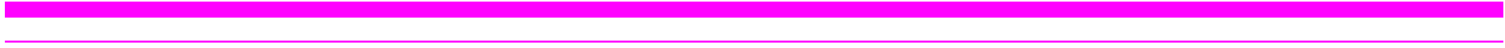


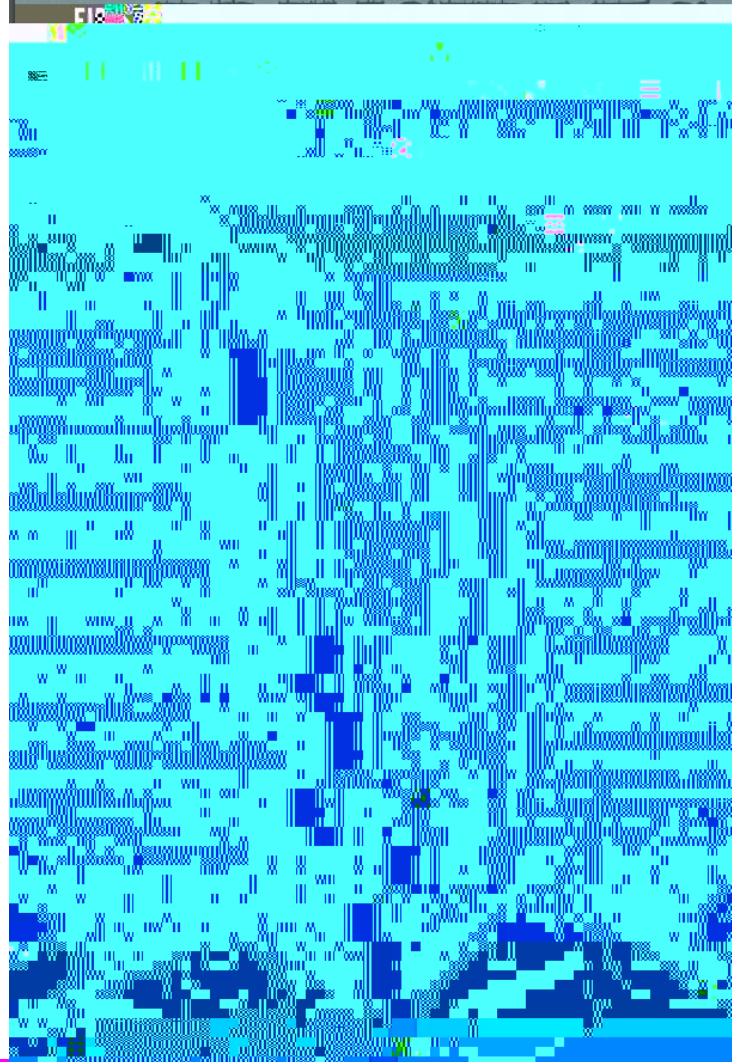
Teaching Mathematics in Relationship with

Welcome to the Kikinoo'amaagoowin Webinar Series

Find past webinars: www.angelanardozi.com/webinars



<http://www.fnesc.ca/wp/wp-content/uploads/2015/09/PUB-LFP-POSTER-Principles-of-Learning-First-Peoples-poster-11x17.pdf>



Integrating Indigenous Ways of Knowing

Build strong relationships with your students - get to know them

Collaborative Learning = building relationships

Hands on/experiential learning with contexts

Explore different strategies and different ways of looking at problems

Utilize reflective and reflexive thinking

Utilize holistic learning

Use story

Learn on and from the land

Honouring and valuing contributions from many cultures

Collaborative Learning

Complex Instruction (misnomer) - use specific roles within groups and was designed to create equity in classrooms

<http://cgi.stanford.edu/group/pci/cgi-bin/site.cgi>

<https://complexinstruction.stanford.edu/>



Hands-On and Experiential Learning

Use manipulatives and models to delve into WHY the math works

Example: Using Cuisenaire Rods to explore:

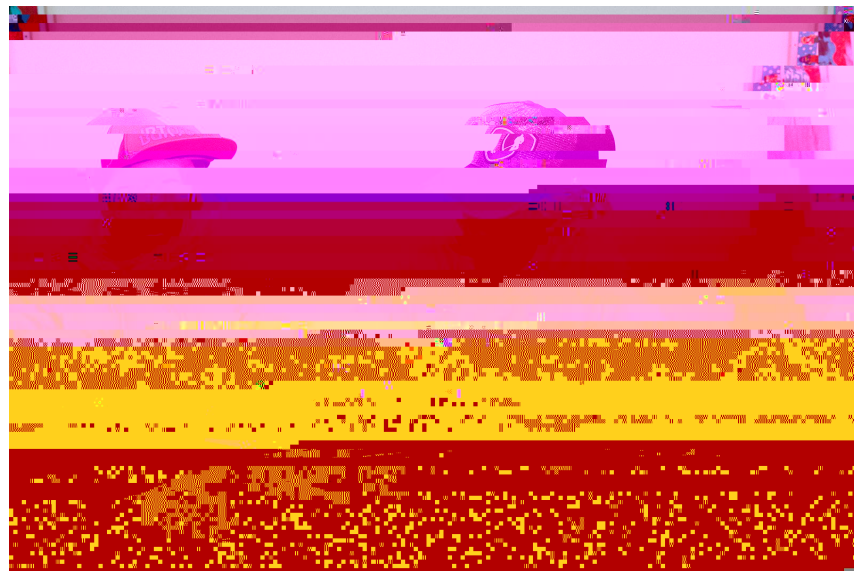
- Patterns found in the pairs of numbers that add to make 10 (friends of 10)

- Subtraction as difference

- Multiplication and how it relates to division

- Proportional reasoning

- Fractions as a linear measurement, mixed numbers and improper fractions, why we need a common denominator to add/subtract fractions, multiplying and dividing fractions



Explore Different Strategies

All of our brains are different and to understand different strategies is to understand more deeply

Example: area models for multiplication

- Visual tool

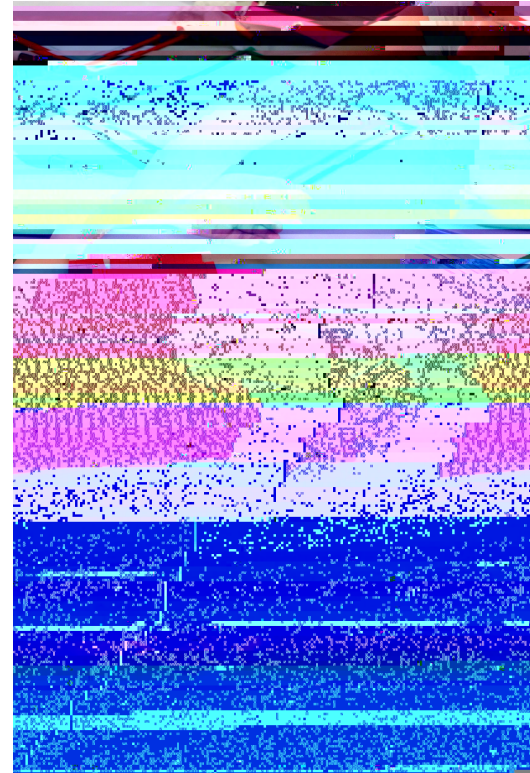
- Connected to area/building

- Can be used with all types of numbers (decimal, fraction, algebraic)

- Can be connected to all other symbolic strategies for multiplication

- Related to division

There are many strategies for performing operations with all types of numbers that often make a lot more sense to students than traditional algorithms



Holistic Learning

Holistic Learning: An approach that seeks to fully activate all aspects of the learner's personality (intellect, emotions, imagination, body) for more effective and comprehensive learning.

(<http://www.ibe.unesco.org/en/glossary-curriculum-terminology/h/holistic-learning-approach>)

Example: Exercise and its effects on our health (could incorporate Science, History, Language Arts, PE)

Math related content:

Adding and Time: keep track of the minutes (or hours) we spend playing sports, playing outside, anything active and then determine the amount of time in a week, month, etc.

Rates - measuring heart rate before, during and after exercising

Story

Use story books or stories related to land, culture, history to introduce or explore math concepts.

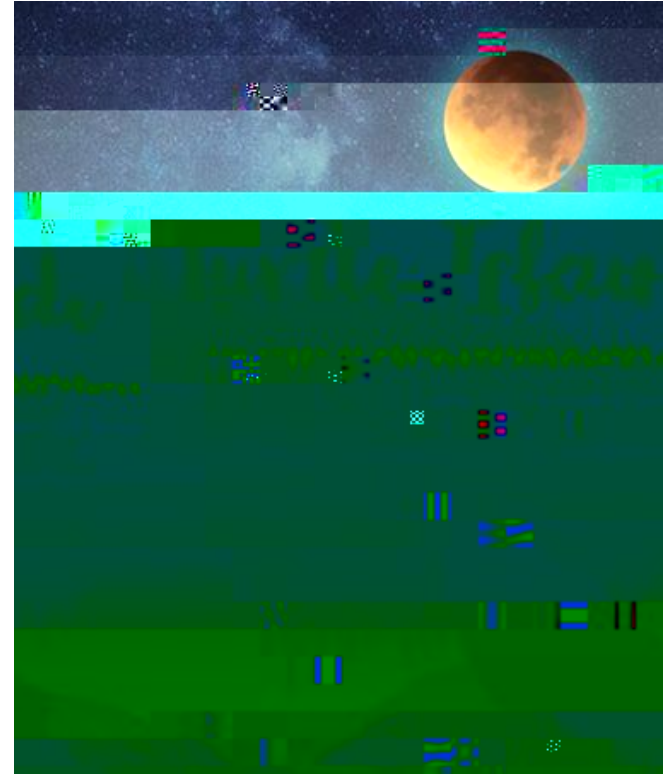
Invite an Elder or knowledge keeper to join you to tell a story (and you can listen for the math that can be found within)

<http://mathcatcher.irmacs.sfu.ca/>

https://www.strongnations.com/store/item_display.php?i=6602

<https://www.strongnations.com/search/?s=math>

<https://www.the-best-childrens-books.org/math-for-kids.html>



Using Stories in Math Class

Story can be modeled, acted out and solved by students:

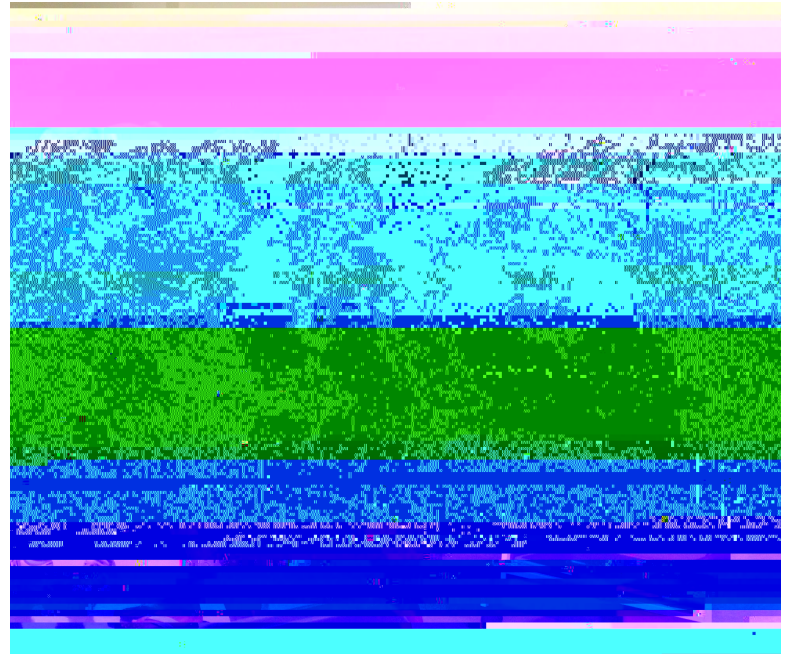
- Fractions in Disguise
- Equal Schmequal
- Spaghetti and Meatballs for All
- Greedy Triangle

Story can be the jumping off point:

- 'The Cedar Tree - The Heart of Our People'
- 'Turtle Island' (ex: page 63)

Story can be history of the math; the people who used/invented the math:

- The Egyptian history of fractions - they were used to compare whole numbers (proportion)
- Drum making using 3 diameters and a hand



Exploring Trees

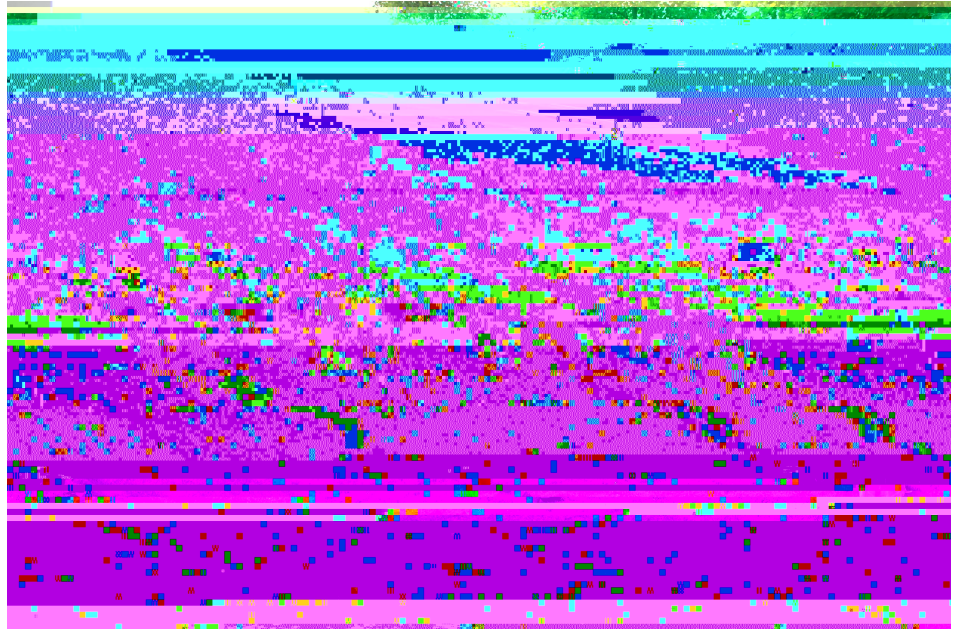
Read the 'The Cedar Tree - The Heart of Our

Learning On and From the Land

Estimating and measuring length,
perimeter and area
Estimating tree heights, ages, volumes
Using data to measure the health of
waterways, oceans, lakes (use data on
salinity, temperature, toxins, fish counts,
etc.)

<https://www.sciencefriday.com/educational-resources/illustrated-graphs-using-art-enliven-scientific-data/>

ratio/proportion to explore: the amount
of green space versus developed space,
trees per area, native plants versus
non-native species



Place Based Learning

Patterns found within nature (pine cones, flowers, etc.) - fibonacci, fractals
Using Desmos to find and compare linear equations around the school and outdoors and/or plot the school grounds on a cartesian plane - find locations using coordinate points
Estimating large numbers - what does a million blades of grass look like? - connect to exploring very small numbers (the field is 1, each blade of grass is ___?)
Drawing what we see (drawing uses all sorts of geometry and proportion)

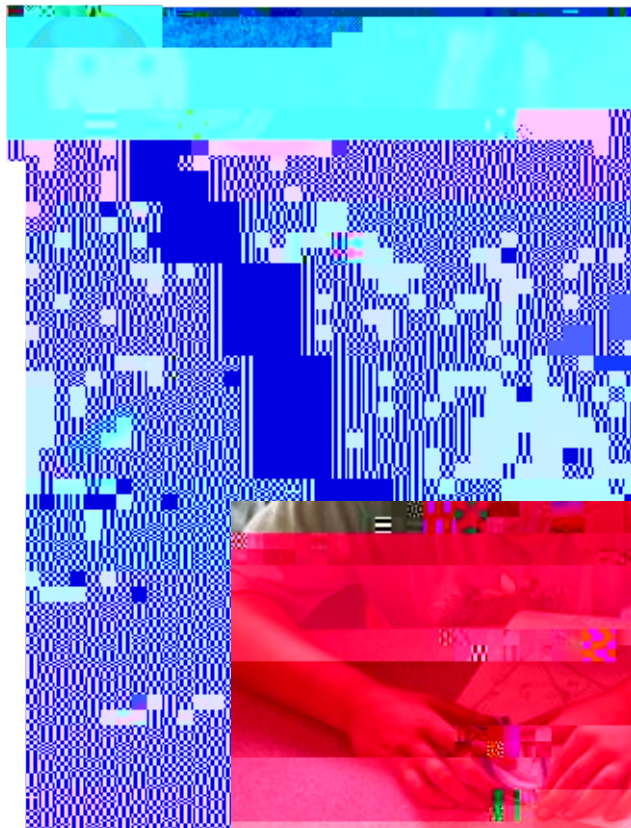
Use geometric shapes and symmetry to create drawings of nature, buildings, hands, etc.
Ask local businesses what problems they that we could work on as a math class (profits, loss, percent)
Data analysis of anything that is of interest to them or connected to another project/topic/concept you are exploring (math is one way of making sense of the world)
Beach clean up - ratios of marine debris and microplastics and length of time to clean them up

Sun Shadows

Using a pencil, or any stick measure sun shadows each hour (tip: you need to be in the same location and orientation so use chalk to mark where your paper lies):

Explore when the shadows are shortest and longest (and how that relates to solar noon)

Measure angles at each hour and look for patterns and connections



Cultural Connections

Co-creating resources within your community would be ideal

Start with the cultural context and its importance and then explore how the math may be useful in understanding, building, drawing, etc:

Art - symmetry, transformations, using body ratios, estimating, scale

Housing - Longhouses, pit houses, tipis (depending on your location) - area, perimeter, scale, volume, capacity

Drumming - the math in music, beats, making drums

Artifact sharing - can be math and culture or just culture related

Planning for a cultural celebration

When learning on and from the land incorporate traditional ecological knowledges, landmarks, significances of the land

Resources

Math in a cultural context (Yup'ik):

<https://www.brushededucation.ca/catalog/math-in-a-cultural-context>

Show Me Your Math (Mi'kmaw):

<http://showmeyourmath.ca/>

Collection of resources:

https://www.oise.utoronto.ca/deepeningknowledge/Teacher_Resources/Curriculum_Resources_%28by_subjects%29/Math/index.html

Video Series and resources from Ontario:

<http://mkn-rcm.ca/indigenousknowledge/>

Grade 8/9 resource from FNEsc (BC):

<http://www.fnesc.ca/math-first-peoples/>

Math Catcher Series of stories/videos:

<http://mathcatcher.irmacs.sfu.ca/>

Ethnomathematics Lessons:

<https://ethnomath.coe.hawaii.edu/resources.php>

Culture-Related math:

<https://csdt.rpi.edu/culture/legacy/index2.html>

Final Notes

Collaborating with community members, students and their families, Elders and knowledge keepers is the best way to create authentic resources that will be relevant to your learning community

Connect with your Indigenous Education department for resources local to you
Start small if you're feeling overwhelmed...try one new strategy:)

Please feel free to email me:
Nikki @educatingnow.com