

“connect mathematical concepts to each other and to other areas and personal interests”

~BC Mathematics curricular competency

Reggio Emilia education philosophy and principles

- developed by Loris Malaguzzi and the parents and teachers in the community
- viewing the child as capable, competent and having rights – that the child has a hundred or more languages to express ideas
- environment as third teacher, encounters with materials
- pedagogy of listening
- responsive, emergent curriculum
- socially constructed learning, collaborative, in community
- importance of relationships

Reggio-inspired practices

- the 100 languages of children
- connectedness
 - culture, community, environment
- the environment as third teacher
- emergent curriculum
- inquiry-based
- loose parts & natural materials
- projects/investigations
- documentation
 - teacher as researcher
 - making learning visible

Inquiry-Based Learning Experiences

Rich Tasks

Open Questions or Problems

Invitations

Provocations

Some frames for provocations:

- *What stories live within...?*
- *What do you notice? What do you wonder?*
- *What is the relationship between....?*
- *What are the connections between...?*
- *What happens when...?*
- *How many different...?*
- *How do these materials help you think about...?*
- *Where do we see...in the world?*

Developing Provocations

- Planning with intention – knowledge of curriculum and your students
- Being thoughtful about what materials will be offered
- Create opportunities for collaboration
- Choose a big idea or concept, content and process:
 - *How will you provoke thinking and learning?*
 - *What materials will you use?*
 - *What kind of provocation might you provide?*
 - *How do you anticipate your students will engage with your provocation?*
 - *How will students' learning be made visible?*

Thinking about teaching and learning mathematics through Indigenous perspectives and worldviews:

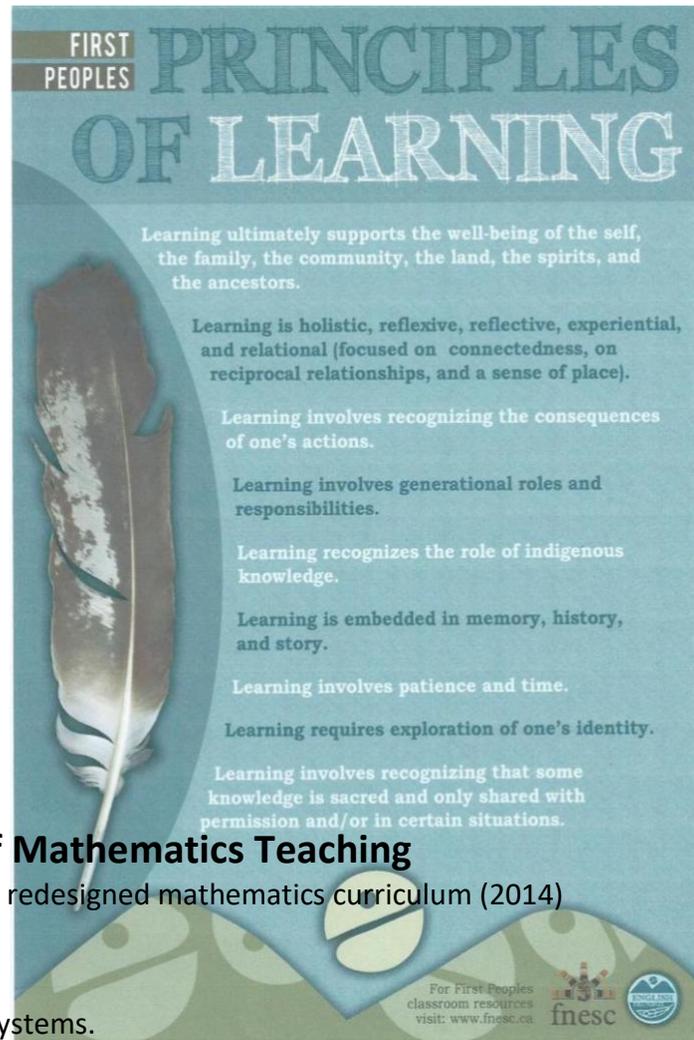
Mathematics is a cultural construct and there are different models that we can use as inclusive frameworks as we think about the teaching and learning of mathematics.

- Culturally responsive pedagogy
- Place-based methodologies
- Bishop's model of cultural mathematics

- First Peoples Principles of Learning

Bishop (1991) identified six areas of human activity that both embody mathematical thinking and occur within all known cultures.

- Measuring
- Locating
- Playing
- Counting
- Designing
- Explaining



The First Peoples Principles of Mathematics Teaching

Developed by FNEsc and included in the redesigned mathematics curriculum (2014)

Respecting Indigenous Knowledge

- Build on indigenous knowledge systems.
- Relate story teachings to mathematical processes (e.g., how characters solve problems).
- Make connections to a wide range of differing contexts (daily activities, traditional practices, activities in the workplace) and integrate learning related to mathematics and other subject areas in project assignments.
- Find ways to build learning relationships with the local Aboriginal/cultural community (Elders, artists, people in various walks of life, including emergent business and industry).

Respecting the learner

- Build on what students are already familiar with (both abstract “knowledge” and concrete knowledge).

- Explore and build on students' interests (asking learners about what is important to them is a good way to identify what context will prove meaningful to them as a basis for learning mathematics).
- Present mathematics problems of various sorts in varied ways (visual, oral, role-play, and experiential problems as well as word and symbol problems).
- Stimulate students' innate curiosity and desire to explore.

Fostering the development of positive attitudes

- Communicate a positive and enthusiastic attitude toward mathematics (be willing to take risks and make mistakes and encourage students to do the same).
- Promote and reward perseverance (give necessary time for difficult problems and revisit them on multiple occasions).
- Use humour and celebrate successes.

Fostering transformation for both teacher and student (transformative pedagogy)

- Reflect on and revise your own practice with respect to teaching mathematics (including mistakes).
- Find ways to build learning relationships with various professional communities where mathematics plays an important role.
- Share what you are doing as a teacher with other colleagues, and use colleagues to support self-reflection.
- Encourage students to reflect on and be explicit about their own thinking processes and the transformations in their own understanding.

the big idea is CONNECTEDNESS...

- ***Connect to community***
- ***Connect mathematics and Indigenous Knowledge***
- ***Connect to students***
- ***Connect to First Peoples themes and topics***

First Peoples Themes and Topics

- Family and ancestry
- Travel and navigation
- Games
- Land, environment and resource management
- Community
- Art
- Nutrition
- Dwellings
- Seasonal cycles in relation to traditional ways of life
- Place and relationship to the natural world

- Balance
- Sharing and generosity

Ways to begin:

- *story*
- *place*
- *self-identity*

Project Ideas

- Social Justice
- Interdisciplinary
- Environmental Sustainability
- Art, Language and Culture

Resources

Tluuwaay "Waadluxan Mathematical Adventures

<http://www.haidagwaiiobserver.com/Article.aspx?id=5321>

email Joanne Yovanovich (SD50 Principal for Aboriginal Education) for ordering information:
jyovanovich@sd50.bc.ca

UBC Aboriginal Mathematics K-12 Network

<http://blogs.ubc.ca/aboriginalmathnetwork/>

Teaching Mathematics in a First Peoples Context: Grades 8 & 9 (FNESC)

<http://www.fnesc.ca/curriculum/math>

Haida Legends: Culturally Responsive Mathematics

http://www.haidanation.ca/Pages/language/haida_legends/media/Lessons/RavenLes4-9.pdf

A Cultural Introduction to Math by Alison L. Gear (Teaching Children Mathematics journal, February 2012)

<http://www.nctm.org/publications/curious/default.aspx?id=41462>

Squamish Lil'wat Cultural Centre Mathematics and Culture ebook (BCAMT)

<http://slcc.ca/learn/classroom-resources/>

Shared Learnings: Integrating BC Aboriginal Content K-10 (2006)

<http://www.bced.gov.bc.ca/abed/shared.pdf>

Investigating Culturally Responsive Mathematics Education (a research report)

<http://www.ccl-cca.ca/pdfs/FundedResearch/201009NicolArchibaldBakerFullReport.pdf>

What values do you teach when you teach mathematics? (Bishop)

<http://www.nctm.org/resources/nea/TCM2001-02-346a.pdf>

Bishop, A.J. (1990). Western mathematics: The secret weapon of cultural imperialism. *Race and Class*, 32 (2), 51-65.

Bishop challenges the notion that mathematics is value-neutral or culturally-neutral. He sees Western mathematics as a cultural invader in three domains: trade, administration and education. Particular values associated with Western mathematics are: rationality, objectism and power and control. However, every culture has a symbolic technology for the following activities (which he considers to be mathematical): counting, locating, measuring, designing, explaining and playing.

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Weaving

Weaving is a form of textile creation that dates back to at least 10000 BC and is found across many cultures. Materials used for weaving traditionally reflect the natural resources of the region and the designs reflect aspects of the culture. Warp threads run vertically and weft threads run horizontally. A loom usually holds the warp threads in place.

Over and under weaving is known as plain or tabby weaving.
Coast Salish wool weaving includes twilling and twining techniques.

Mathematical content and competencies embedded in the process of weaving include estimation, visualization, problem-solving, making connections, communicating, counting, odd and even numbers, adding, multiplying, pattern, composing and decomposing shapes, transformations, symmetry, fractions, percentages, area, perimeter and linear measurement.

Salish Blankets: Robes of Protection and Transformation, Symbols of Wealth (2017) by Leslie H. Tepper, Janice George and William Joseph.

Aboriginal Mathematics K-12 Network

Instructions for weaving a quarter bag by Anjeanette Dawson

<http://blogs.ubc.ca/aboriginalmathnetwork/files/2014/03/WeavingBagInstructions.pdf>

Museum of Anthropology at UBC

The Fabric of Our Land: Coast Salish Weaving
(exhibit until April 15 2018)

http://moa.ubc.ca/portfolio_page/salish-weaving/

Musqueam Weavers

<http://moa.ubc.ca/wp-content/uploads/2014/08/Sourcebooks-Weavers.pdf>

UBC Biology Blog

Coast Salish Weaving and Spinning Information

<http://blogs.ubc.ca/biologyinfosessions/files/2013/09/coast-salish-wool-dog-poster.pdf>

SD41 Aboriginal Mathematics Inquiry Team project on weaving

<http://burnabyschools.ca/aboriginaleducation/wp-content/uploads/sites/4/2017/11/weaving-math.compressed.pdf>

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- **Reggio-Inspired Mathematics blog**

http://janicenovkam.typepad.com/reggioinspired_mathematic/

- **district blog: <http://blogs.sd38.bc.ca/sd38mathandscience/>**
- **BC Numeracy Network - bcnumeracynetwork.ca**