Using Inquiry in Social Studies Lessons to Target Environmental Education and Stewardship

Geographic Inquiry Model

Formulate Questions	Gather and Organize	Interpret and Analyse	Evaluate and Draw Conclusions	Communicate

Introduction: How Big is your Footprint?

Using a geographical lens encompassing both spatial and ecological perspectives, students investigate a variety of ways that human activities impact the environment, specifically focusing on extraction, production, consumption and disposal of everyday consumer products. Throughout knowledge building activities and collaborative, inquiry-based research, students are afforded the opportunity to analyze the ecological footprint which results from the production and use of products, as well as formulate alternative actions to decrease the ecological and environmental impact.

Considerations for Planning

Prior to this lesson, students will need:

- experience working in groups;
- experience analyzing media texts;
- experience developing the main idea and supporting details;
- understanding of ecology: the relationship between living organisms (humans in this case) and the environment;
- understanding of resource use; and,
- understanding of the production and consumption of consumer products.

Resources and Materials

apple and knife, use of available technologies, i.e., computer, internet, projector/screen, access to park/large field, chart paper

BLM 2.1 - Ecological Footprint
BLM 2.2 - My Ecological Footprint
BLM 2.3 - Ecological Footprint Resource

How does this lesson link to Environmental Education?

Standards for Environmental Education in the Curriculum (2008) suggests that students should be given the opportunity "to become environmentally literate; apply their acquired knowledge, perspectives, skills and practices in real-life situations; and, become environmentally responsible citizens who are aware of the global implications of local action". In this lesson, students use spatial perspective when considering the Ecological Footprint (the amount of productive land and water needed to support what is used and disposed of by people). Using the understanding of the Ecological Footprint, students will begin to contemplate alternatives to the processes of extraction, production, consumption, and disposal of products as a means to reduce the environmental impact.

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Revised (2013) Social Studies History and Geography Curriculum

Lesson: How Big is your Footprint?

Students investigate ways that human activities impact the environment, specifically focusing on extraction, production, consumption and disposal of everyday consumer products. They analyze the ecological footprint which results from the production and use of products, as well as formulate alternative actions to decrease the ecological and environmental impact.

Learning Goals:

By the end of this lesson students will understand and be able to:

- determine, analyze and assess the environmental impact due to extraction, production, consumption and disposal of a particular consumer product; and,
- formulate and develop potential alternatives which decrease the ecological footprint caused as a result of a the production and use of a particular consumer product.

Curriculum Expectations and Concepts of Geographic Thinking

Grade 7: Natural Resources Around the World: Use and Sustainability

Overall expectation:

• Analyze aspects of extraction/harvesting and use of natural resources in different regions and assess ways of preserving them. FOCUS ON: Spatial Significance; Interrelationships

Specific expectations:

• Create a personal plan of action outlining how they can contribute to more sustainable natural resource extraction/harvesting and/or use.

Big Ideas: There is a relationship between Earth's physical features and the distribution of natural resources and how people use them. The ways in which people extract and harvest natural resources can have social, political, and environmental consequences.

Framing Questions to Guide the Lesson: Why might it be easier for some countries to extract and use natural resources in a sustainable way? Is the extractions and use of fossil fuels sustainable? What are some of the ways in which different countries are practising environmental stewardship?

Integrated Expectations across Subject Areas

Language: Media Literacy

• Demonstrate an understanding of a variety of media texts.

Language: Oral and Visual Communication

• Develop and explain interpretations of oral texts using stated and implied ideas from the texts to support their interpretation.

Math: Data Management

• Collect and organize categorical, discrete, or continuous primary data and secondary data and display the data in charts, tables and graphs.

Science and Technology

• Assess the impacts of human activities and technologies on the environment and evaluate ways of controlling these impacts.

Relevant Terminology

sustainability, ecology, hectare, finite, infinite, equity

Minds On: Connecting Background Knowledge

The Earth as an Apple

Large group activity (approximately 10 minutes)

- Set aside an apple in an area where it can safely be cut into sections while students observe.
- Distribute students' Exit Cards (BLM 1.2) from Lesson 1: Geographical Significance Surrounding the Stories of Stuff.
- Students share responses.
- Discuss:
    - In what ways can a person impact the Earth through consumption?
    - Do you think there is a limit to what individuals can consume from the earth?
- Hold up the apple and suggest that the apple represents Earth.
- Ask: How is the earth is like an apple? (spherical, core, worms)
- Suggest: Imagine that this apple is the earth.
- Cut the apple into quarters.
- Set aside three quarters and suggest that these three pieces represent the oceans.
- Suggest: The remaining one quarter represents land.
- Slice the remaining one quarter in half.
- Hold up one eighth and suggest that it represents land which is inhospitable to humans.
- Slice the remaining piece of apple into four sections.
- Set three of these pieces aside and suggest that those pieces represent land which cannot produce food/where people live but do not use land for agriculture.
- Suggest: The fraction of apple which remains is 1/32.
- Peel/cut away the apple skin.
- Suggest: This peel represents earth's very thin crust upon which humankind exists.
- Suggest: Everything people use/have comes from the earth. In other words, the food which feeds the entire globe is grown on this peel.

* This Activity is adapted from Ecovoyageurs website:
http://www.ecovoyageurs.ca/en/page.cgi?stage=impacts/global

Follow Up Discussion

Large group activity (approximately 5 minutes)

- Ask: How is it potentially problematic that all people on earth depend on this very small fraction of land for everything from food to electronics?
- Record students' responses on chart paper (resource scarcity, running out of resources over time, greed as a motivator in use of resources, inequity between resource haves/have not's, rresulting lack of diversity).
- Add additional responses as warranted, based on students' ideas and insights.

Assessment Tools and Strategies:

Assessment for Learning - student responses during discussions, *consider:*

- Are they able to articulate ideas around finite resources?
- Can students make links between finite land and the need to ensure we share equally and/or we need to make sure there are limits to our consumption?
- Can students make connections back to the story of stuff and the cycle of consumption?

Action

Ecological Footprint

Large and small group activities (approximately 10 – 15 minutes)

- Distribute **BLM 2.1 - Ecological Footprint** to every student.
- In a location with accessible internet/wifi (or, alternatively using an IWB), open website: http://www.ecovoyageurs.ca/en/page.cgi?stage=footprint/whatis
- Introduce the concept of an ecological footprint (found within the website). Lead students to the definition/ explanation, as required.
- Within the definition, highlight links which enable further investigation of the concept.
- Suggest: Note on the left, What Makes an Eco-Footprint?
- Suggest: This explains the components of an ecological footprint: water, transportation, waste, energy, food.
- Students write the definition for ecological footprint in the appropriate section of **BLM 2.1 - Ecological Footprint**.
- With a partner, students discuss examples of each component and record on **BLM 2.1 - Ecological Footprint**.
- Suggest: Students share examples with the larger group.

Just How Big is a Hectare?

Large group activity (approximately 50 minutes)

- Suggest: An ecological footprint is measured in hectares.
- Take students on a walk to a nearby park, field or school grounds. (Ensure your chosen site is large enough to demonstrate the approximate size of a hectare.)
- Upon arrival, review the basic definitions of an ecological footprint:

    WWF definition: “It is the amount of the environment necessary to produce the goods and services necessary to support a particular lifestyle.” http://wwf.panda.org/about_our_earth/teacher_resources/webfieldtrips/ecological_balance/eco_footprint/

    Ecovoyageurs definition: “A measure of the productive land and water "that would be required to support a person's current lifestyle forever." http://www.ecovoyageurs.ca/en/page.cgi?stage=footprint/whatis

- Students actively estimate dimensions of a hectare, i.e., demonstrate size by creating a square with four students as corners. (Alternatively, initiate a verbal discussion.)
- Choose four students to be the four vertices of the hectare, and assign to each student a cardinal direction (north, east, south, west).
- Suggest to each student: take 70 large paces in their cardinal direction, stop and face the group.
- Upon completion, explain that this now represents the approximate size of a hectare.
- Revisit the definition of ecological footprint.
- Ask: Estimate the number of hectares that an average person in Canada would require to sustain his or her lifestyle.
- Accept all estimates. Disclose the amount of hectares the average Canadian uses is 7.6
- Discuss as a group:
    - Can our footprint be comprised of land use from many different countries?
    - How does purchasing consumer products abroad impact our ecological footprint?
    - What happens to our ecological footprint when the majority of our purchases are of items produced in other countries?
    - How does a person's use of resources and size of ecological footprint affect the environment?

Assessment Tools and Strategies:

Assessment for Learning – Observation/notes during discussion, *consider*:
- Are students able to provide clear and realistic connections between consuming products that come from large distances and the size of their ecological footprint?

Measuring My Own Ecological Footprint

Individual activity (approximately 15 minutes)

- Ideally, access space where each student has a computer. (Students may partner if a Lab or other space is unavailable.)
- Distribute **BLM 2.2 - My Ecological Footprint** to each student.
- Students complete one of the following surveys to measure their ecological footprint:
    - http://www.myfootprint.org/
    - http://www.earthday.org/ (Click on footprint calculator at the top of the page.)
    - http://www.ecovoyageurs.ca/en/page.cgi?tplate=footprint_wide&stage=footprint/calc
- Students record results on **BLM 2.2 - My Ecological Footprint** in the appropriate section.
- **Suggest: Students keep BLM 2.2 - My Ecological Footprint for later use.**

Consolidation and Debrief

Reflecting on Others' Ecological Footprint

Small and large group activities (approximately 15 minutes)

- Provide anecdotes of everyday scenarios for an adult and a student (listed on **BLM 2.3 - Ecological Footprint Resource**).
- Distribute **BLM 2.3 - Ecological Footprint Resource** to each student.
- Organize students into small groups.
- Students examine the scenarios in their groups and suggest ways which could reduce both the adult's and student's ecological footprints.
- Provide each group with chart paper and a marker.
- One student writes suggested solutions on chart paper.
- Allow time for each group to post their chart paper and elaborate.

Reflecting on One's Own Ecological Footprint

Partner and independent activities (approximately 15 minutes)

- Students retrieve their copy of **BLM 2.2 - My Ecological Footprint**.
- Students discuss their ecological footprint with a partner, comparing footprint results.
- Students identify activities from each component of a footprint (water, transportation, waste, energy, food) which add to their footprint (drive to school, long hot showers, generating excessive garbage), and record two examples per component on **BLM 2.2 - My Ecological Footprint** in the appropriate section.
- Students independently complete the remaining section on **BLM 2.2 - My Ecological Footprint** (Ways to Reduce). (Examples may include use of compact florescent bulbs, increase insulation, water saving fixtures, energy efficient appliances, turning off lights when leaving a room, turning off a tap while brushing teeth; turning off computer monitors/computers when not in use, drying clothes outside, unplugging small appliances, shorter showers, walking to work/school, biking to work/school, taking public transit to work/school, litterless lunches, improved effort at recycling, etc.)
- Time permitting; students may share their examples and solutions with the class. Alternatively, complete as homework, and share at the beginning of the Lesson, Population Pressure.

Assessment Tools and Strategies:

Assessment for Learning - Student-teacher conferences regarding BLM 2.2 - My Ecological Footprint, *consider*:
- students' ability to identify examples which create their ecological footprint
- students' ability to determine solutions/actions which reduce their ecological footprint

Further Opportunities for Learning

Ecological Load

Students calculate the ecological load of Canada compared to two other countries. Students calculate and compare ecological load by researching the population and ecological footprint of each country. (Ecological Load = Population x Ecological Footprint) Following their research/calculation, students develop a written response which identifies patterns/conclusions based on inference from data of countries, such as lifestyle, etc.

Graphing

Students record data and create graphs which compare results of Canada's Ecological Load and that of two other countries. Post around the class.

Related Resources and References

Websites

- Ministry of Education
  http://www.edu.gov.on.ca/eng/teachers/enviroed/education.html
- Ministry of Education
  http://www.edu.gov.on.ca/eng/curriculum/elementary/sshg.html
- Ecovoyageurs

http://www.ecovoyageurs.ca

- Ecological Footprint

http://myfootprint.org/en

References

Cooper, Damian. (2007). *Talk About Assessment: Strategies and Tools to Improve Learning.* Toronto, Ontario: Nelson- Thomson Canada Ltd.

Ministry of Education. Acting Today, Shaping Tomorrow; A Policy Framework for Environmental Education in Ontario Schools. Ontario, 2009

Ministry of Education: Growing Success: Assessment, Evaluation and Reporting in Ontario Schools. First edition, Grades 1 – 12, Ontario, 2012

BLM 2.1 – Ecological Footprint

1. What is an Ecological Footprint? _____

_____

_____

2. What are the five components of an Ecological Footprint? Give an example of each.

Components of an Ecological Footprint	Examples
1.	
2.	
3.	
4.	
5.	

3. When is an Ecological Footprint considered sustainable?

_____

_____

_____

4. What are some implications of an Ecological Footprint that is not sustainable?

_____

_____

_____

BLM 2.2 – My Ecological Footprint

1. Determine the size of your Ecological Footprint. Use one of the following websites:

http://www.myfootprint.org/
http://www.earthday.org/ click on footprint calculator at the top of the page
http://www.ecovoyageurs.ca/en/page.cgi?tplate=footprint_wide&stage=footprint/calc

2. Summarize below the size of your ecological footprint.

_____

_____

_____

_____

3. Provide examples of your footprint from each of the five components.
Determine ways that you could reduce each example.

Component	Example of Use	Ways to Reduce
Water		
Transportation		
Waste		
Energy		
Food		

Example 1: Average Day of a Single Adult in a City

Ms. G. is a teacher who lives in the city in an apartment near the downtown core. Her apartment has one bedroom and is 100 square metres. Every morning Ms. G. wakes up at 6:30 a.m., has a hot shower, blow dries her hair and brushes her teeth. She makes herself a cup of coffee and breakfast then watches the morning News. Ms. G. leaves for work at 7:30 a.m. and drives 17.5 km to get to her school. In her classroom, Ms. G. has a laptop, and a projector and screen which she uses for lessons . Usually Ms. G. brings her lunch, but, sometimes she drives up the street to get some take-out. Ms. G. drives to the Gym after school, before going home. At the gym she likes to use the treadmill and watches the news while she runs. When she gets home, Ms. G. cooks dinner, usually including a meat dish. Once she is finished with her meal, she turns on the dishwasher. Finally, she sits down to surf the net or watch television before going to bed.

If everyone lived like Ms. G., we would need 4.47 earths.

Example 2: Average Day of a Student in a City

Marcin lives with his parents and brother in a small, two story, semi-detached home with 3 bedrooms. Every morning Marcin wakes up at 7 A.M., has a 15 minute warm shower while his mom or dad makes breakfast. He eats breakfast while watching a morning television show, brushes his teeth when he is finished, then packs up his lunch. Often Marcin is running late because he takes too long in the shower. So, his parents drive him down the street to school. Marcin eats lunch at school. After school, he walks home with friends. When he gets home, Marcin usually turns on the stereo to listen to music, then plays video games until dinner. After dinner, Marcin likes to go online to talk to friends, listen to music and watch television. He has another hot shower before he goes to bed, brushes his teeth and then falls asleep with the television on.

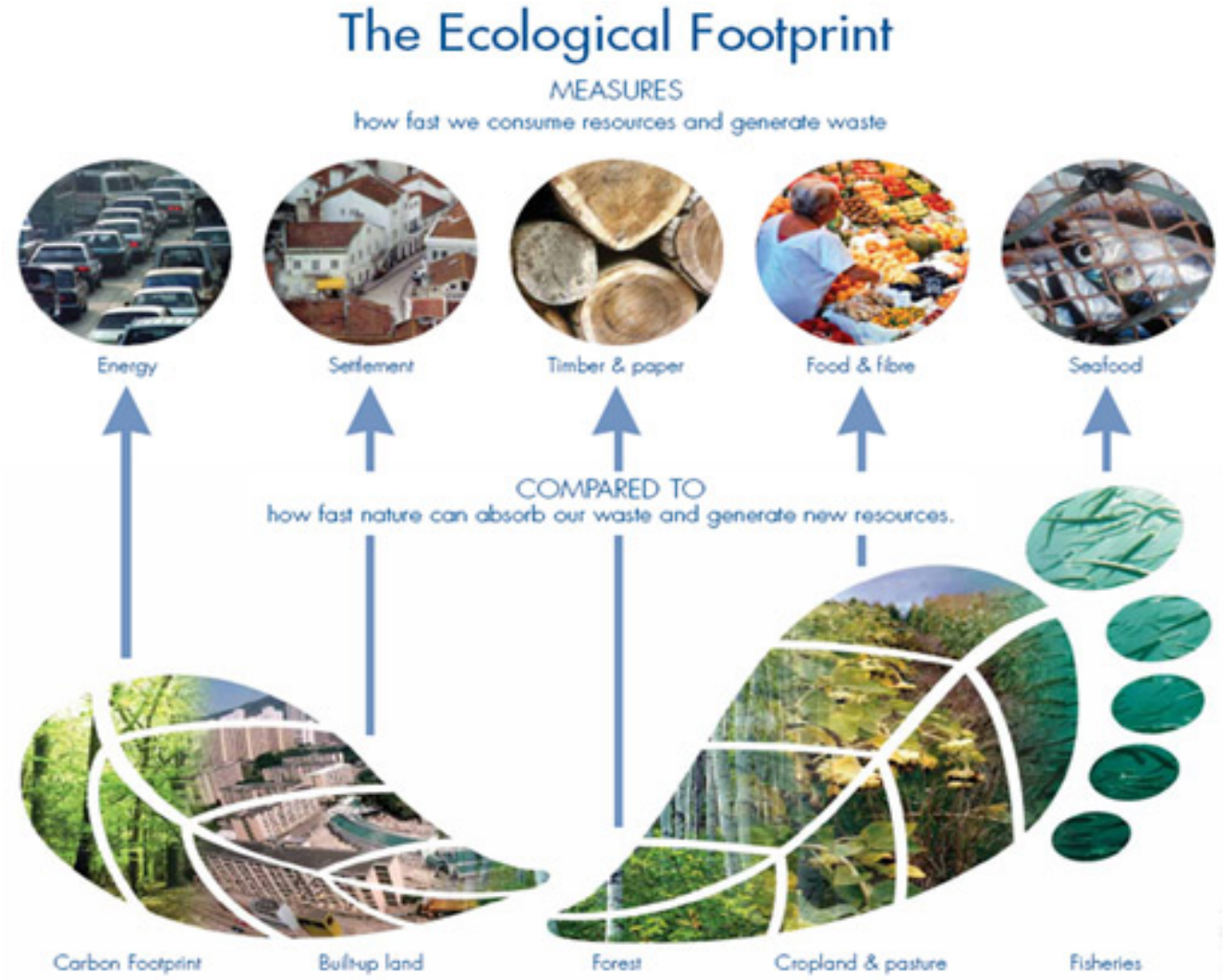
If everyone lived like Marcin we would need 4.23 earths.

Reduce your Footprint

http://myfootprint.org/en/take_action/reduce_your_footprint

BLM 2.3 – Ecological Footprint Resource

An ecological footprint estimates the amount of productive land and water needed to support what is used and disposed of by people. An ecological footprint can be calculated for individuals, communities and countries. If our collective ecological footprint indicates that we are using more natural resources than what earth is ultimately able to supply, then we are not engaging in a sustainable lifestyle. We must put forth conscientious effort in understanding the impact of our collective ecological footprint, for the benefit of future generations.



http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_basics_overview/

History

While affiliated with the University of British Columbia, William Rees and Mathis Wackernagel first developed the ecological footprint concept and calculation method in 1990. In 1996, Rees and Wackernagel published a book entitled, Our Ecological Footprint: Reducing Human Impact on the Earth. Since that time, many alternative calculations have been suggested to help individuals and businesses determine human impact on the environment.

For more information: http://www.livestrong.com/article/185668-how-is-an-ecological-footprint-calculated/#ixzz23Ye3ssnw