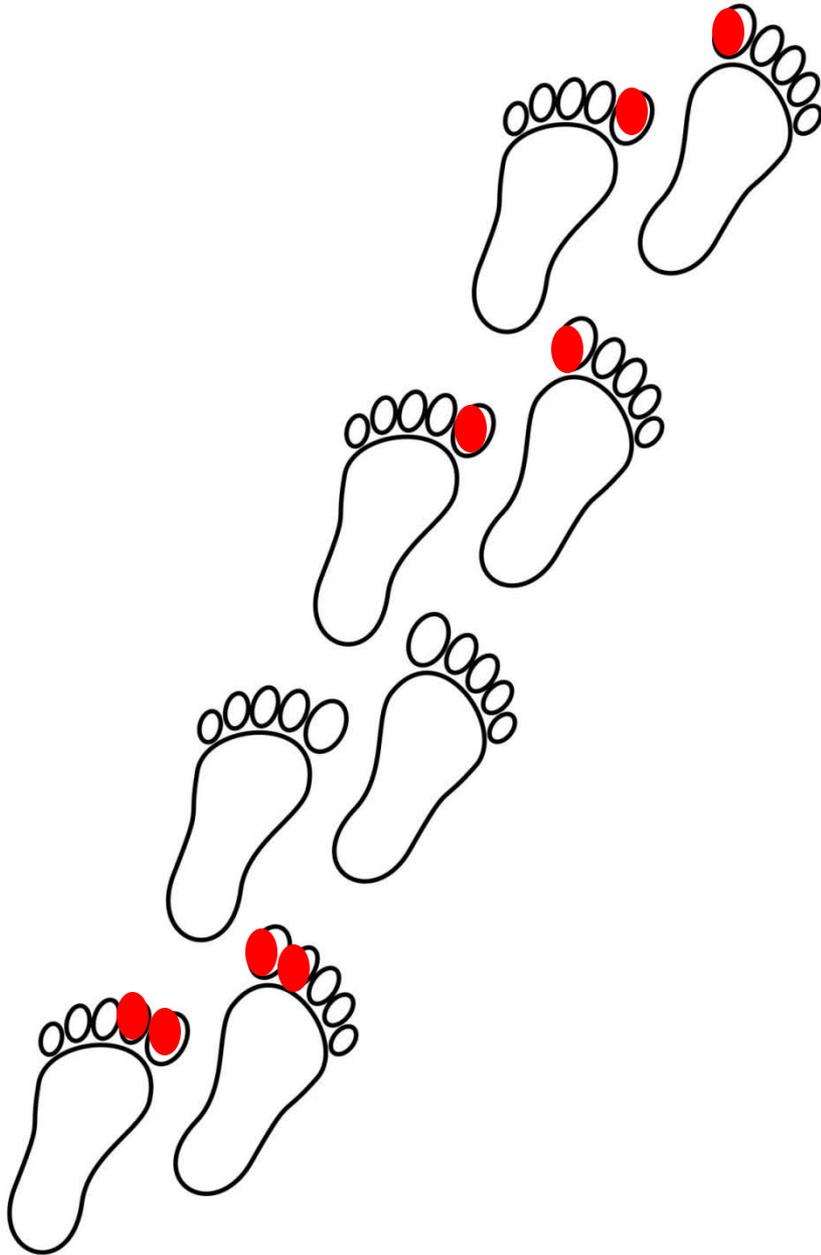


- 4
- 3
- 2
- 1

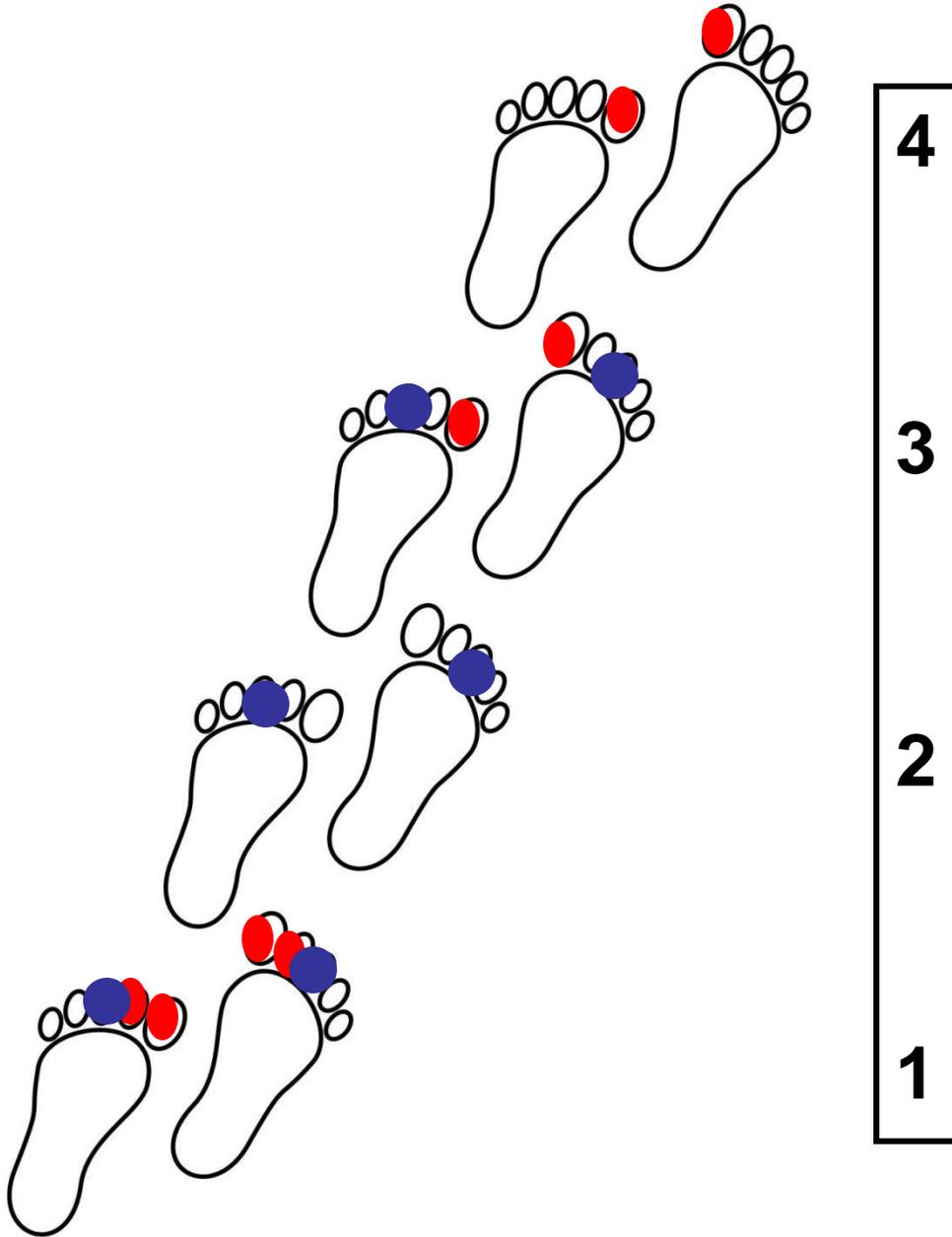
**Christmas  
break**



**Each term  
= 5 courses**



**MST+T  
science  
courses**



**MSTT  
science  
courses**

**PCS  
courses**

**MSTT  
science  
courses**

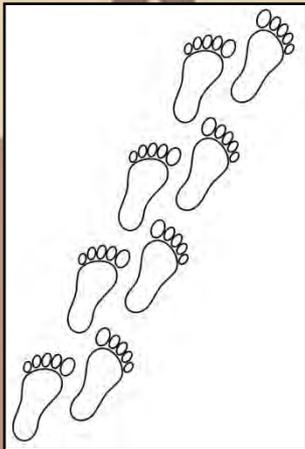
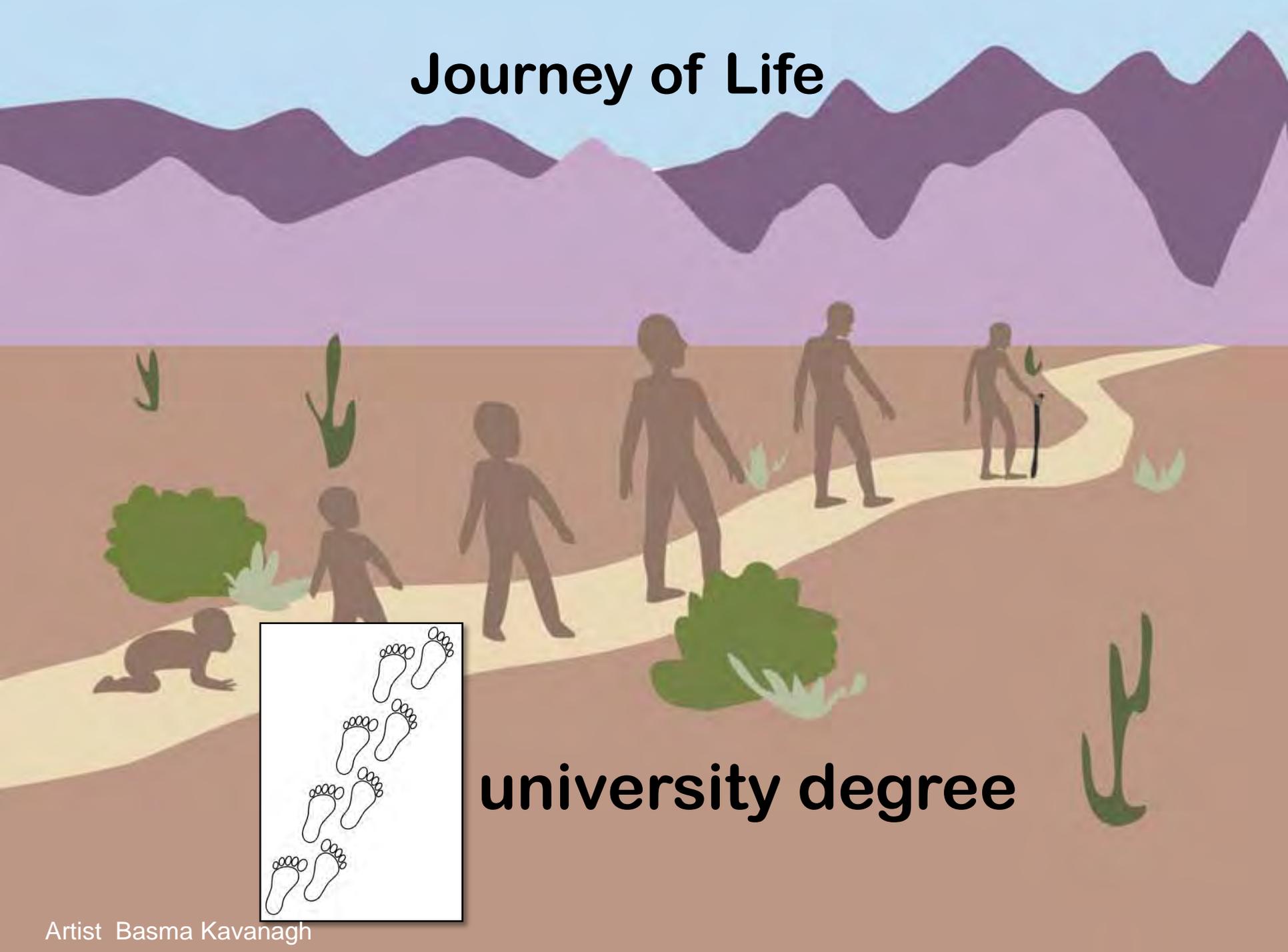
**MSAP**

---

**Mi'kmaq  
Science  
Advantage  
Program**



# Journey of Life



**university degree**

# Toqwa'tu'kl Kijitaqnn Integrative Science



**What**

**Why**

**How**

**Who**

**Where**

**PART 2**  
MSIT approach  
& contents

# How?

1



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

2



TK literature

3



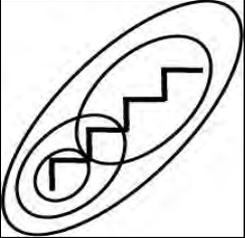
students out-of-doors

4

Aboriginal concepts & pedagogy

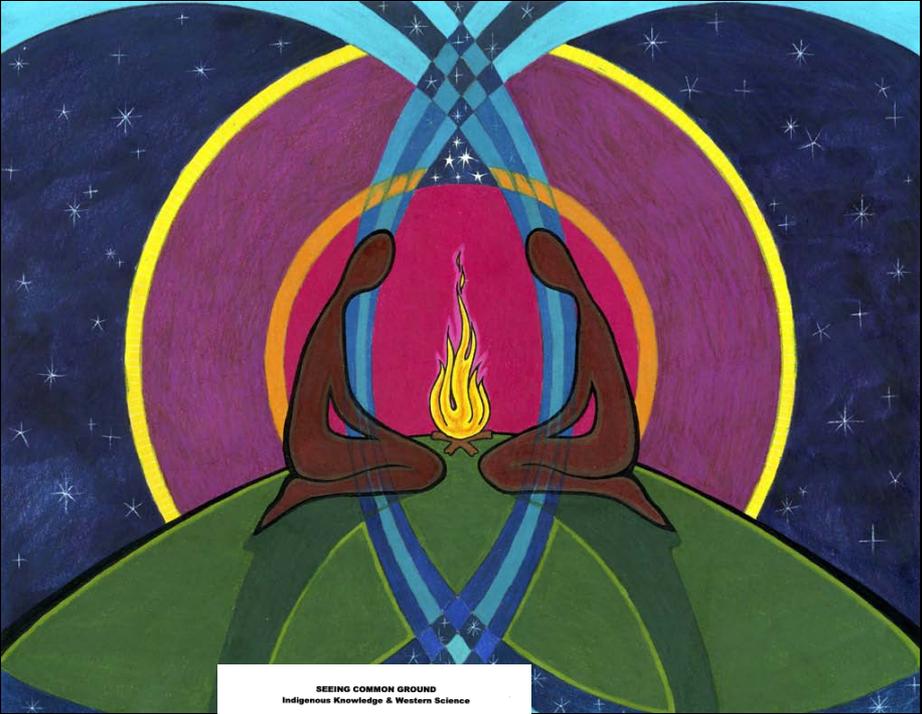


5



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

6



# How?

## integrative framework

"integrative" ...

... both Indigenous & Western, plus:

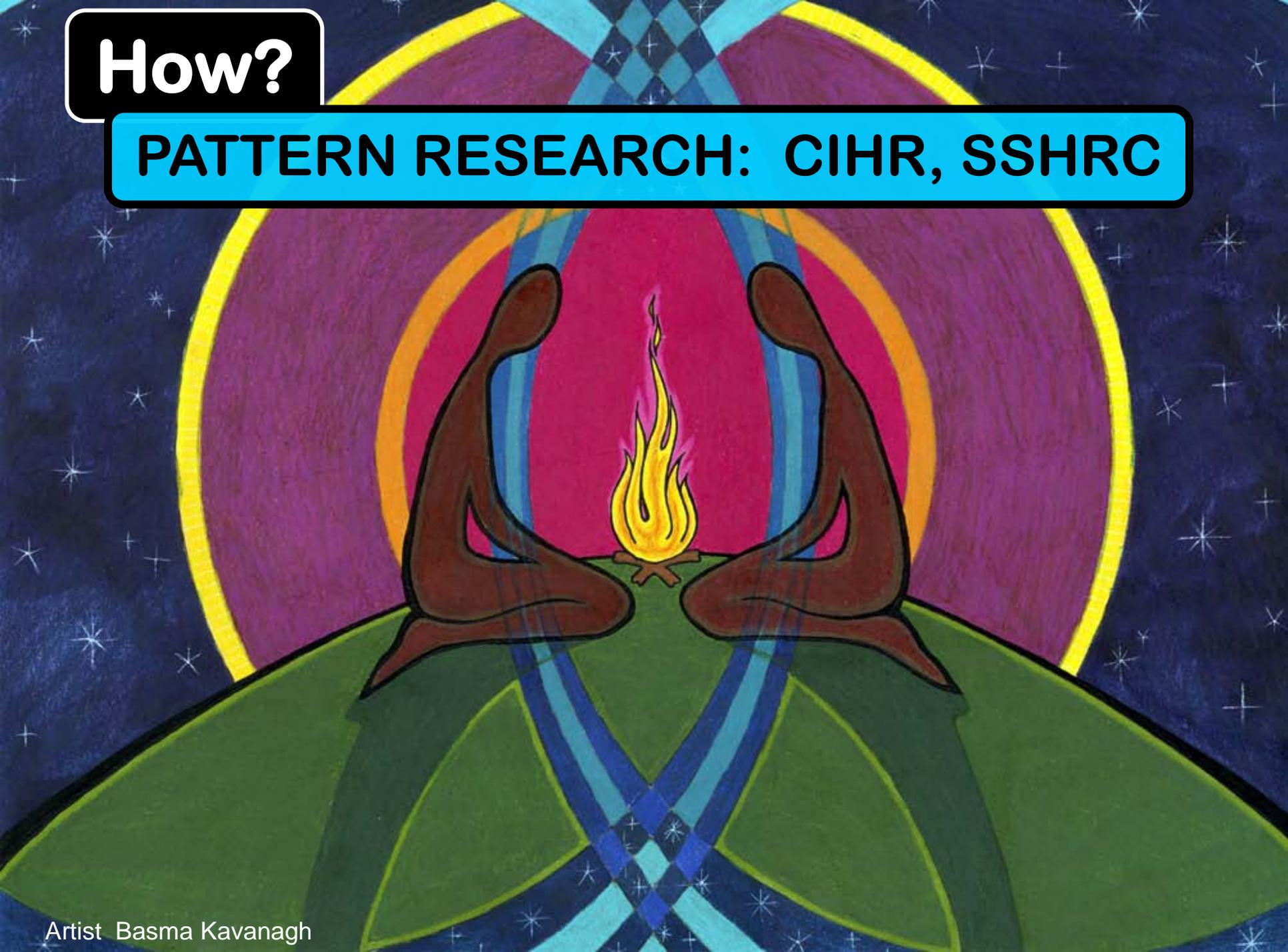
- role of me and you in "the knowing"
  - esp. patterns: recognition & transformation
- our common ground
- our differences
- our journey forward, together

---

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

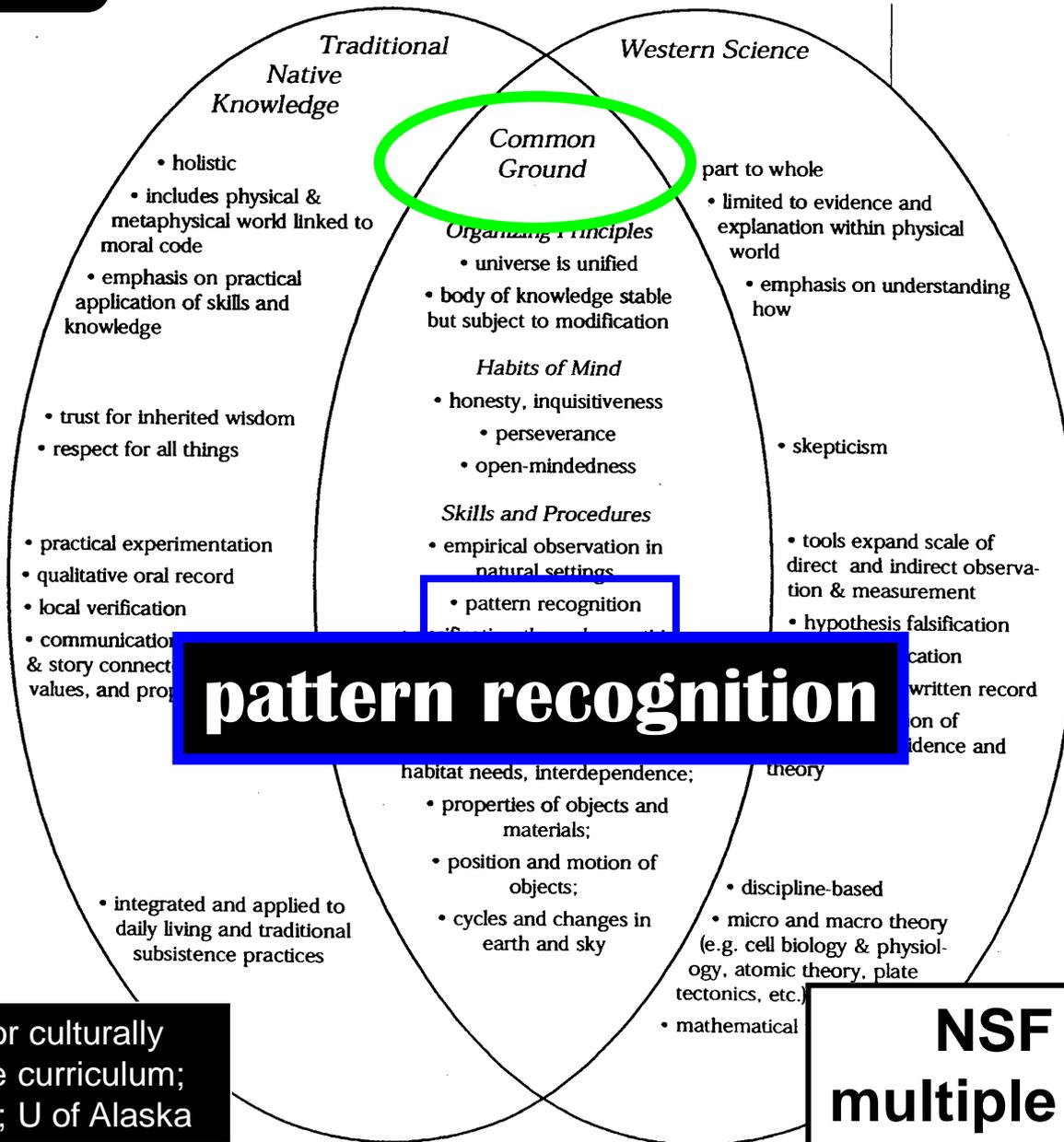
**How?**

**PATTERN RESEARCH: CIHR, SSHRC**



# How?

## SEEING COMMON GROUND Indigenous Knowledge & Western Science

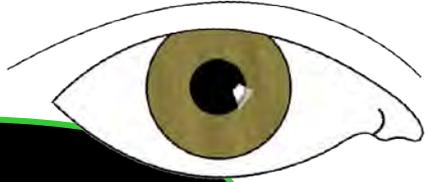


from: Handbook for culturally responsive science curriculum; S. Stephens, 2000; U of Alaska

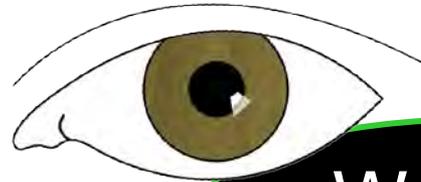
**NSF funding:  
multiple millions \$\$\$**

stories of our interactions with and within nature

“two-eyed seeing”



Indigenous

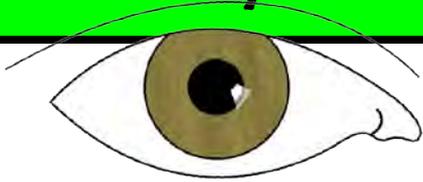


Western

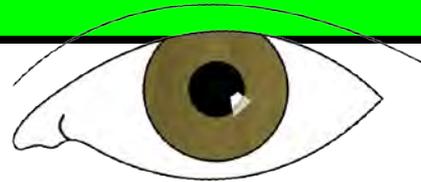
Science

# **“two-eyed seeing”**

*our key concepts & actions*

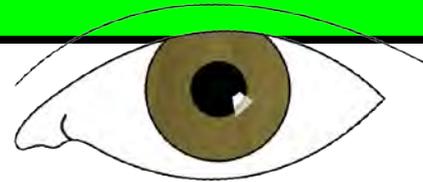
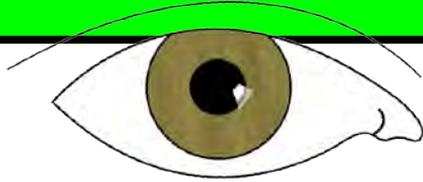


- **respect**
- **relationship**
- **reverence**
- **reciprocity**
- **ritual**
- **repetition**
- **responsibility**

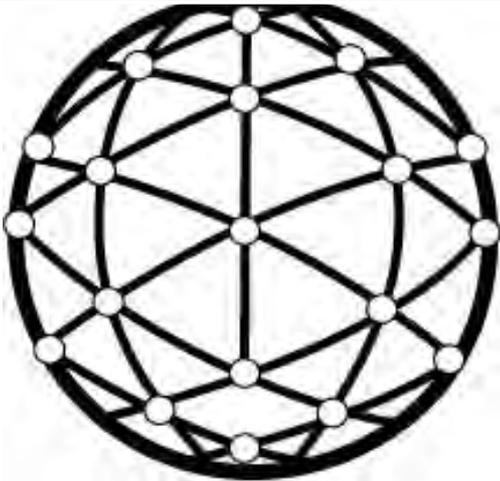


- **hypothesis**  
(making & testing)
- **data collection**
- **data analysis**
- **model & theory construction**

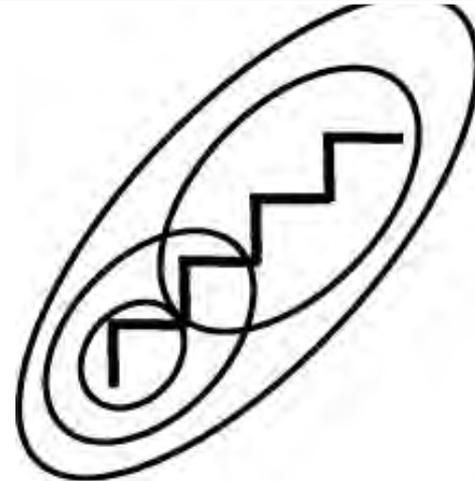
**“two-eyed seeing”**  
how our world is



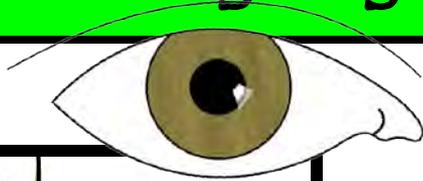
**interconnected**



**parts & wholes**

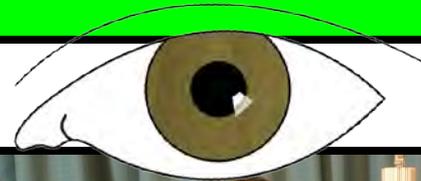


**“two-eyed seeing”  
our language & methodology**



**vigour**

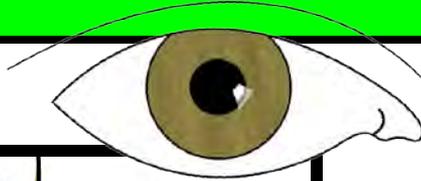
**WEAVING**



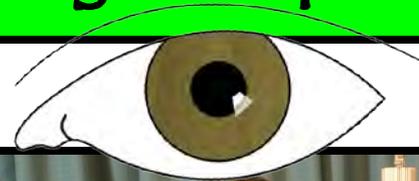
**rigour**

**UN-WEAVING**

# “two-eyed seeing” our overall knowledge objectives



towards resonance  
of understanding  
within environment

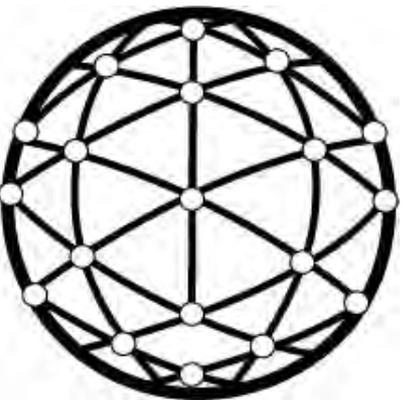


towards construction  
of understanding  
of environment

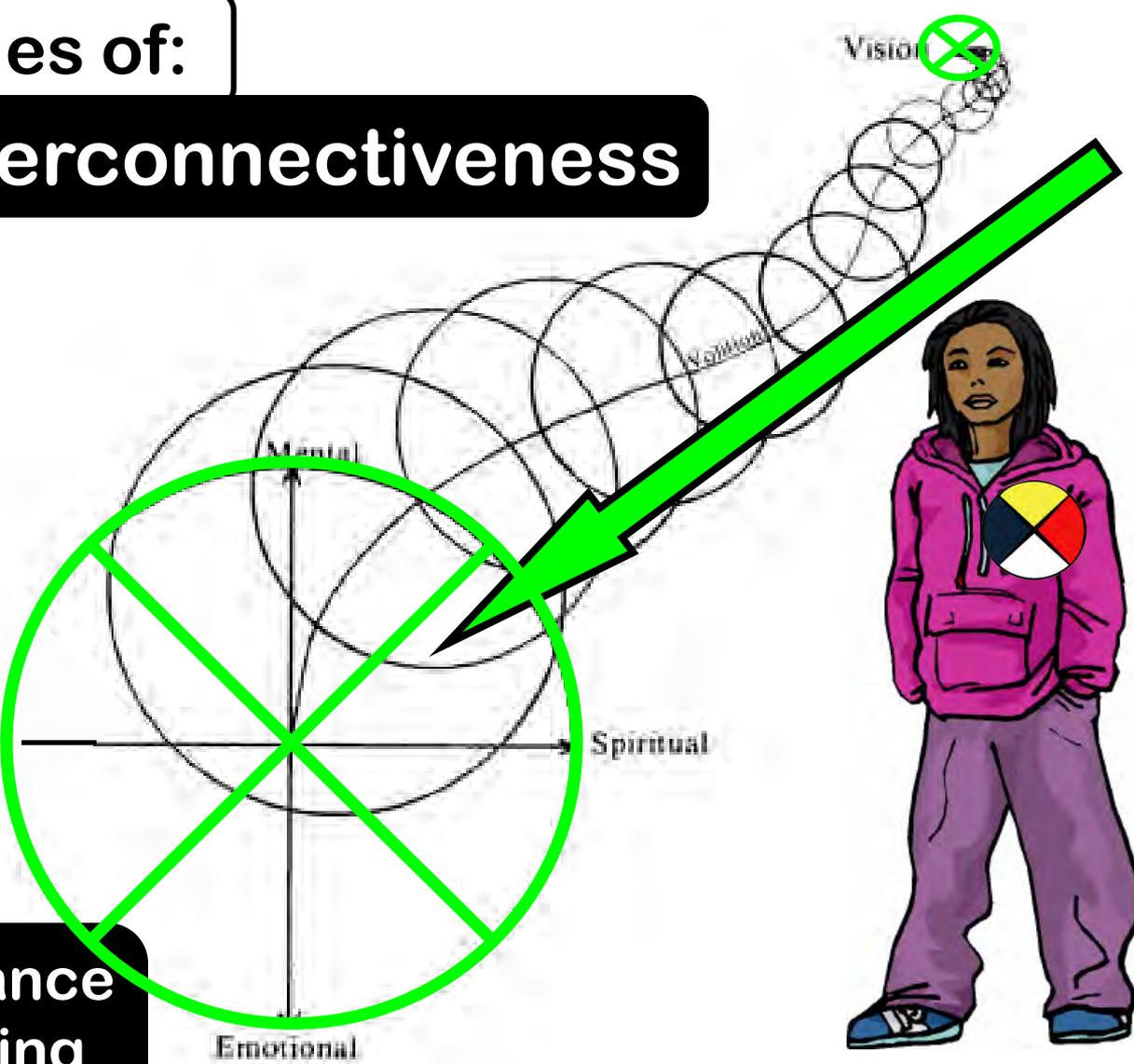
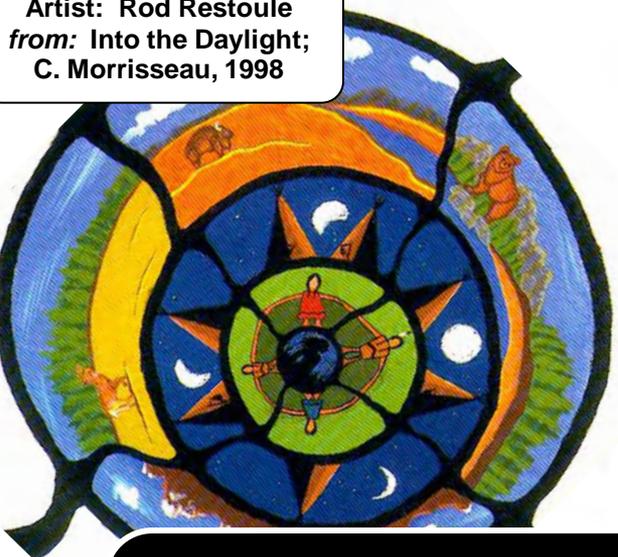
stories of:

**interconnectiveness**

Vision 



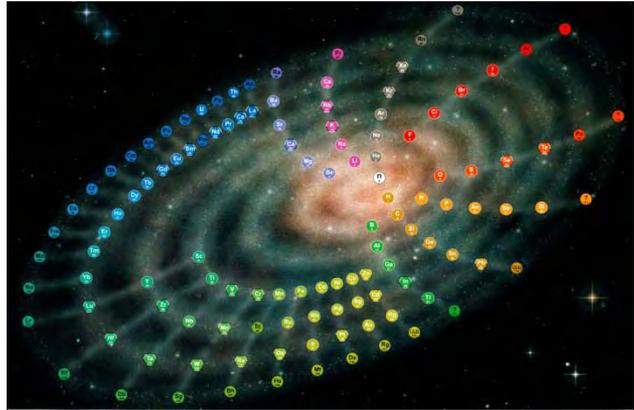
Artist: Rod Restoule  
from: Into the Daylight;  
C. Morrisseau, 1998



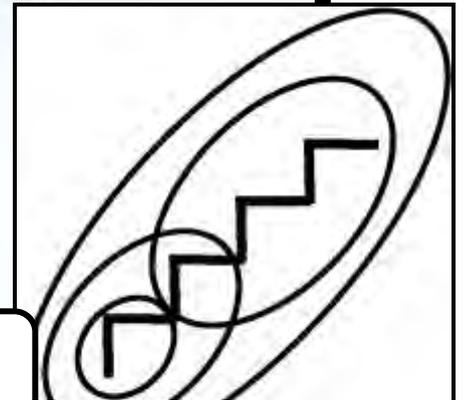
**towards resonance  
of understanding  
within environment**

**"all my relations"**

# Universe: Visible Matter (levels of organization - biology)



- ▣ Universe
- ▣ super clusters (Local)
- ▣ clusters (Local Group)
- ▣ galaxies (Milky Way)
- ▣ star systems (Sun)
- ▣ planet Earth
- ▣ ecosystems
- ▣ communities
- ▣ populations
- ▣ organisms
- ▣ organ systems
- ▣ organs
- ▣ tissues
- ▣ cells
- ▣ organelles
- ▣ molecules & minerals
- ▣ atoms (natural elements #1-92; artificial elements #93 & higher)
- ▣ baryons (neutrons & protons)
- ▣ fundamental particles (quarks & leptons)

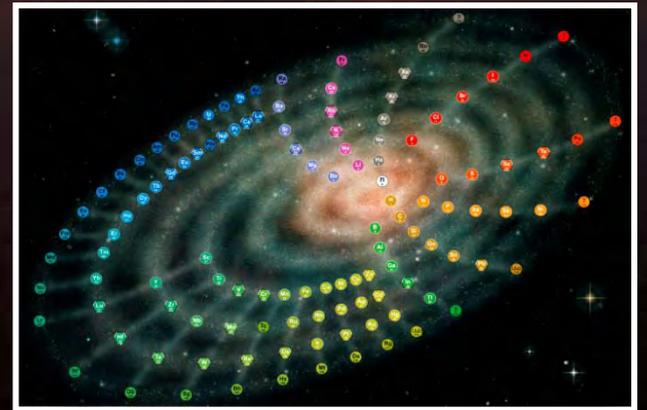
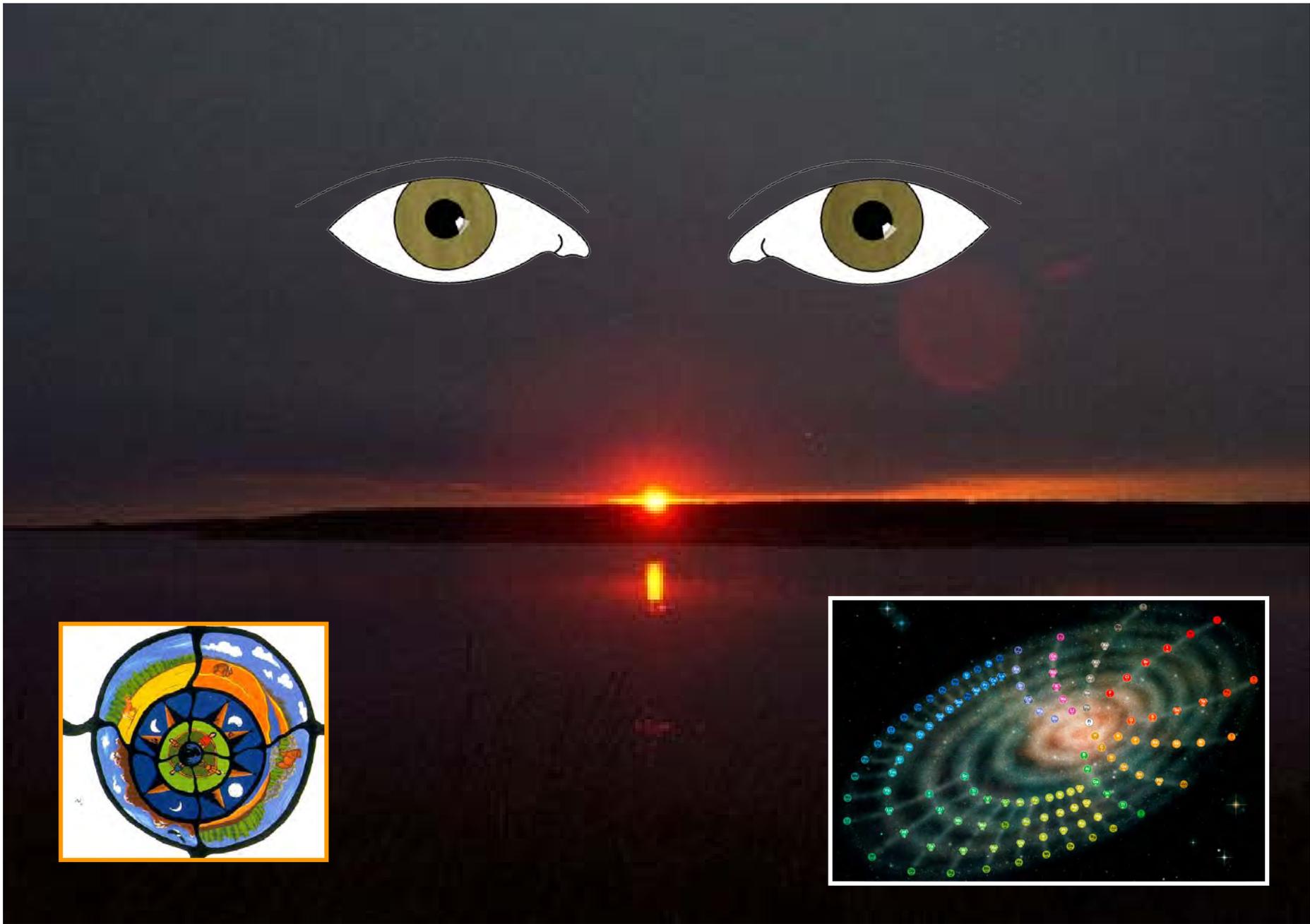
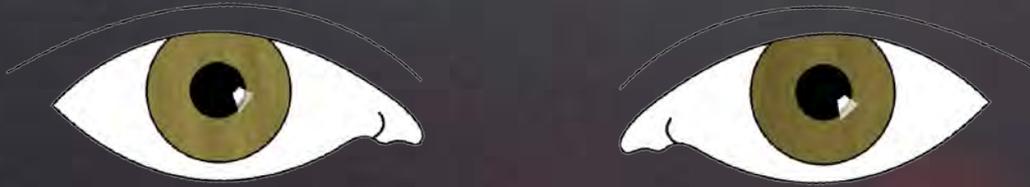


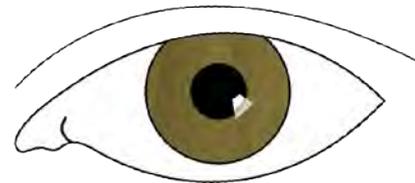
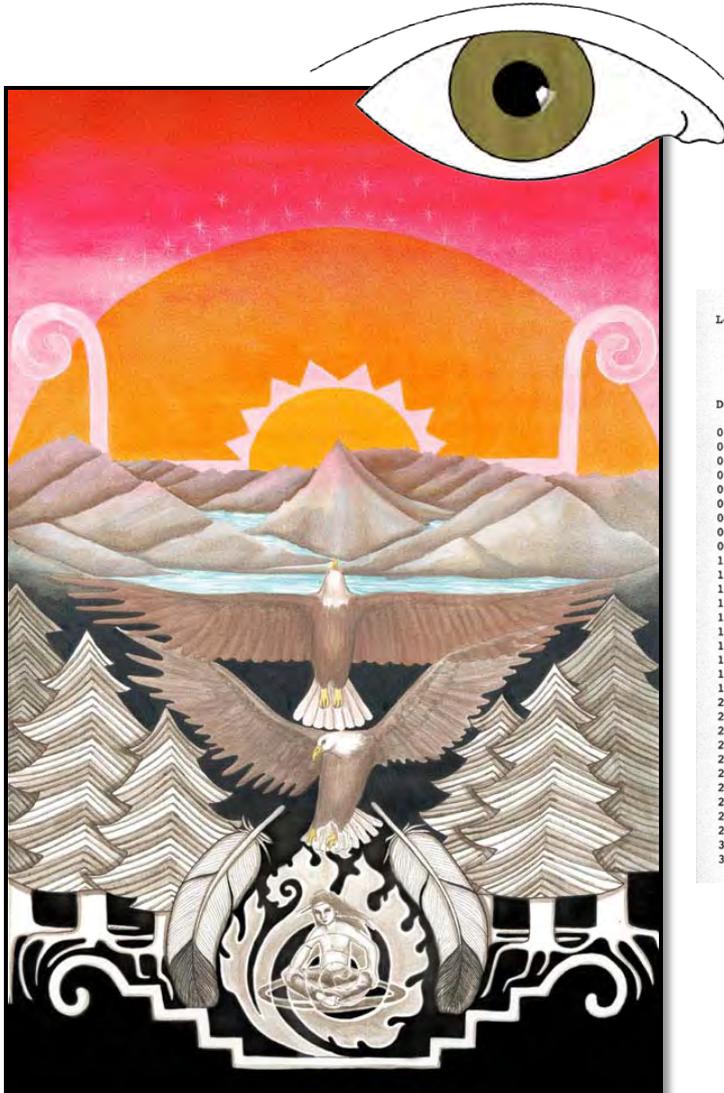
stories of:

**parts & wholes**



**towards construction  
of understanding  
of environment**



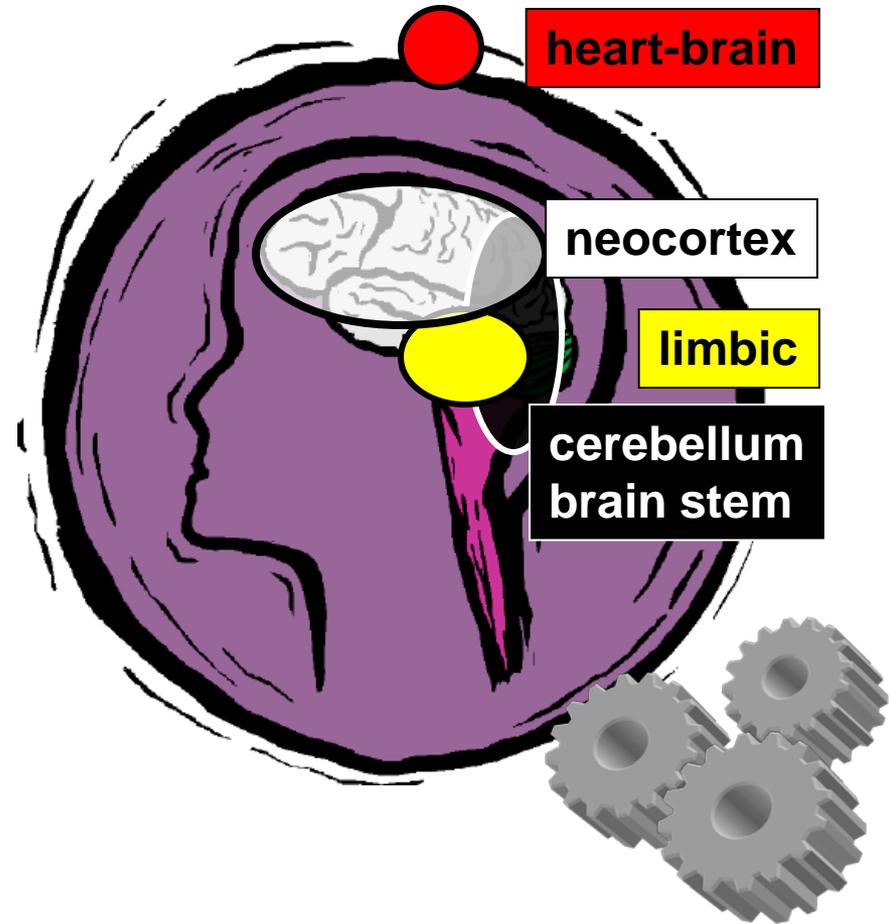
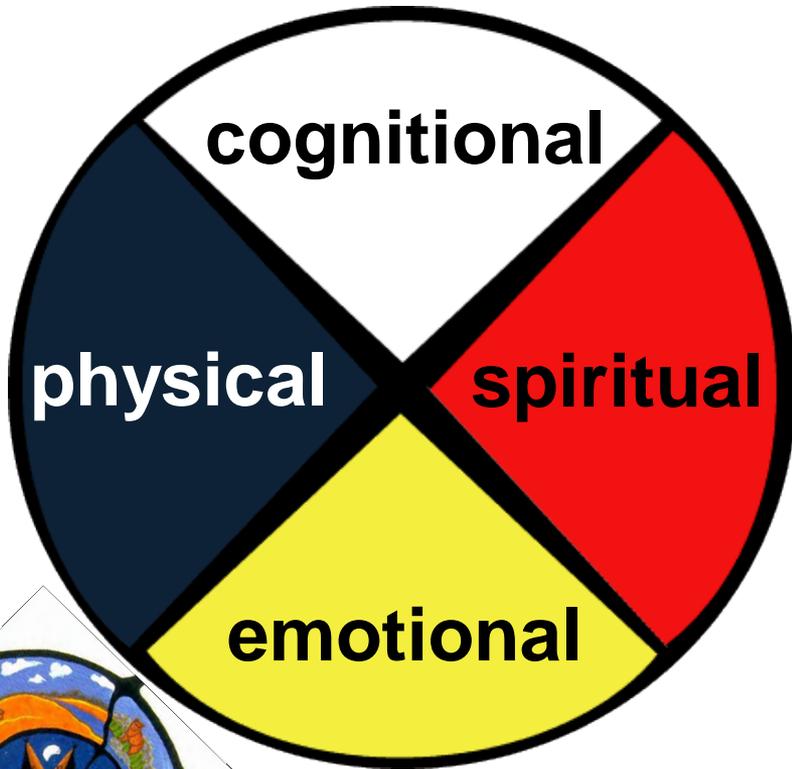
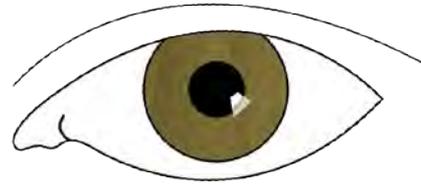
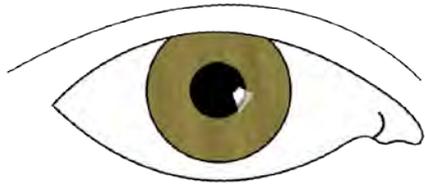


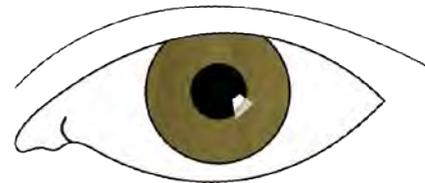
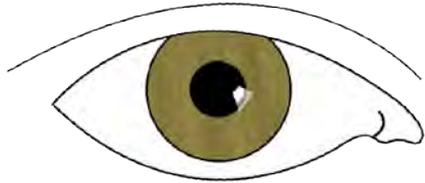
Location: W060 11, N46 09

SYDNEY, NS  
Rise and Set for the Sun for 2004  
Zone: 4h West of Greenwich

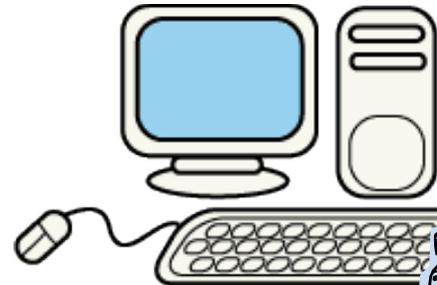
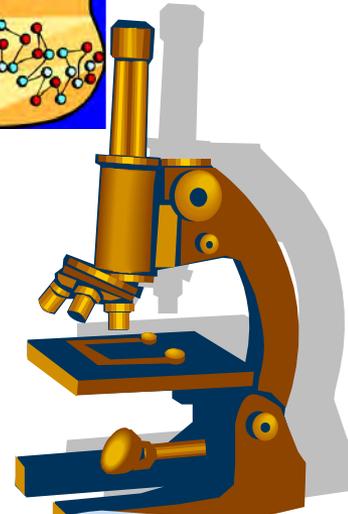
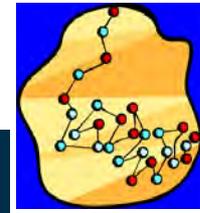
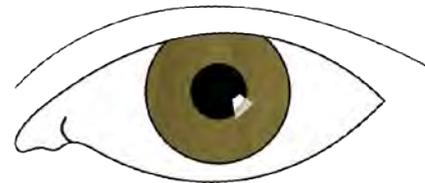
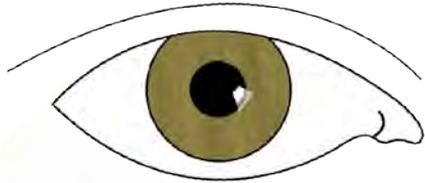
Astronomical Applications Dept.  
U. S. Naval Observatory  
Washington, DC 20392-5420

	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
Day	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set														
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
05	0743	1629	0719	1711	0632	1753	0532	1835	0441	1915	0411	1948	0416	1954	0448	1925	0527	1831	0605	1732	0648	1640	0728	1615
06	0743	1630	0718	1712	0630	1755	0530	1837	0439	1916	0410	1949	0417	1954	0449	1923	0528	1829	0606	1730	0649	1639	0729	1615
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
09	0742	1633	0714	1717	0624	1759	0525	1841	0435	1920	0409	1951	0419	1952	0453	1919	0532	1823	0610	1725	0654	1635	0732	1615
10	0742	1635	0712	1718	0622	1800	0523	1842	0434	1921	0409	1952	0420	1952	0454	1917	0533	1821	0611	1723	0655	1634	0733	1615
11	0742	1636	0711	1720	0620	1802	0521	1843	0433	1922	0409	1952	0421	1951	0455	1915	0534	1819	0613	1721	0657	1633	0734	1615
12	0741	1637	0709	1721	0619	1803	0519	1845	0431	1924	0409	1953	0422	1951	0457	1914	0535	1817	0614	1719	0658	1631	0734	1615
13	0741	1638	0708	1723	0617	1804	0517	1846	0430	1925	0409	1953	0423	1950	0458	1912	0537	1815	0616	1717	0659	1630	0735	1615
14	0740	1640	0706	1724	0615	1806	0515	1847	0429	1926	0409	1954	0424	1949	0459	1911	0538	1813	0617	1716	0701	1629	0736	1615
15	0740	1641	0705	1726	0613	1807	0514	1848	0428	1927	0409	1954	0424	1948	0500	1909	0539	1811	0618	1714	0702	1628	0737	1615
16	0739	1642	0703	1727	0611	1808	0512	1850	0427	1928	0409	1954	0425	1948	0502	1907	0541	1809	0620	1712	0704	1627	0737	1616
17	0738	1643	0701	1729	0609	1810	0510	1851	0425	1930	0409	1955	0426	1947	0503	1906	0542	1807	0621	1710	0705	1626	0738	1616
18	0738	1645	0700	1730	0607	1811	0508	1852	0424	1931	0409	1955	0427	1946	0504	1904	0543	1805	0622	1708	0706	1625	0739	1616
19	0737	1646	0658	1732	0605	1812	0507	1854	0423	1932	0409	1955	0428	1945	0505	1902	0544	1803	0624	1707	0708	1624	0739	1617
20	0736	1648	0657	1733	0603	1814	0505	1855	0422	1933	0409	1956	0430	1944	0507	1900	0546	1802	0625	1705	0709	1623	0740	1617
21	0735	1649	0655	1735	0601	1815	0503	1856	0421	1934	0409	1956	0431	1943	0508	1859	0547	1800	0627	1703	0710	1622	0741	1618
22	0735	1650	0653	1736	0559	1817	0501	1858	0420	1935	0410	1956	0432	1942	0509	1857	0548	1758	0628	1702	0712	1623	0741	1618
23	0734	1652	0651	1738	0557	1818	0500	1859	0419	1936	0410	1956	0433	1941	0510	1855	0549	1756	0629	1700	0713	1621	0741	1619
24	0733	1653	0650	1739	0555	1819	0458	1900	0418	1937	0410	1956	0434	1940	0512	1853	0551	1754	0631	1658	0714	1620	0742	1619
25	0732	1655	0648	1740	0553	1821	0456	1902	0418	1938	0411	1956	0435	1939	0513	1852	0552	1752	0632	1657	0716	1620	0742	1620
26	0731	1656	0646	1742	0551	1822	0455	1903	0417	1939	0411	1956	0436	1938	0514	1850	0553	1750	0634	1655	0717	1619	0742	1621
27	0730	1658	0644	1743	0550	1823	0453	1904	0416	1940	0411	1956	0437	1936	0515	1848	0554	1748	0635	1653	0718	1618	0743	1622
28	0729	1659	0643	1745	0548	1825	0451	1906	0415	1941	0412	1956	0438	1935	0517	1846	0556	1746	0636	1652	0720	1617	0743	1622
29	0728	1700	0641	1746	0546	1826	0450	1907	0415	1942	0412	1956	0440	1934	0518	1844	0557	1744	0638	1650	0721	1617	0743	1623
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





from:  
Mi'kmaq Family  
& Children's  
Services

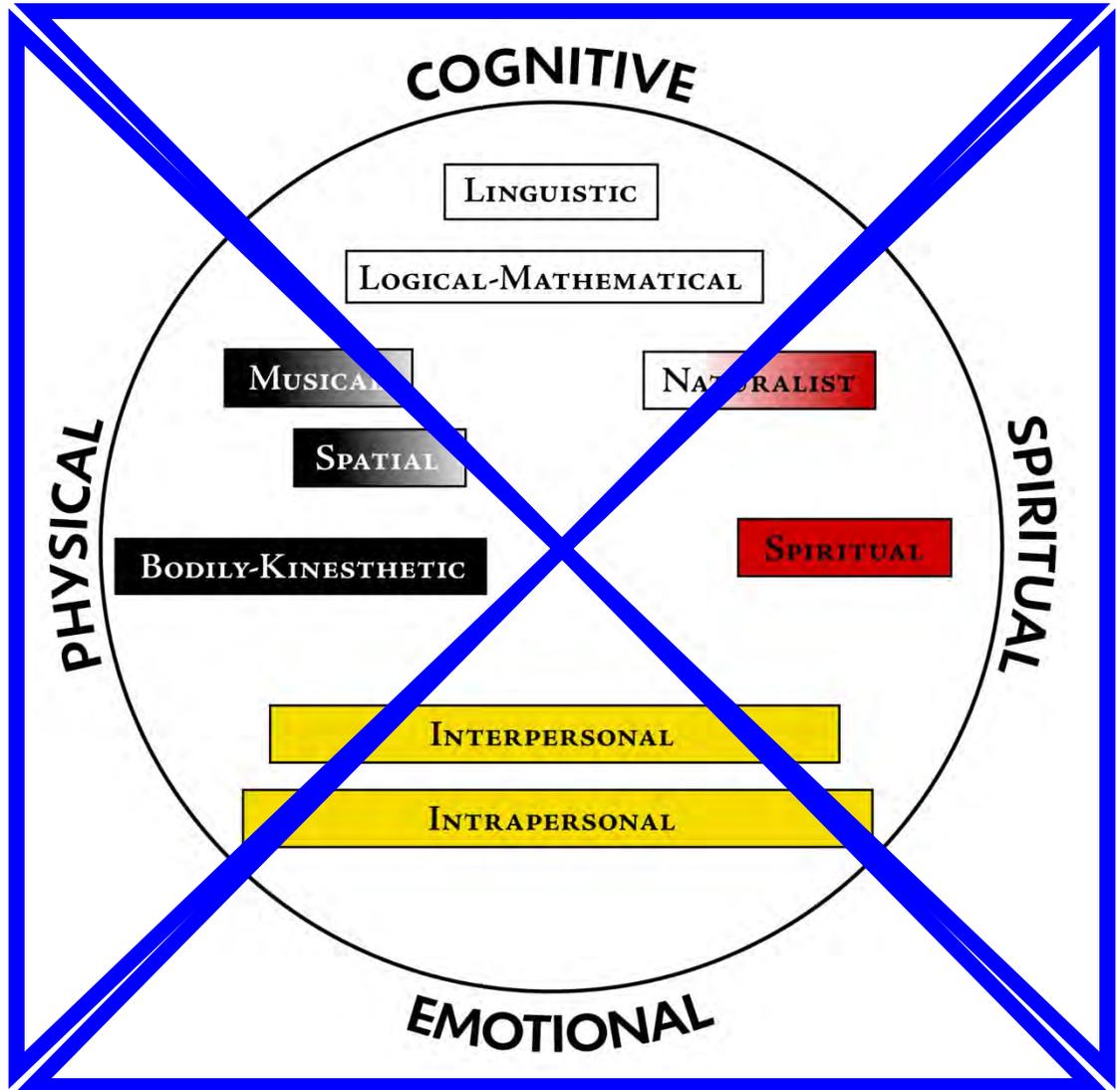
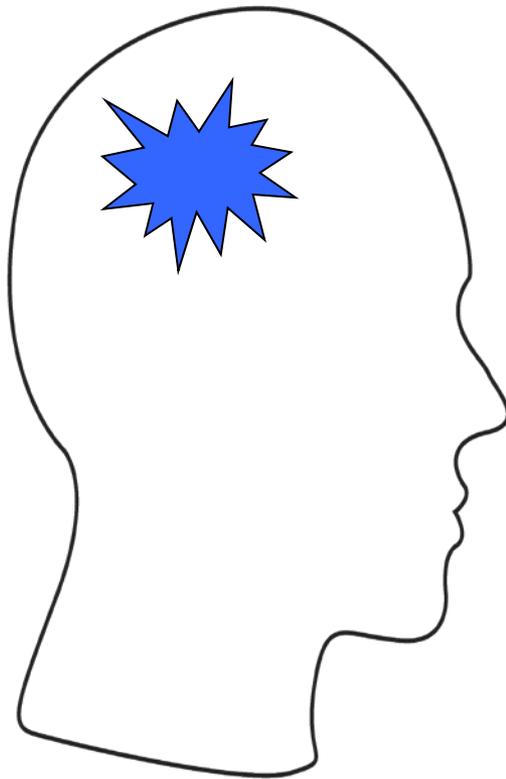


Artist: Rod Restoule  
from: Into the Daylight;  
C. Morrissette, 1998

# “human pattern smarts”

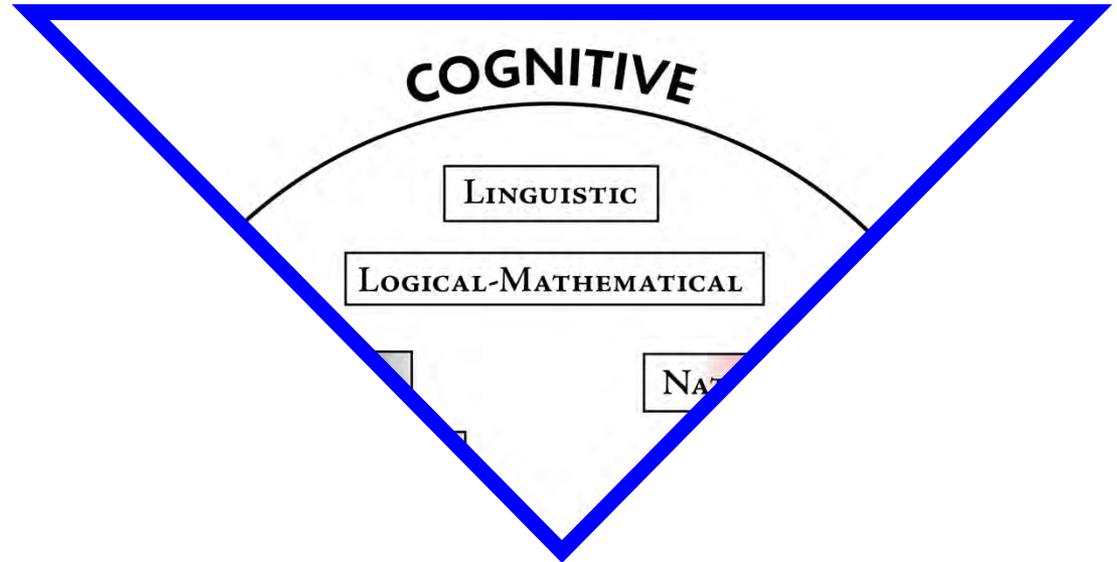
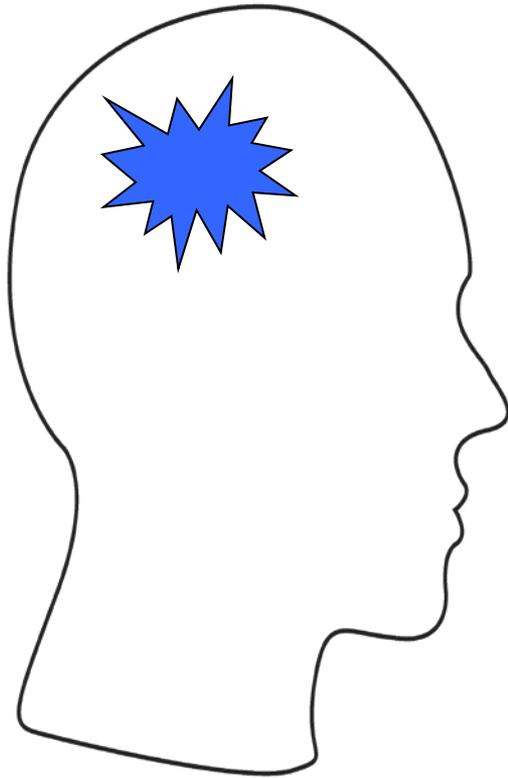
multiple intelligences (brain-based theory, H. Gardner, Harvard Univ.)

... mapped onto  
4 quadrants



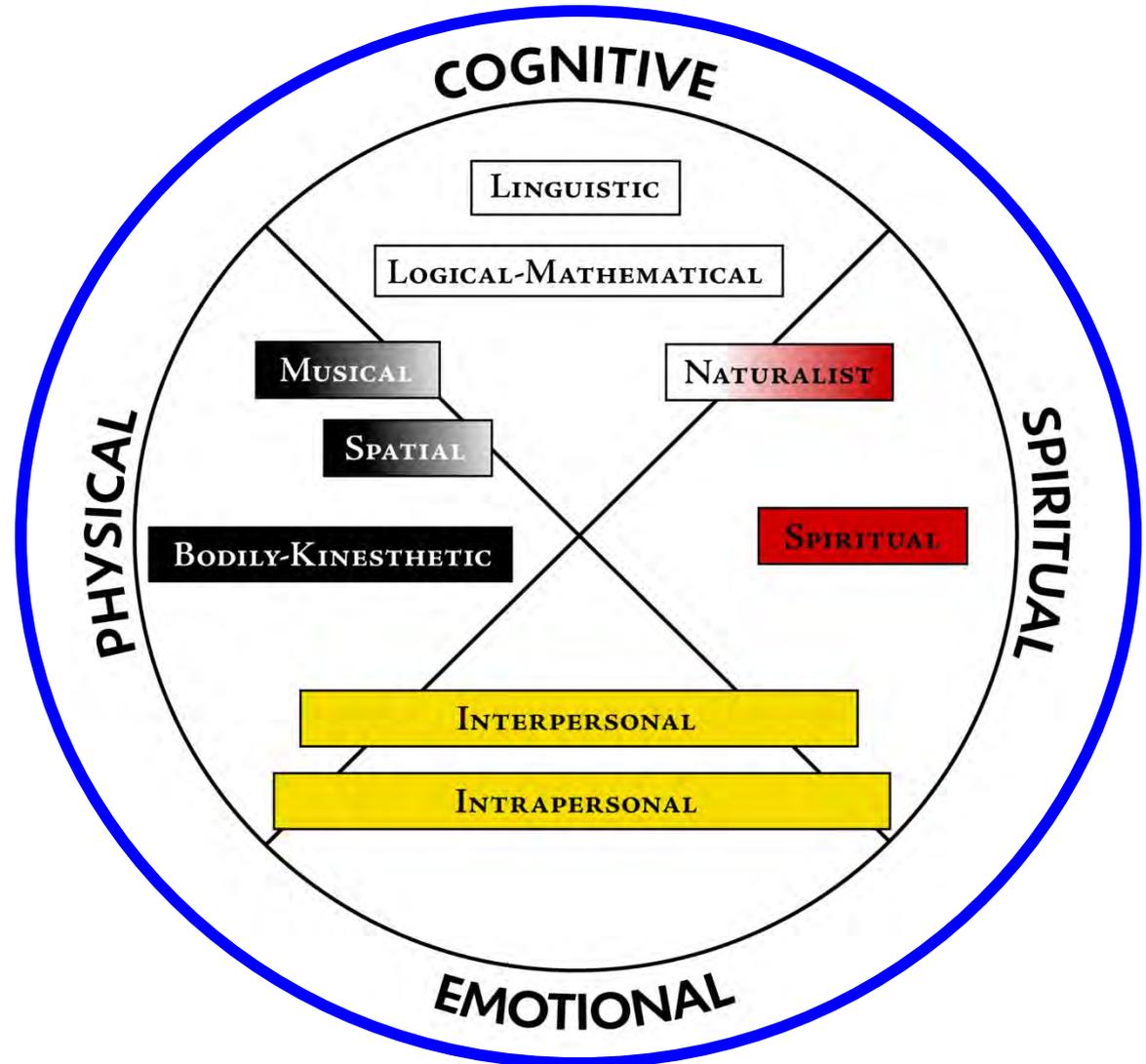
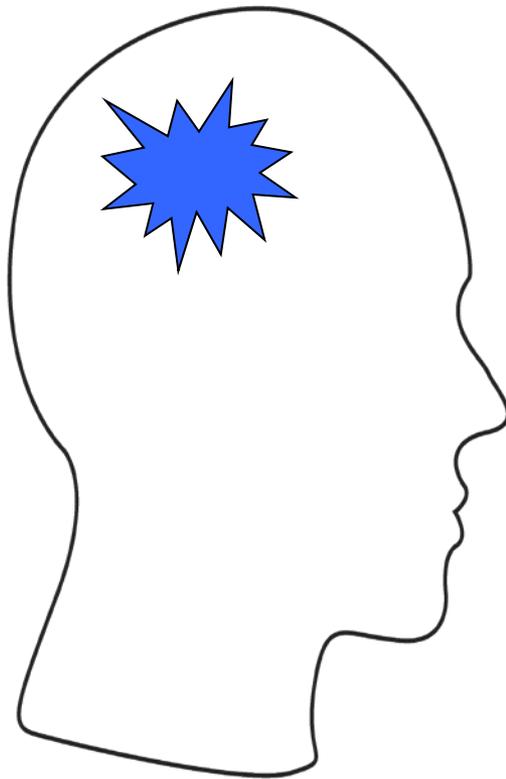
# stories of our interactions with and within nature

## “pattern smarts”



# stories of our interactions with and within nature

## “pattern smarts”





# “pattern seeing”



F. Scott

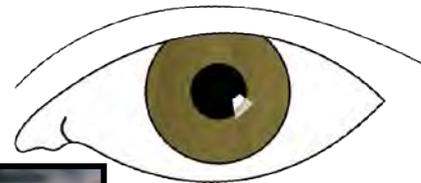
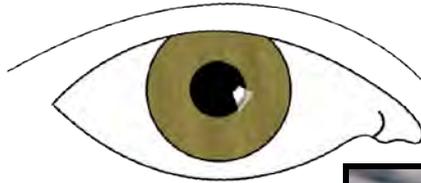
Mte'skmwaqsi  
“snakes –  
plants bunched”



fiddlehead fern  
[*M. struthiopteris*]



# what our “pattern seeing” (re)generates



**subject-subject**

**subject - object**

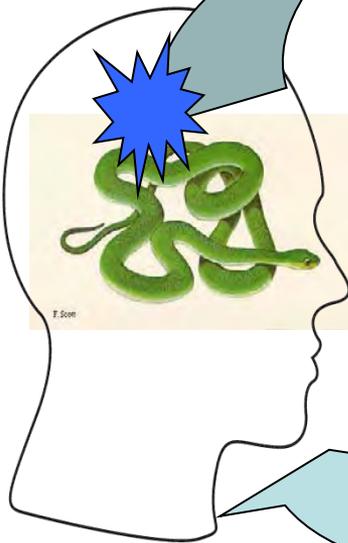


**eco-  
reflexive &  
participatory**

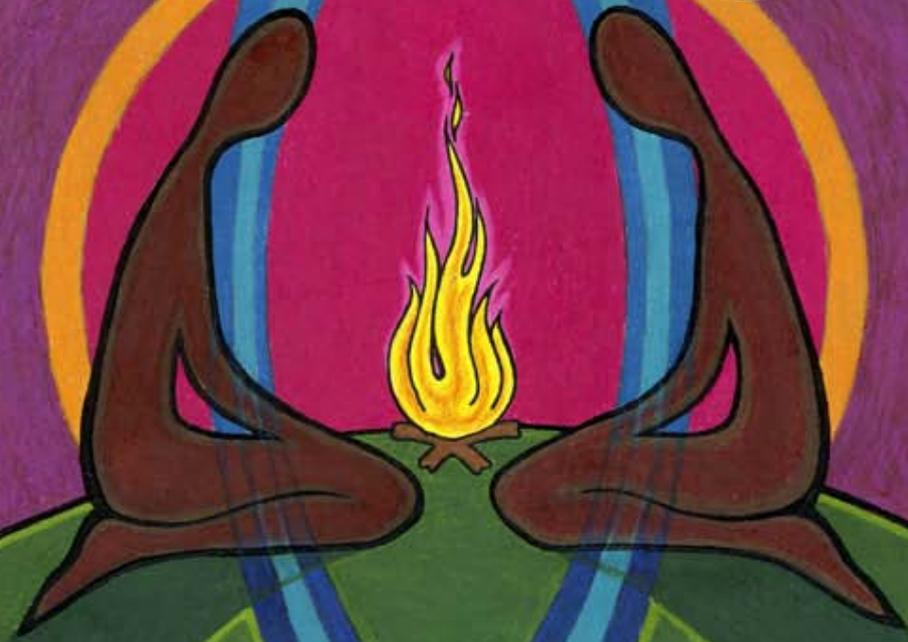
**cogno-  
centric &  
detached**

connectedness

disconnectedness



# Toqwa'tu'kl Kijitaqnn Integrative Science



**What**

**Why**

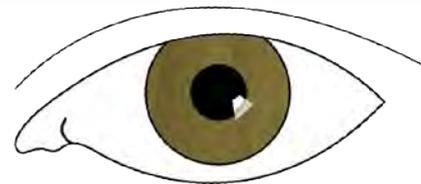
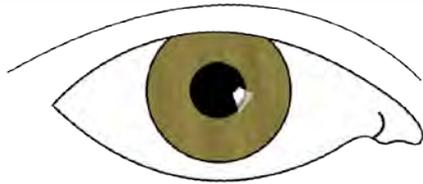
**How**

**Who**

-----

**Where**

**HEALTH SCIENCES: education, research, and application  
... enriching our understandings via “Two-Eyed Seeing”**



**Mi'kmawey Debert**

The logo features the word "Science" in blue, "Wtisi" in green, and "FIRST NATION CENTRE" in blue. Below this, it says "for Science Nourishment and Growth". The text is overlaid on an illustration of two fluffy white birds sitting on a nest of sticks. A red line with blue and green spheres at its ends is positioned above the birds.

**Science**  
**Wtisi**  
**FIRST NATION CENTRE**  
*for*  
**Science Nourishment and Growth**

Canada Research Chairs / Chaires de recherche du Canada / Canada

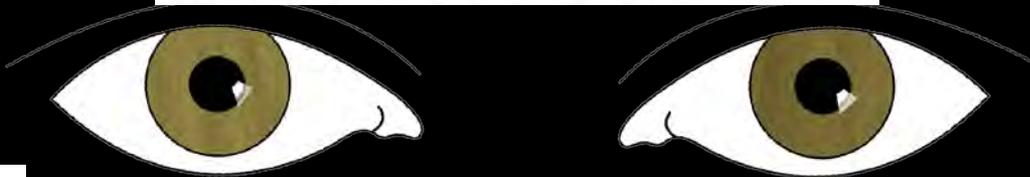
Social Sciences and Humanities Research Council of Canada / Conseil de recherches en sciences humaines du Canada

Canada Foundation for Innovation / Fondation canadienne pour l'innovation

CAPE BRETON UNIVERSITY



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



IWK Health Centre Foundation

IAPH

ATLANTIC ABORIGINAL Health Research Program

Mi'kmaq Elders

NOVA SCOTIA Health Research FOUNDATION

SABLE OFFSHORE ENERGY INCORPORATED

UNAMA'KI INSTITUTE OF NATURAL RESOURCES

KECCA Knowledge: Education and Cultural Consultant Associates

NSERC CRSNG

Mi'kmawey Debert

Royal Canadian Mounted Police / Gendarmerie royale du Canada