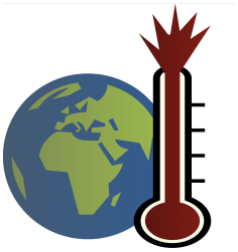
Environmental Issues and Mathematics

Math and the Environment

Environmental issues are a large part of social justice and it affects individuals and communities around the world. It is important for students to be aware of national and global environmental issues, have the knowledge to analyze them and their effects, and consider ways to improve them. One way to do this is viewing and analyzing environmental issues through a Math lens, including graphing, data collection, numerical calculations, statistics, and more.

- Schwartz (1985)



Environmental Topics that Relate to Math

- Pollution
- Climate Change
- Water
- Deforestation
- Natural Disasters
- Garbage
- Oil and Energy

Importance of Cross-Curricular Connections

As there are ongoing environmental and social issues occurring around the world, students should be environmentally responsible. By making cross-curricular connections between Mathematics and environmental education, we can solidify students' understanding of environmental challenges and build their capacity and willingness to take action.

- Ontario Ministry of Education, 2009

Why Teach Environmental Issues Through Math?

- Students gain a deeper understanding of the topics through a Mathematical framework
- Appreciation of how different subjects connect in real-life contexts
- Gain ability to take different perspectives on an issue
- Develop realistic and mathematically-sound solutions to address issues
- Increased levels of student engagement

- *Natural Curiosity* (2017)
- *Rethinking Mathematics* (2005)

Student Motivation

Relating Mathematics to local and global environmental issues motivates students in learning and utilizing Math, as it shows them what Math can be used for and how it can help make a difference!

"Knowledge plus motivation equals action."
– David Suzuki

Valuable Resources

- *Natural Curiosity* (2017, 2nd edition)
- *Rethinking Mathematics* (2005)
- United Nations Environment (https://www.unenvironment.org/)

Below are potential lessons on pollution that outline topics of environmental issues and Mathematics supported by research and statistics, and how to implement them in the classroom to ensure that students are engaged and interested in these issues.

Lesson #1: Garbage

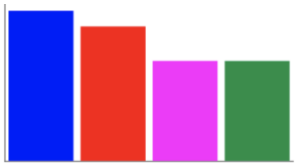
- Make a tally chart of how many students are bringing in litter-free or litter lunches. Garbage output in the classroom can be weighed after every week from the classroom
- Impacts can be analyzed; for example, this class produced *x* amount of garbage in one week. If this class reduced their garbage by *y* amount, how much can they reduce the garbage in landfills in 1 year?

Math Concepts Covered:
- Data Management (Grade 1-3)
- Measurement (Grade 1-3)

Cross-Curricular Connections:
- Science (Grade 1: Society and The Environment) 1.1
- Science (Grade 2: Society and The Environment) 1.1

Lesson #2: Data Collection on Origins of Clothing

- Collect data with the class and make a bar graph
  - on sticky notes, students write where their clothing was made (ex. shirt from China, jeans from India)
- Have students discuss the data from this graph using the following prompts:
  → Why is our clothing made in these countries?
  → What environmental effects does this have? (ex. dangerous levels of pollution and poor air quality because of factories)
  → What can be done?



Math Concepts Covered:
- Data Management (Grades 1-6)

Cross-Curricular Connections:
- Science (Grade 2: Society and The Environment) 1.1
- Social Studies (Grade 6: Responses to Global Issues) B2.1, B2.2, B2.4, B3.7

Lesson #3: Keystone XL Pipeline Debate

- Background information
  - Canada's oil industry accounts for a large amount of Canada's greenhouse gas emissions
  - Keystone XL pipeline would ship oil to the U.S. from Alberta
- Debate on whether new pipelines should be built in Canada
  → FOR: creation of new jobs, more money for Canada
  → AGAINST: climate change, pipeline leaks, First Nations rights, oil spills, destruction of wildlife/habitats
- Example of Math consideration:
  - the Keystone XL pipeline would create 42,100 jobs over the pipeline's construction
  → 42,000 jobs estimated at $80,000 each → income tax of Alberta is 25%, multiplied by 42,000 jobs = how much money comes back to Canada? → around 840 million dollars for this one pipeline

Math Concepts Covered:
- Number Sense and Numeration (Grade 5)
- Number Sense and Numeration (Grade 6)
- Data Management and Probability (Grade 6)

Cross-Curricular Connections:
- Social Studies (Grade 6: People and Environments) B1.1, B1.2, B2.4, B3.1, B3.9
- Science (Grade 4: Life Systems, Habitats, and Communities) 1.1
- Science (Grade 5: Conservation of Energy and Resources) 1.1
- Science (Grade 7: Heat in the Environment) 3.8