Impact on Earth
TEACHER'S GUIDE

From cars and plastic packaging to food-delivery services and social media, the modern world is full of remarkable developments that have improved life for millions of people. However, many of these developments come at a considerable cost. This series looks at the positive aspects of modern developments as well as the problems they create, such as pollution, the overuse of resources, overcrowding, and cyber-bullying. The efforts being made to reduce some of the most negative effects are highlighted in features such as "Tech Solution" and "Emergency Case Studies," along with suggestions for readers on what they can do to help. The Impact on Earth Teacher's Guide includes engaging, student-centered lessons that develop the critical thinking and global awareness that are essential for students to develop into global citizens.

The innovative and multimodal lesson plans in this guide are tailored for grades 5 to 6 and are focused on developing the critical-thinking skills needed to analyze and draw conclusions about the effects we have on our Earth through the products and services we use. Students will learn how evaluate their own impacts on the earth through thinking critically about the daily choices we make as both a producer and a consumer. Overall students will learn that everyone creates an ecological foot print but that we can work to reduce ours.

Each lesson plan in this guide can stand alone, or be taught in a sequential order that works to scaffold understanding. Reproducible worksheets and assessment tools accompany each lesson plan. The titles in Impact on Earth include:

The Impact of Travel and Transportation

The Impact of the Internet

The Impact of Energy

The Impact of Buildings and Cities

The Impact of Plastics

The Impact of Food and Farming

Ontario
Ontario Media Development Corporation
Made possible with the support of the Ontario Media Development Corporation.

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PACING CHART AND VOCABULARY

Lesson Title	Pacing	Vocabulary
Going Green Museum	1 to 2 class periods*	environmental impact impact waste
Debate	1 to 2 class periods	rebuttal
Creating an Environmentally Friendly Product	3 to 4 class periods	contributor delivery features materials packaging problem

* 1 class period = 40 to 60 minutes

ACCOMMODATION STRATEGIES

Accommodations provide equal access to learning and equal opportunity to demonstrate what is learned. Accommodations allow a student access to the subject or course without any changes to the knowledge and skills the student is expected to demonstrate.

Educators are encouraged to adapt the instructional approach, activities, and assessments included in this guide to best meet the diverse interests, needs, and abilities of their students. Possible accommodations may include:

Instructional Strategies

- Break tasks into parts with accompanying time lines
- Provide extra time for processing of oral information.
- Pair oral instructions with visual ones (writing or symbols)
- Pre-teach new vocabulary and regularly review previously taught vocabulary
- Provided model of completed work
- Frequently check with the student to get him/her started
- Provide oral and visual instructions and examples
- Provide a checklist of tasks for the student

Environmental Strategies

- Proximity to teacher
- Strategic seating
- Flexible or mixed-ability grouping
- Provide an alternative setting for learning that is free from visual and auditory distractions.

Assessment Strategies

- Build in extra time to allow student to process questions asked and answers given
- Provide written instructions and rubrics for assignments
- Offer a choice of assessment activities so that the student can choose one suited to their strengths
- Space out or extend assignments to prevent student feeling overwhelmed
- Reduce the number of tasks used to assess skill or concept
- Allow students to use assistive devices or technology

LESSON 1
Going Green Museum

Curriculum Correlations

C3 Framework
D4.7.3-5.

Next Generation Science Standards
5-ESS3-1.

Ontario Science & Technology
Grade 5 Conservation of Energy and Resources
Overall Expectation 1
Specific Expectation 1.1

Grade 5 Properties of and Changes in Matter
Overall Expectation 1
Specific Expectation 1.1

Materials

- *Going Green Museum Handout*
- *Going Green Exhibit Tags*
- Variety of items impacting the environment (see suggestions below)
- Writing materials
- *Going Green Museum Reflection*
- *Going Green Museum Checklist*

Objectives

Students will be able to:

- Consider the impact different products make on the environment
- Think critically about items they interact with on a daily basis
- Reflect on their own environmental impact.

Setting the Stage

Begin by asking students to desribe some things they do individually or with their family to help the environment. Record these ideas on the board.

Then, ask students to describe some of their habits or behaviors that have negative effects on the environment. Record these ideas beside the first list.

Have students discuss in small groups which negative behaviors would be easy to change and which would be more difficult and why. Share some of the ideas with the whole class.

Activity

Introduce students to the idea that certain habits, behaviors, and objects impact the environment in different ways. They can have a positive or negative impacts, and in some cases, they can have both.

Ask students for an example of something that has a positive impact on the environment (i.e. reusable grocery bags reduce the number of plastic grocery bags used). Ask for an example of something that has a negative impact on the environment (ex., vehicles release harmful carbon emissions into the atmosphere). Discuss the examples and the specific impact they have on the environment. (Things may impact the environment in more than one way.)

Around the room (a large space such as a library is a great location to spread out the items) lay out individual items with exhibit tag numbers so that students can track which exhibits they have viewed. The items included in your museum should be a variety of items that positively or negatively impact the environment.

Some suggestions of items to include are listed below, with possible impacts to discuss:

- takeout containers (Styrofoam or plastic produce only negative impacts, cardboard containers are more environmentally friendly but still produce more trash then dining in)
- reusable straws (metal or glass straws can be reused and eventually recycled)
- paper or noodle straws (can be composted or will biodegrade as a great alternative to plastic straws)
- Paper towel roll (while this will biodegrade, it creates more garbage then using a cloth that can be washed)

- Beeswax wrap (reduces the amount of plastic wrap used)
- Shipping box with packaging materials (extra emissions created from the delivery of ordering products to your home, with additional garbage created from packaging materials)
- Silicone muffin liners (reduces the garbage created by single use paper liners)
- Plastic zipper bags (often only used once and disposed of, the plastic won't biodegrade in a single person's lifetime)
- Bar of soap (often comes with little or no packaging reducing the amount of waste created, also doesn't need the plastic bottle that body wash or hand soap uses)
- Reusable water bottle (reduces the number of single use bottles in landfills)
- A fruit or vegetable not local to the area in a plastic produce bag (the emissions from these products traveling from where they were grown, the garbage created from produce bags)

Place students in pairs to walk around and view 10 different exhibits. Have them discuss the environmental impact of each item with their partner. At each exhibit, instruct the students to use the *Going Green Museum Handout* to try to identify the product and what kind of impact it may have on the environment. Students are only given the option of positive or negative on the handout. Allow enough time for students to view and reflect on each exhibit.

Following the museum activity, gather together as a class to discuss the different exhibits, allowing students to share their thoughts on each of the items and its impact on the environment. Through this discussion, students may identify that some products have both a positive and negative impact.

Extensions

- Ask students to consider if a product can have no negative impact on the environment. Encourage them to research how a "environmentally friendly" product is created. Once they have done so, reflect on their findings by writing a journal considering if it is worth it to switch to this product. Are there other more environmentally friendly options?
- As an additional option, have students select a product from the *Going Green Museum* that has a negative impact on the environment and research alternatives. Have each student create a list of alternative options that are more environmentally friendly to present to the class or school (using a poster, announcement, email etc.) in order to make others more aware of these options.

Wrap-Up

After considering all the items in the *Going Green Museum,* have students reflect on their own life and their own understanding of the products they use on a daily basis.

Have them complete the *Going Green Museum Reflection*. Before completing the reflection, discuss with students how no one can have no negative impact on the environment. Encourage them to consider small ways to reduce their own impact on the environment.

Assessment

Assess students' understanding during lessons using observational and anecdotal notes.

Collect students' *Going Green Reflections* to check for understanding using the *Going Green Museum Checklist*. Review students' work to clarify misunderstandings as needed.

Going Green Museum Handout

Name: ______________________________ **Date:** ______________

Exhibit #: ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**	**Exhibit #:** ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**
Exhibit #: ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**	**Exhibit #:** ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**
Exhibit #: ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**	**Exhibit #:** ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**
Exhibit #: ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**	**Exhibit #:** ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**
Exhibit #: ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**	**Exhibit #:** ____________ **Item:** ____________ **Effect on the environment** (circle one) **Positive** **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Exhibit #: ____________________

Item: ____________________

Effect on the environment (circle one)

Positive **Negative**

Going Green Exhibit Tags

Going Green Museum **Exhibit #1**	Going Green Museum **Exhibit #2**
Going Green Museum **Exhibit #3**	Going Green Museum **Exhibit #4**
Going Green Museum **Exhibit #5**	Going Green Museum **Exhibit #6**
Going Green Museum **Exhibit #7**	Going Green Museum **Exhibit #8**
Going Green Museum **Exhibit #9**	Going Green Museum **Exhibit #10**
Going Green Museum **Exhibit #11**	Going Green Museum **Exhibit #12**
Going Green Museum **Exhibit #13**	Going Green Museum **Exhibit #14**

Going Green Museum **Exhibit #15**	Going Green Museum **Exhibit #16**
Going Green Museum **Exhibit #17**	Going Green Museum **Exhibit #18**
Going Green Museum **Exhibit #19**	Going Green Museum **Exhibit #20**

Going Green Museum Reflection

Name: _____ **Date:** _____

1. What item were you most surprised to learn about in the Going Green Museum? What was surprising about its environmental impact?

_____

_____

_____

_____

_____

2. Think about your life and the products you interact with everyday. What is one product or item you could eliminate or swap for a more environmentally friendly option?

_____

_____

_____

_____

_____

_____

3. Do you think it would be difficult to make this change in your life? Would it affect you in any negative ways (i.e., cost, time etc.).

_____

_____

_____

_____

_____

Going Green Museum Checklist

Student: ______________________ Date: ______________

The student was able to identify environmental impact of products	Achieved	Somewhat Achieved	Has not yet Achieved
The student reflected on their own environmental impact	Achieved	Somewhat Achieved	Has not yet Achieved

Additional Comments:

____

____

Student: ______________________ Date: ______________

The student was able to identify environmental impact of products	Achieved	Somewhat Achieved	Has not yet Achieved
The student reflected on their own environmental impact	Achieved	Somewhat Achieved	Has not yet Achieved

Additional Comments:

____

____

Student: ______________________ Date: ______________

The student was able to identify environmental impact of products	Achieved	Somewhat Achieved	Has not yet Achieved
The student reflected on their own environmental impact	Achieved	Somewhat Achieved	Has not yet Achieved

Additional Comments:

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LESSON 2
Debate

Curriculum Correlations

C3 Framework for Social Studies:
D4.7.3-5.

Common Core State Standards
SL.5.1
SL.5.4
SL.6.1
SL.6.4

Ontario Language Arts
Grade 5 Oral Communication
Overall Expectation 2
Specific Expectation 2.3

Grade 6 Oral Communication
Overall Expectation 2
Specific Expectation 2.3

Materials

- *Debate Planning Sheets*
- *Debate and Rebuttal Sheet*
- *Debate Reflection*
- *Debate Rubric*
- Agree/Disagree signs

Objectives

Students will be able to:

- Understand how to argue both sides of a topic
- Practice creating rebuttals to arguments
- Understand the benefits and drawbacks of certain actions that affect the environment.

Setting the Stage

Post an "Agree" sign on one side of the classroom and a "Disagree" sign on the other.

Make relatable (and debatable) statements to students such as:

- Everyone should have a pet.
- Kids shouldn't be allowed to drink pop.
- Teacher shouldn't be allowed to give out homework.
- Physical education should happen every day.

Ask students to think about their opinion on the statement, ask them to go to the side of the room they relate to. If they are unsure, there can be a middle "unsure" spot between the signs.

When students are in groups below each sign or in the middle, have them discuss their opinions on the statement and come up with one point to make about their side. Give each side a chance to share their point, and then consider the other's point and come up with a possible rebuttal. Allow groups a chance to share their rebuttal. Once both groups have shared, allow anyone who would like to change sides to move.

Pose a different statement and have students choose either the agree or disagree side. This time, tell them they need to make a point that supports the opposite side. Give groups a chance to think how they might argue against what they initially believe. Have each group share their one point, allow for rebuttals if students are able. Discuss what students found challenging about this activity.

Activity

Set up some agreements for students about how a debate should look. Pose the questions:

- How do we debate politely? What would that look and sound like?

Record ideas on the board. Tell students that these will act as your guidelines for your debate.

Write your debate statement on the board. Here are two possibilities

- Everyone should eat locally
- We should no longer use plastic

If there is an area students are interested or curious about, then consider a statement related to that topic. You could run two different debate topics as well to reduce group size.

Hand out the *Debate Planning Sheet* and have students write the topic on the top. Individually or with a partner, students will then brainstorm and research ideas for both sides of the argument. Encourage students to research the side they disagree with or know little about.

After students have generated ideas, have them partner up with another person or pair and share their ideas. Encourage students to discuss these points so they understand them.

At this point, every student should have a list of different ideas and arguments for each side of the debate. Then, sort students into "for" and "against" groups at random.

Hand out a *Debate and Rebuttal Sheet* to each group. Have students work with their group to plan out three points that they will share. Groups will have to consider the arguments that will be made by opposing side, and then discuss some possible rebuttals for these arguments.

For each argument, have the group select one speaker to present that point and to discuss it.

After students are finished planning for the debate, prepare the classroom for the debate. Set up a space for each side to sit facing each other. Explain how the debate will be formatted. It might also help to write the debate format on a white board or chalkboard. Remind students of the guidelines created earlier.

Format:

- "For" side shares first point (optional: give time to discuss)
- "Against" side shares rebuttal
- "Against" side shares first point (optional: give time to discuss)
- "For" side shares rebuttal

Repeat with second and third points.

Allow time for each side to present a closing argument to summarize their side.

Extensions

- Have students plan out additional debate topics related to their impact on Earth, for future discussions.
- Have students take their points and write them into position papers presenting their side. If applicable, research some stakeholders in the issue and consider sending them the position paper to ask for their input.
- Allow students to research and plan an action related to their topic, such as creating an "eating local" menu or creating a plastic-free packaging option.

Wrap-Up

Following the debate, discuss with students how their thinking on the topic changed throughout the debate.

Have students complete the *Debate Reflection* to reflect on their involvement and learning in their group's debate.

Assessment

Assess students understanding during lessons using observational and anecdotal notes.

Collect *Debate Planning Sheet* and *Debate Reflection* to help assess their involvement in the planning process for their group. Use the *Debate Rubric* to assess each student's oral communication while partaking in the debate.

Debate Planning Sheet

Name: _____ **Date:** _____

Topic: _____

Arguments For:

Arguments Against:

Debate and Rebuttal Sheet

Topic: _____

Group Members: _____

Debate Points:

1._____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

_____

Possible rebuttals:

Debate Reflection

Name: _____

Topic: _____

What role did you play in your group's debate?

_____

_____

_____

_____

_____

_____

What is your opinion on the debate topic? Did you change your opinion at any point during or after the debate? Why or why not?

_____

_____

_____

_____

_____

_____

Debate Rubric

Student: _____ Date: _____

The student was an active participate in their group (Planning process)	Achieved	Somewhat Achieved	Has not yet Achieved
The student spoke clearly and with purpose (Debate)	Achieved	Somewhat Achieved	Has not yet Achieved
The student was able to explain their opinion on the topic (Reflection)	Achieved	Somewhat Achieved	Has not yet Achieved

Additional comments:

_____

_____

Debate Rubric

Student: _____ Date: _____

The student was an active participate in their group (Planning process)	Achieved	Somewhat Achieved	Has not yet Achieved
The student spoke clearly and with purpose (Debate)	Achieved	Somewhat Achieved	Has not yet Achieved
The student was able to explain their opinion on the topic (Reflection)	Achieved	Somewhat Achieved	Has not yet Achieved

Additional comments:

_____

_____

LESSON 3
Creating an Environmentally Friendly Product

Curriculum Correlations

C3 Framework for Social Studies
D4.7.3-5
D4.6.3-5.

Next Generation Science Standards
MS-ESS3-3

Ontario Science and Technology
Grade 5 Properties of and Changes in Matter
Specific Expectations 1.1 & 1.2

Grade 5 Conservation of Energy and Resources
Specific expectations 1.1 &1.2

Materials

- Impact on Earth books
- Sticky notes
- *Problem Finding Brainstorm Sheet*
- *Problem Finding Checklist*
- *Product Planning Organizer*
- *Product Rubric*

Objectives

Students will be able to:

- Brainstorm solutions or alternatives to environmental problems or products that have a negative impact on the environment
- Consider how a problem can be broken down into smaller issues
- Design a new product that positively impacts the environment.

Setting the Stage

In groups, have students discuss what it means for something to be environmentally friendly. Have each group create their own definition or criteria to determine if a product is environmentally friendly. Then, have groups share their definitions and criteria. Together, create a list of questions to ask to determine if something is environmentally friendly. If time allows, apply the list of questions to a product marketed as environmentally friendly.

Activity

Have students consider the environmental issues and problems in the Impact on Earth series. Hand out the *Problem Finding Brainstorm Sheet* to each student. Have each student select an issue to focus on (i.e., plastic in oceans, dying bee populations etc.).
Then, have students try to deconstruct the problem into different elements that contribute to the problem.

- For example, if the topic is plastic in oceans, some contributors might be the use of plastic materials (i.e., straws, water bottles etc.) or items not being recycled.

Have students list each contributor separately. If students find this challenging, have them discuss with a partner and generate ideas together. Once students have a complete list, then they can move to the second column. Students should brainstorm ways to solve each contributor to the problem. Encourage students to generate more than one way to address a contributor.

Example:

Contributors to this problem:	Possible ways to address this::
Use of plastic items (straws, water bottles, tooth brushes)	Create reusable items made out of alternative items (i.e., glass, metal etc.)
Plastic being properly recycled	• Reward people for recycling/ fine people for not recycling • Create awareness about what can and cannot be recycled • Pick up litter

After students have some ideas in both columns, place them in groups of 4 to 5 students. Have each student share their issue and ideas on their *Problem Finding Brainstorm Sheets*. Ask the other group members to comment any additional ideas they may have. Encourage groups to have and open discussion about the topic, encouraging students to add to both columns here.

Once students have all shared and received feedback from their groups, have them return to their seats to reflect on their completed chart. Students are now entering the brainstorming phase, by answering the last question:

- How could a product address one of these contributors?

Students should jot down ideas for a product that could address one of the contributers.

As students finish, conference with them using the *Problem Finding Checklist*. Teachers can use this checklist as a discussion tool to speak one-on-one with students about their *Problem Finding Brainstorm Sheet*, or teachers can collect and complete the checklist for feedback for students.

Activity 2

Return the *Problem Finding Checklist* and *Problem Finding Brainstorm Sheet* to students. Allow students time to reflect on the feedback.

Inform students that they are moving into the design phase of product development. They will be planning and designing a product based on the investigation they did previously into their issue.

Hand out the *Product Planning Organizer*. Allow students the option of working independently or with partners. If working with a partner, students need to decide which idea they will work with.

Have students begin by looking at their suggested ideas for how a product could address a contributor. Students will need to begin to brainstorm the product they want to create. It should be a new product that doesn't exist. Or, they can make changes to an existing product that make it environmentally friendly.

Students do not need to complete the *Product Planning Organizer* in order.

Encourage students to consider everything they have learned about the environmental impact of a product when making choices about their own product.

Give students plenty of time to complete their product planning organizer. Have small groups meet and discuss their products in order to receive feedback before submitting their final product.

Extensions

- Students can create an elevator pitch for their product to present to the class, who act as potential investors in their company.
- Have students create a prototype of their proposed product.
- Students can research the environmental impact of a current "environmentally friendly" product. They should investigate the materials used and the company's overall approach to being environmentally friendly.

Wrap-Up

Have students complete a gallery walk of all the product designs. Give students sticky notes to leave positive comments or suggestions on other student's product designs. Invite students from other classes to view the products. Consider having students stand with their design to discuss it with their viewers.

Assessment

After students have completed the *Problem Finding Brainstorm sheet,* complete the *Checklist for Problem Finding*. Conference with students one-on-one to discuss their ideas, then give feedback for the product design phase. This ensures students are on track before completing the assignment.

Once students have completed the *Product Design Page*, collect and assess using the *Product Design Rubric*.

Problem Finding Brainstorm Sheet

Name: _____ **Date:** _____

Environmental Problem:	
Contributors to the problem:	**Possible ways to address the problem:**
How could a product address one of these contributors?	

Problem Finding Checklist

Name: _____ **Date:** _____

Student has:	
Completed the Problem Finding Brainstorm Sheet	Yes: _____ No: _____ Notes: _____ _____ _____
Considered individual elements of their chosen issue during the problem finding process	Yes: _____ No: _____ Notes: _____ _____ _____
Developed an idea for a product that addresses some concerns associated with the chosen issue	Yes: _____ No: _____ Notes: _____ _____ _____

Overall feedback:

_____

_____

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_____

_____

_____

Product Planning Organizer

Name: _____ **Date:** _____

Product Name:	
Product: (What is it?)	
Features:	
How it works:	
Materials used:	

How will this product impact the environment? (Include positves and negatives.)

Make a sketch of what your product will look like. Include labels of different features and materials used in your product. Consider drawing your product from different views.

Product Design Rubric

Name: _____ Product: _____

Strengths:	Criteria:	Next Steps:
	Student designed a product that addresses a part of their chosen environmental issue.	
	Student's product design is a creative and original.	
	Product sketch is detailed and includes labels that explain the features and materials used.	
	Student thought critically about the way this product impacts the environment.	

Additional Comments:

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_____