Earth “Spheres” Concept Map
Mike Farley, University of Toronto Schools

Introduction
This year-end summative project for my Grade 7 Geography students is actually a “new and improved” version of a similar assignment I have done in the past with my World Issues students. The students were asked to choose a behaviour or product and examine its effects on the “four spheres” of the Earth (lithosphere, hydrosphere, atmosphere, biosphere).

There are five parts to this project (see next page for more info):
• online Ecological Footprint (75 minutes in computer lab);
• research sheet (75 minutes in computer lab);
• concept map rough copy (75 minutes);
• concept map good copy (150 minutes);
• solution write-up (150 minutes in computer lab).

If you don’t think the whole project is a good fit for your class, you might consider using the online Ecological Footprint (EF) calculator (www.footprintnetwork.org > Your Footprint > Take the Quiz) as a stand-alone assignment. This excellent new EF calculator is from the same designers who created “The Meatrix” and “The Story of Stuff”.

Selected Ministry Expectations
Even though this assignment was designed for my Grade 7 classes, I believe it could be modified for a number of different courses. I have highlighted a few of them below with the main corresponding expectations:

Grade 7 Geography
• communicate the results of inquiries and analyses for specific purposes and audiences, using computer slide shows, videos, websites, oral presentations, written notes and descriptions, drawings, tables, charts, diagrams, maps, models, and graphs.

Grade 9 Geography of Canada (CGC1D)
• explain how human activities affect, or are affected by, the environment.
• predict the consequences of human activities on natural systems.

Grade 11 Physical Geography (CGF3M)
• evaluate the impact of human life on the environment.

Grade 12 Canadian and World Issues (CGW4U)
• explain how the earth’s natural and human systems are interconnected in multiple, complex ways.

Selected Further Resources
• “Garbage: The Revolution Starts at Home” video (www.garbagerevolution.com);
• Inspiration Software (concept-mapping software – I haven’t used this, but it’s supposed to be very good);
• for more info or a digital copy, you can contact me at mfarley@utschools.ca or michael.farley@tel.tdsb.on.ca.

Concept Map Exemplars
Introduction

Throughout this course, we have looked at the earth’s four spheres: lithosphere, hydrosphere, atmosphere and biosphere. We may feel somewhat disconnected from these spheres – to a large extent we manipulate them to suit our needs (e.g. paving the earth, diverting rivers, heating and cooling our homes, and pushing wildlife further and further away from the city). But if we look a little deeper, we realize that we are highly connected to the spheres and that the spheres themselves are deeply interconnected and interdependent.

To explore these connections you will be creating a “concept map” that links one of your behaviours to the spheres and the impacts you have upon them.

Tasks

1. Calculate your online Ecological Footprint (EF) using the accompanying handout.

2. Review areas that increased your EF and choose one behaviour. Some examples might include:
   - electricity (e.g. leaving lights on, inefficient light bulbs, overuse of AC);
   - water (e.g. excessive showers, regular showerheads and toilets);
   - garbage (e.g. non-recyclable lunch packaging);
   - meat consumption (e.g. meat at almost every meal);
   - home heating (e.g. a “tropical climate” in your home);
   - food that has travelled long distances (e.g. mangos, kiwis);
   - e-waste (electronic waste) (e.g. iPods, computers, cell phones);
   - paper (e.g. daily newspaper, computer paper, photocopying);
   - excess living space (e.g. five bedrooms for a four-person family);
   - air travel (e.g. flying to Montreal when you can take the train instead);
   - toxic products (e.g. chemical cleaning products, single-use batteries);
   - shopping (e.g. buying clothes when your closet is already crammed);
   - if you’d like to do something else, consult with me.

3. Complete a research sheet that focuses on the effects of your chosen behaviour using your textbook and the internet. You should use the following headings: “Lithosphere”, “Hydrosphere”, “Atmosphere”, “Biosphere”, and “Connections Between Effects” (e.g. if your behaviour is “paper use” and you identified deforestation as an effect on the biosphere, you could also connect deforestation to soil erosion in the lithosphere).

4. Create a rough copy of your concept map using your research sheet. Your behaviour should go in the middle of the page and then start listing the environmental effects on the four spheres around this. Under each effect, you might want to put a small point form description giving further explanation. This will probably be very messy, but that’s good! This is your chance to play around with different layouts and connections.

5. Using your rough copy and research sheet, create a good copy of your concept map. Feel free to add graphics and colour to help illustrate your text. The final product should be approximately 17 x 21”.

6. Type a two page (double-spaced) write-up that describes in detail one way in which you can reduce the negative effects of your chosen behaviour (e.g. compostable fast food containers, rechargeable batteries, more fuel-efficient airplanes). Be sure to embed your sources in the text (MLA format) and include a Works Cited list at the end (use www.easybib.com). Your write-up should be structured as follows:
   - introduction explaining your solution;
   - how the solution lessens the negative effects of your behaviour;
   - possible difficulties for this solution;
   - conclusion.

Evaluation: see attached rubrics
Online Ecological Footprints (EF)

1. Go to: www.footprintnetwork.org > Your Footprint > Take the Quiz (do the “detailed information” route)
   a) If everyone lived like you, how many Planet Earths would we need to provide enough resources?
   b) How many hectares of the Earth’s productive area does it take to support your lifestyle? (note: you must convert acres to hectares; 1 acre = 0.405 hectare). How many tons of carbon dioxide do you create each year? (note: you must convert tons (imperial) to tons (metric); 1 imperial ton = 0.907 metric ton)
   c) How does your EF break down? (%) Food, Shelter, Mobility, Goods, Services
   d) Using the “Edit Your Footprint” and “Explore Scenarios” links, see if you can reduce your EF. Record your revised numbers:
      • If everyone lived like you, how many Planet Earths would we need to provide enough resources?
      • How many hectares of the Earth’s productive area does it take to support your lifestyle? (note: you must convert acres to hectares; 1 acre = 0.405 hectare). How many tons of carbon dioxide do you create each year? (note: you must convert tons (imperial) to tons (metric); 1 imperial ton = 0.907 metric ton)
      • How does your EF break down? (%) Food, Shelter, Mobility, Goods, Services
      • What are some of the ways you reduced your EF? (briefly explain)

e) What did you like about this EF calculator? Explain.

f) Can this EF calculator be improved? Is there anything that it leaves out? (you may need to come back to this question once you tried some of the other calculators below)

2. If time permits, try some of the following EF calculators:
   • www.myfootprint.org
   • www.ecologicalfootprint.com
   • www.royalsaskmuseum.ca/gallery/life_sciences/footprint_mx_2005.swf
   • www.mec.ca/Apps/ecoCalc/ecoCalc.jsp (do the second of the two calculators listed)
   • see if you can find other EF calculators and give them a try
## Rubric for Concept Map

<table>
<thead>
<tr>
<th>Look-fors</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Mark:</th>
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</thead>
<tbody>
<tr>
<td><strong>Concept Map: Identification of Effects</strong></td>
<td>- thorough research</td>
<td>- minimal identification and description of environmental consequences (10-11)</td>
<td>- satisfactory identification and description of environmental consequences (12-13)</td>
<td>- good identification and description of environmental consequences (14-16)</td>
<td>- excellent identification and description of environmental consequences (17-20)</td>
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<td>- excellent annotations</td>
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<tr>
<td><strong>Concept Map: Linking of Effects</strong></td>
<td>- ability to make links between environmental consequences</td>
<td>- minimal linking between environmental consequences (5)</td>
<td>- satisfactory linking between environmental consequences (6)</td>
<td>- good linking between environmental consequences (7-8)</td>
<td>- excellent linking between environmental consequences (9-10)</td>
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<tr>
<td><strong>Concept Map: Creativity</strong></td>
<td>- creativity</td>
<td>- concept map shows little creativity and design (5)</td>
<td>- concept map shows some creativity and design (6)</td>
<td>- concept map shows substantial creativity and design (7-8)</td>
<td>- concept map shows abundant creativity and design (9-10)</td>
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<td>- design</td>
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<td>- “WOW!” factor</td>
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<tr>
<td><strong>Concept Map: Construction</strong></td>
<td>- ink and colour</td>
<td>- concept map construction is disorganized, messy, and unappealing (5)</td>
<td>- concept map construction is somewhat organized, tidy and appealing (6)</td>
<td>- concept map construction is organized, tidy and appealing (7-8)</td>
<td>- concept map construction is exceptionally organized, tidy and appealing (9-10)</td>
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<td>- neatness and organization</td>
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**Total:** /50

## Rubric for Written Work

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<tr>
<th>Look-fors</th>
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<th>Mark:</th>
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</thead>
<tbody>
<tr>
<td><strong>Ecological Footprint Sheet</strong></td>
<td>- complete</td>
<td>- sheet is incomplete, lacks insight and is disorganized (2)</td>
<td>- sheet is complete, somewhat insightful and moderately organized (3)</td>
<td>- sheet is complete, insightful and organized (4)</td>
<td>- sheet is complete, very insightful and very well-organized (5)</td>
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<td></td>
<td>- insightful</td>
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<td>- organized</td>
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<tr>
<td><strong>Research Sheet</strong></td>
<td>- complete</td>
<td>- sheet is incomplete, lacks insight and is disorganized (2)</td>
<td>- sheet is complete, somewhat insightful and moderately organized (3)</td>
<td>- sheet is complete, insightful and organized (4)</td>
<td>- sheet is complete, very insightful and very well-organized (5)</td>
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<td>- insightful</td>
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<td>- organized</td>
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<td><strong>Write-up: Research</strong></td>
<td>- thorough research</td>
<td>- write-up lacks research (5)</td>
<td>- write-up contains satisfactory research (6)</td>
<td>- write-up contains solid research (7-8)</td>
<td>- write-up contains exceptional research (9-10)</td>
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<td><strong>Write-up: Writing Mechanics</strong></td>
<td>- spelling and grammar</td>
<td>- countless spelling and grammatical errors (2)</td>
<td>- many spelling and grammatical errors (3)</td>
<td>- few spelling and grammatical errors (4)</td>
<td>- excellent spelling and grammar (5)</td>
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<td><strong>Write-up: Works Cited and Referencing</strong></td>
<td>- embedded citations in text</td>
<td>- embedded citations and Works Cited list do not follow MLA guidelines (2)</td>
<td>- embedded citations and Works Cited list follow MLA guidelines somewhat (3)</td>
<td>- embedded citations and Works Cited list mostly follow MLA guidelines (4)</td>
<td>- embedded citations and Works Cited list follow MLA guidelines exactly (5)</td>
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<tr>
<td></td>
<td>- Works Cited list</td>
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**Total:** /30