20/20 THE WAY TO CLEAN AIR

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A campaign to help students and their families reduce energy use, improve air quality and reduce the risk of climate change

20/20
In-Class Lessons

ONTARIO ecoschools

Welcome to the In-Class Unit for

20/20 The Way to Clean Air

20/20 The Way to Clean Air is a campaign to help students and their families conserve energy to help improve air quality and reduce the risk of climate change. 20/20 provides hands-on activities for **reducing home energy use by 20% and vehicle use by 20%** - hence the name "20/20".

This booklet is a companion piece to the main 20/20 resources for schools – the 20/20 Planner for students and the 20/20 Teacher's Guide. You will find thirteen separate worksheets (plus a 20/20 Glossary of Terms), complete with ideas for teaching each lesson. Each worksheet is a standalone lesson so you can copy and distribute one or more depending on your teaching goals during the year. You may wish to use this unit in conjunction with the 20/20 Planner "at home" program for students. As well, these lessons provide a good introduction to Earth Day in April or other environmental events and celebrations. Each lesson is also available separately for downloading from **www.cleanairpartnership.org/2020**.

The 20/20 program comes to you from local public health units across Ontario, the Clean Air Partnership and the province-wide EcoSchools program. 20/20 actions support the energy conservation goals of EcoSchools. When all classrooms in your school participate in 20/20, your school earns points toward EcoSchools certification. (See **www.ontarioecoschools.org** to learn more about becoming a certified EcoSchool; visit **www.ecoschools.ca** if you are with a school in the Toronto District School Board).

20/20 THE WAY TO CLEAN AIR

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Lesson 1: Why is air quality so important?

Media article; vocabulary builder

Canada's Government Launches World's First Air Quality Health Index Program

This article has been modified from *www.ecoaction.gc.ca* and *www.davidsuzuki.org*

No matter who you are, where you live or how healthy you are, the quality of the air you breathe each day can affect you. Everyone reacts differently to air pollution. Children, the elderly, and those with heart or lung disease (like asthma) have the most health problems from air pollution. But even healthy Canadians can feel the effects of poor air quality when they exercise or work outdoors.

We use energy in our homes for heating and for electricity to power our computers, televisions and lights. We also use energy to fuel our cars and trucks. Using energy in our homes and vehicles means that we are burning fossil fuels including gas, oil and coal. When fossil fuels are burned, they send harmful pollutants into the air. These pollutants include: particulate matter, nitrogen dioxide, and sulphur dioxide.

Breathing pollutants created from burning fossil fuels can cause problems for your lungs and heart. You may:

- become short of breath – this feels like you cannot get enough air;
- wheeze; and/or
- have an asthma attack.

Air pollution has been associated with the rising levels of asthma. In Canada, rates of childhood asthma have risen a lot. From 1978 to 1995, the percentage of children with asthma increased from 2.5 percent to 11.2 percent. That means the number of cases of asthma has more than doubled over the past 17 years.

Lesson 1: Why is air quality so important?

Media article; vocabulary builder (continued)

By reducing our use of energy in our homes and vehicles, it is possible to reduce the air pollution being created. So reducing energy use can lead to better health.

You can also protect your lungs from harmful air pollution by checking the Air Quality Health Index at **www.airhealth.ca** every day. It tells you how safe the air is to breathe and whether it is a good day for exercising outside.

Lesson 1: Why is air quality so important?

Student worksheet

Part 1 - Vocabulary Builder: Find the meaning for the following words. You can find the words by using a dictionary or the 20/20 Glossary of Terms. Write your answer in the space provided.

	Word	Definition
1	Disease	
2	Asthma	
3	Energy	
4	Particulate matter	
5	Sulphur dioxide	
6	Wheeze	

Lesson 1: Why is air quality so important?

Student worksheet (continued)

Part 2 - Comprehension: Are the following statements are true (T) or false (F)?

	Statement	T	F
1	Children, the elderly, and people with heart and lung disease are most affected by air pollution.		
2	Healthy Canadians do not feel the effects of air pollution.		
3	Heating our homes does not cause air pollution.		
4	Sulphur dioxide is released into the air by burning fossil fuels.		
5	The number of cases of children with asthma has more than doubled over the past 17 years.		
6	A good way to protect yourself against air pollution is to check the Air Quality Health Index.		

Lesson 1: Why is air quality so important?

Student worksheet (continued)

Part 3 - Application: In a small group of 3 or 4, discuss the following questions and be prepared to respond orally. Your classmates may have different answers than you and that is fine. No two people think alike and some of you may have different opinions. As long as you are careful to explain your answers, then you have a right to your own opinion. Be sure to listen to everyone else's answers too. There is enough space after the question to record some ideas.

a) Where did the information come from for this article? Do you think this source is credible (believable)? Why or why not? Hint: Is the source a familiar person or organization?

b) What would you do to encourage people to use less energy?

c) Are Canadians likely to check the Air Quality Health Index to protect their health? Why or why not?

Lesson 1: Why is air quality so important?

Teacher instructions

(Note: this lesson requires the 20/20 Glossary of Terms)

Introducing the activity

- Hold up an empty 1 litre bottle of pop or container of milk. Ask students if they can guess how many litres of air the average adult breathes every day. Write their guesses on the front board. The answer, according the Ministry of the Environment for Canada is between 15,000 and 20,000 litres every day (Source: **www.ene.gov.on.ca/en/air/index.php**). That is a lot of milk!

- Challenge students to tell you what they think they are breathing when they inhale air? Explain that air is a mixture of gases that makes up our atmosphere. You may wish to write the mixture on the board: nitrogen (78.09%), oxygen (20.95%), argon (0.93%), carbon dioxide (0.03%), trace gases (0.003%) and water vapour (varying amounts). (Source: **www.airqualityontario.com/science/aqi_description.cfm**)

- Ask students if they can tell you what they know about rising levels of carbon dioxide. Did they know that just as oxygen is essential for humans, carbon dioxide is essential for plants? Does it make sense that environmentalists are concerned about cutting down trees?

Ideas for teaching the article

- Invite students to look over, but not read, the article "Why is air quality so important?". Ask them to identify where the information on the page came from (**www.ecoaction.gc.ca**; and **www.davidsuzuki.org**). You may wish to explain the importance of reading the URL before they read the article to determine how credible the information will be. Ask them to think about what 'ecoaction' and 'David Suzuki' indicate in terms of the website's credibility. They will be asked to answer this on their worksheet. Ask students what they think "**gc.ca**" stands for. *("gc" indicates that the site is a "Government of Canada" site and "ca" refers to Canada.)*

- Have students break into small groups of three or four and then read the article aloud. Have each group create two questions for discussion. The questions can be about the vocabulary, the ideas, or just general interest questions. You may wish to write their questions on a piece of chart paper and then invite the classroom to discuss possible answers to a few. Encourage students to be creative with their questions as they are just as important as their answers.

Lesson 1: Why is air quality so important?

Teacher instructions (continued)

Ideas for teaching the worksheet

- Copy and distribute one copy of the worksheet and the 20/20 Glossary of Terms to each group. Invite students to look at the worksheet with their group members to determine how it is organized and what kinds of questions they will be answering.

- When you are satisfied that students are comfortable with the material, ask them, in their small groups, to complete the worksheet. The answers to Part I and Part 2 are listed below. You can keep Part 3 simple or make it into a larger activity. For example, (c) can become part of a data management lesson. Students could create a survey that would give help them understand whether students at their own school would be likely to consult the Air Quality Health Index. ***(See Lesson 5 for a more comprehensive activity on the Air Quality Health Index).***

Answer Key for student worksheet – Part 1 (taken from 20/20 Glossary of Terms)

1	Disease	An illness or sickness of the body that causes the body not to function properly. For example, heart disease is an illness that causes the arteries that carry blood to the heart to become blocked.
2	Asthma	A breathing disease of the lungs. It causes shortness of breath, tightness in the chest, coughing and wheezing. It is triggered by things like dust, air pollutants and mould.
3	Energy	The ability to do work or the ability to move an object.
4	Particulate matter	A type of air pollution that includes dust, soot and tiny bits of solid materials that moves around in the air.
5	Sulphur dioxide	A colourless gas with a very strong smell. It is usually produced by burning coal. It pollutes the air when present in large amounts.
6	Wheeze	A breathing sound caused when the airways of lungs are blocked or swollen. It is a common sign of asthma.

Answer Key for student worksheet – Part 2

	Statement	T	F
1	Children, the elderly, and people with heart and lung disease are most affected by air pollution.	X	
2	Healthy Canadians do not feel the effects of air pollution.		X
3	Heating our homes does not cause air pollution.		X
4	Sulphur dioxide is released into the air by burning fossil fuels.	X	
5	The number of cases of children with asthma has more than doubled over the past 17 years.	X	
6	A good way to protect yourself against air pollution is to check the Air Quality Health Index.	X	

Lesson 2:
According to my calculations, how much is 20%?

Student worksheet

Percent is a way of expressing a number as part of 100

The symbol for percent is **%**

To find 20% of a number, multiply that number by .20

Example: What is 20% of 10 km?
10 km x .20 = 2 km

If your parents usually drive 10 km each day, but they decided to reduce their driving by 20% (which is 2 km), they will now be driving 8 km a day. This would save 2 km worth of tailpipe pollution!

Complete the following problems to practice your skills:

	Number	X .20	= 20% of the first number
1	What is 20% of **$20.00**?	**$20.00** X .20	= $4.00
2	What is 20% of **50** kilograms?	X .20	=
3	What is 20% of **100** kilometers?	X .20	=
4	What is 20% of **200** litres of gas?	X .20	=
5	What is 20% of **250** kilograms of carbon dioxide?	X .20	=
6	What is 20% of **300** trees?	X .20	=
7	What is 20% of **15** pages?	X .20	=
8	What is 20% of **30** students?	X .20	=

Lesson 2:
According to my calculations, how much is 20%?

Teacher instructions

Introducing the activity

- Poll students to determine how many of them believe there is a connection between vehicle use and air pollution.

- Ask students what happens to the level of air pollution when we drive more?

- Have students imagine 100 cars lined up on a road. *(You may wish to use some sort of manipulative to represent 100 cars on a road.)* All of these cars are burning gas and producing carbon dioxide and other pollutants which end up in the air we breathe. Next, ask them to imagine that 20 of these 100 cars were taken off the road. How many cars would be left?

- How many cars stopped producing air pollution?

- So 20 of 100 cars (or 20 per cent of the cars) have stopped contributing to air pollution. Write the expression 20 of 100 on the front board three ways: 20 of 100, 20/100 and 20 percent (or 20%). Explain that each of these three expressions means the same thing but they are just written differently.

- Challenge students to tell you how they would represent the following as a percent:
    - 50 cars of 100 are taken off the road
    - 70 of 100 cars are taken off the road
    - 100 cars are taken off the road

- Ask them what they think would happen to our air if 100% of the cars were taken off the road?

Lesson 2:
According to my calculations, how much is 20%?

Teacher instructions (continued)

Ideas for teaching the worksheet

- Once you are comfortable that students are prepared to complete some percent problems on their own, challenge them to explain the title 20/20 The Way to Clean Air. *(It is a program that encourages people to reduce home energy use by 20% and vehicle use by 20%).*

- Percent can be used to calculate the quantity of a variety of objects including money, weight, and distance. Ask students if they have ever been in a store where there are items for sale, such as 25% off of something? Do they think they would be getting a better deal if they were getting 25% or 35% off?

- Copy and distribute Lesson 2: According to my calculations, how much is 20%? Ask students to locate the percent formula for you and to explain to you how it works.

- Lead them through this worksheet according to their ability.

Lesson 3: The Earth's blanket

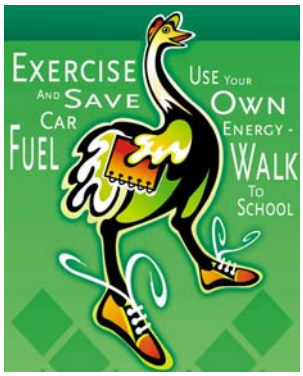
Student worksheet; vocabulary builder

Have you ever snuggled up with a blanket to keep you warm? The Earth does that all the time. Of course, the Earth's blanket, called the atmosphere, looks different from yours. In fact, the Earth's blanket is almost invisible and is made from gases.

These gases are called greenhouse gases. Without these gases, the Earth would be too cold for us. BUT, too many greenhouse gases make it too hot. There must be a balance. It seems that the gases are off balance and this has resulted in climate change.

What puts the gases off balance*?** It takes energy to drive our vehicles, to heat or cool our homes, and to power our computers and televisions. Every time we use energy, we are burning fossil fuels including gas, oil and coal. Burning fossil fuels sends pollution and greenhouse gases into the air. ***This is what puts the gases off balance and contributes to smog and climate change.

Lesson 3: The Earth's blanket



Student worksheet; vocabulary builder (continued)

How many of the following words do you know?
Look up those that you don't know in the dictionary or the 20/20 Glossary of Terms. Add to the chart any other words you know that are related to the atmosphere or energy use.

	Vocabulary	Definition
1	Fossil fuels	
2	Smog	
3	Pollution	
4	Greenhouse gases	
5	Climate change	
6	Energy consumption	
7	(Your choice)	
8	(Your choice)	

Lesson 3: The Earth's blanket

Teacher instructions

(Note: this lesson requires the 20/20 Glossary of Terms)

Introducing the activity

- You may wish to bring in a blanket as a prop to bring this activity to life. Ask students how it feels when they snuggle up with a blanket? Why does the blanket feel warm? Is the blanket warm without them? *(No)* What warms the blanket? *(Our bodies!)*

- Explain the following: The Earth has something that keeps it warm too – it has an atmosphere. Like the blanket, the atmosphere itself is not warm but it holds the heat that is released from the Earth. The Sun heats the Earth and the Earth releases the heat back into space. Some of the heat is caught by the atmosphere and some is caught by the clouds. Gases in the atmosphere *(called greenhouse gases)* trap the heat that comes from the Earth the same way a blanket traps heat that comes from your body.
  (For a visual, see Encyclopedia Britannica Student Edition: http://cache.eb.com/eb/image?id=91945&rendTypeId=34)

- Ask the following: What happens to the temperature when the heat-absorbing gases increase? If vehicles are partly responsible for putting greenhouse gases in the atmosphere, then what happens when more vehicles are added to the roads? What happens when we take cars off the road? What other activities add greenhouse gases to our atmosphere? *(Using energy in our homes.)*

- Additional challenge: Ask students to name some types of greenhouse gases. *(Water vapor, carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons.)*

Ideas for teaching the article and worksheet

- Copy and distribute Lesson 3: The Earth's blanket and the 20/20 Glossary of Terms.

- Ask students to look at the image on the top of the article and have them explain the connection between this and the title of the worksheet. Ask them also why they think certain words are underlined. These words may be new to them and are important to learn.

- Review the article aloud with students, stopping to check comprehension after each paragraph. Ask students if they were surprised by anything that they heard and record their responses on the board. Finally, ask if they think that what they read in the article is true. After a few responses, tell them that the government (public health) worked with a teacher to develop this unit. This exercise gets students into the habit of thinking critically about what they read as not everything will be true.

Lesson 3: The Earth's blanket

Teacher instructions

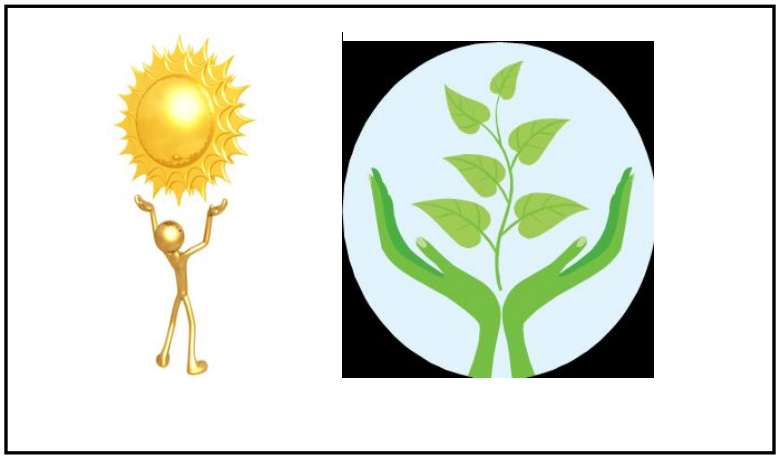
Ideas for teaching the article and worksheet (continued)

- Have students complete the worksheet definitions. Encourage them to use the 20/20 Glossary of Terms to find the words but then to use their own words to create their own definitions. This makes the exercise more interesting by encouraging creative thinking! There are two additional spaces on the worksheet for students to add their own vocabulary.

- Additional challenges for students!

    - How does the amount of energy they use today affect the amount of heat-holding gases they put into the air?
      (The more energy they used, the more gases were released.)

    - Is the Earth really warmer than it used to be?
      *(According to Environment Canada "an analysis of temperature records shows that the Earth has warmed an average of 0.5°C over the past 100 years. The warming is real and significant though its intensity has varied from decade to decade, from region to region and from season to season"; Source: **www.ec.gc.ca**.)*



Lesson 3: The Earth's blanket

Teacher instructions (continued)

Definition Answer Key (taken from the 20/20 Glossary of Terms)

	Vocabulary	Definition
1	Fossil fuels	Fuels that are made from decomposed ancient plants and animals. Examples include coal, oil, and natural gas. They are buried deep in the ground and took millions of years to form.
2	Smog	A haze that forms when sunlight reacts with pollutants in the air. Smog makes it difficult for many people to breathe and can cause breathing problems.
3	Pollution	Substance(s) in the environment which result(s) in damage to the water, air, or soil.
4	Greenhouse gases	Any of the gases that contribute to the greenhouse effect. These include carbon dioxide (CO2), methane (CH4), nitrous oxide (N20), ozone (O3), water vapour, and hydrochlorofluorocarbons (HCFCs).
5	Climate change	This is the change in the average weather that a given region experiences. Different areas of the globe will experience different changes, including higher or lower temperatures, increased rainfall, more storm activity or extended drought periods.
6	Energy consumption	The act of using energy.
7 & 8	Student's choice	

Lesson 4: Conserving energy in school

Student worksheet – Part 1

How much energy does your school currently conserve?

	Question	Yes	No	Comment(s)
1	Do you know how much energy your school uses? How is this energy measured?			What are the measurement units used?
2	Does your school currently have a plan in place to reduce energy consumption?			A plan must be made before reduction can begin.
3	Are the computer screens in the classroom off when they are not in use?			Computer screens use energy even when they are "sleeping".
4	Are the computers in your classroom / school energy efficient?			Look for the Energy Star icon.
5	If there are curtains in your classroom, are they being used to help insulate the class to keep warm air in and cold air out?			Curtains act like a blanket so they can help to conserve energy.
6	Are the lights in our classroom on only when they are needed?			Turning lights off is an easy way to reduce your energy use!
7	Do the taps in your school leak?			Leaky water is wasted water and energy.

Lesson 4: Conserving energy in school

Student worksheet – Part 1 (continued)

How much energy does your school currently conserve?

	Question	Yes	No	Comment(s)
8	Do you and your classmates reduce, reuse, and recycle?			Save energy by reusing items and buying fewer new things.
9	Are there trees around your school?			Trees can provide shade to help lower cooling costs.
10	Does your school have a food program? If your school has a food program, do you know if the food is locally grown?			Food that travels from a long distance requires more energy (such as gas) for the trucks that deliver it.
11	Can you see any gaps between the doors or windows and their frames?			A lot of heat/cold escapes through these gaps.

Lesson 4: Conserving energy in school

Student worksheet – Part 2

How can we conserve more energy at school?

1. List any energy saving tips from the survey that surprised you.

2. Describe what your school currently does best to conserve energy.

3. Which energy saving tip do you think your school should start doing right away? Why?

Lesson 4: Conserving energy in school

Student worksheet – Part 2 (continued)

4. On a scale of 1 -10 (1 being not interested and 10 being very interested), how interested are you in helping your school to reduce the amount of energy it uses? Check the box that corresponds to your answer.

1	2	3	4	5	6	7	8	9	10

5. If you are interested in helping to reduce energy at school, which three things do you want to do first?

1. _____

2. _____

3. _____

Lesson 4: Conserving energy in school

Teacher instructions

Introducing the activity

- A good starting place to reduce energy use is in the school. This worksheet provides an easy-to-use survey that will give students a sense of how well their school is doing to conserve energy. This survey overlaps with the EcoSchools Energy Conservation EcoReview. Having your students complete this short survey will prepare them for doing the more comprehensive EcoReview *(for more information, see **www.ontarioecoschools.org**; for schools in the Toronto District School Board, go to **www.ecoschools.ca**.)*
- Ask students if they are aware of how the school uses energy and record their responses on a piece of chart paper. Have them look for the obvious things first, such as items that need to be plugged in to work.
- Coach students to understand that many other things are less obvious since the energy they use is hidden. For example:
    - Water supply. How does the water get to the school?
    - Garbage. Does it take energy to transport, compost, recycle or bury the garbage?
    - Food. What is needed to produce and deliver food to the school?
    - Paper. How do they turn trees into paper and get it into your notebook?

Ideas for teaching the worksheet

- Distribute the student worksheet - Part 1 and instruct them to indicate either “yes” or “no” to each question on the energy use survey. Have students work in small groups to go through the survey or else review it with your whole class, according to your students’ abilities.
- Once students have completed the survey, review the answers and encourage questions and discussion to prepare them for the 2nd part of the worksheet.
- Read through the questions on the student worksheet – Part 2 on how to conserve more energy in school. Record the answers and indicate that students may recopy them onto their worksheet.
- In questions four and five, students can indicate their level of commitment to implementing their own actions. Over the next few weeks, encourage students to focus on the three conservation tips they listed. Explain that energy-saving behaviours need to be rehearsed often so that they become second nature. Ask them how they plan to remember their commitments. Encourage them to write it on the 20/20 sticker and/or sign the 20/20 Poster as a reminder of their commitment to clean air. Monitor how long it takes for them to adopt energy-conscious behaviours in school.

Lesson 5: The Air Quality Health Index

Student worksheet - internet activity

1. Predict what sort of information you think you will find on a website that has the address **www.airhealth.ca**.

   _____

2. Log onto **www.airhealth.ca**. Who hosts this website? (Hint: look at the very top of the page.)

   _____

3. The Air Quality Health Index (AQHI) is a new index that helps Canadians protect their health each day from air pollution. How do you think an index that measures air pollution can help you to protect your health?

   _____

   _____

4. Find and record two pieces of information about the following subjects. (Hint: check the side bar.)

Subject	Information
About the AQHI	1. 2.
People who are “at risk”	1. 2.
The link between air quality and weather	1. 2.

Lesson 5: The Air Quality Health Index

Student worksheet - internet activity (continued)

5. (a) Click on "your local AQHI conditions". What image appears?

   _____

   (b) Click on your province. Now, locate the Greater Toronto Area on the map and click. What happens? _____

   _____

   (c) From here, click on your City (or the one that is closest to you) and then answer the questions below.

6. Find the scale below and colour it to match the colours on the scale from the website.

Colour	1	2	3	4	5	6	7	8	9	10	+
Risk	Low (1 – 3)			Moderate (4-6)			High (7 – 10)				Very High

7. Which numbers are associated with a low health risk? _____

8. Which numbers are associated with a moderate heath risk? _____

9. Which numbers are associated with a high health risk? _____

10. How do you know when the air is extremely poor? _____

Lesson 5: The Air Quality Health Index

Student worksheet - internet activity (continued)

11. Find the current Air Quality Health Index reading for your city today.

    _____

a) What advice is offered to those who are “at risk” or who suffer when air pollution is high?

_____

_____

b) If the current reading showed a high health risk (7-10), what do you think people who are “at risk” (like people with asthma) would need to do?

_____

_____

12. Do you think you will use the Air Quality Health Index to help protect your own health? Explain.

_____

_____

13. Do you consider yourself to be “at risk” or part of the general population? How do you know?

_____

_____

Lesson 5: The Air Quality Health Index

Teacher instructions

Introducing the activity

Note: The federal government's Air Quality Health Index is a tool that reports the health risk associated with local air quality on a scale from 1 to 10. A reading of 1 means low health risk and 7 or greater represents a high health risk. This index can help you and your students decide when to enjoy physical activity outdoors and when to reduce or reschedule your activities. If you are looking for additional resources on the Air Quality Health Index, the Clean Air Partnership provides a toolkit that contains video clips, radio advertisements, printable resources and web tools. ***If you are interested in ordering an Air Quality Health Index toolkit, please visit http://www.cleanairpartnership.org/air_quality_health_index.***

- Before students begin using the computers, put them into small groups of three or four. You are challenging them to become "government advisory committees"! Ask students what they think is meant by the term "advisory committee"? *(A group of people who gather together to investigate a problem and recommend solutions.)* In this scenario, students will be creating recommendations for the Canadian government. Have them jot down their thoughts and present the results of their discussions to the class.

- Read the following out loud and write the questions on the board:
  "Imagine that you have been asked by the government of Canada to help keep Canadians safe on the days when the air is not healthy to breathe." Government officials would like to hear your recommendations on the following:

    - Do you think it would be a good idea to tell Canadians how much pollution is in the air every day so that they know what kind of air they are breathing? Explain your answer.

    - What would be the best way to inform Canadians about pollution levels every day: a radio announcement, a television advertisement or a website? Explain your choice.

    - If you were to create a website, how would you make it appealing to young people like yourselves?

- Once students have presented their recommendations, explain that the government (Environment Canada) has created a website that helps Canadians protect their health from air pollution and that they will be exploring it in an internet activity.

Lesson 5: The Air Quality Health Index

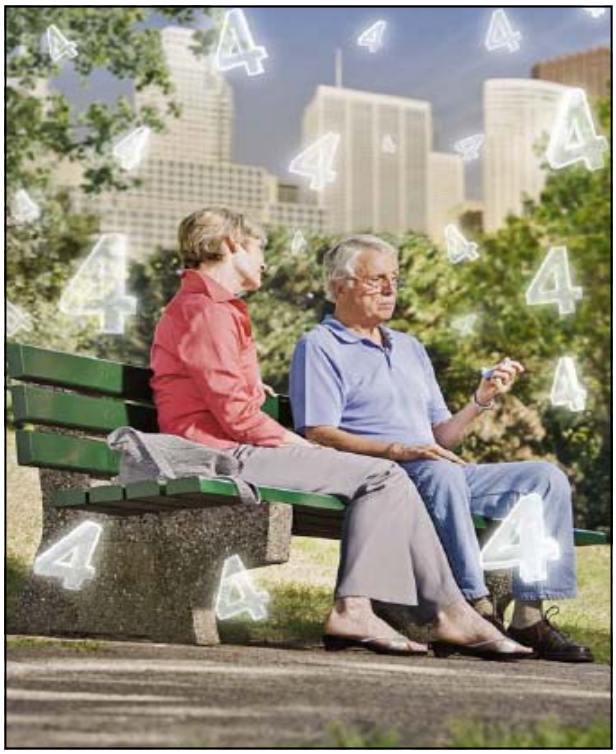
Teacher instructions (continued)

Ideas for reviewing the worksheet

- The activity is self explanatory, but it may work best if students work in partners; one person can navigate the website and the other can record the information.

- Review the worksheet with students before they go to the internet so that they are familiar with the questions before they begin. Have them think about how closely this website comes to what they would consider appealing if they were designing it themselves.

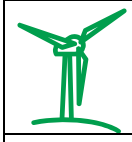
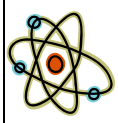
- Once students have completed the activity, review the final question with the class: “Do you consider yourself to be “at risk” or part of the general population?” Probe a little deeper by asking them the following: What does it mean to be “at risk”. Can the level of risk change as they age? What might happen that would put them in the “at risk” category? Is there any way that they can reduce their chances of becoming “at risk”? How?



Lesson 6: Here today, gone tomorrow - renewable and non-renewable energy

Student worksheet

If renewable energy is energy that can be replaced, what is non-renewable energy? Of course…non-renewable energy is energy that cannot be replaced. For example: gas, coal and oil come from deep within the earth and may run out someday. Indicate whether you think the following energy sources are renewable or non-renewable. Place an X in the box that corresponds to your choice. The first one has been completed as an example.

Energy Source	Renewable	Non-renewable
 **Natural Gas**		**X**
 **Solar**		
 **Hydro-electricity**		
 **Wind**		
 **Coal**		
 **Biomass (energy from plants)**		
 **Oil**		
 **Uranium (used in nuclear reactors)**		

Lesson 6: Here today, gone tomorrow – renewable and non-renewable energy

Teacher instructions

Introducing the activity

- Begin this activity by asking students why they think they need to eat. *(Food gives them energy and energy keeps them alive.)* Hold up an apple and ask: a) is an apple is a source of energy, and b) is an apple a renewable source of energy*?* In order to answer this question, students will need to understand the difference between renewable and non-renewable energy. Discuss the following: **Many sources of energy including coal and oil can be replaced…it just takes millions of years. Coal is the ancient remains of land-plants that were buried millions of years ago and exposed to heat and pressure. Since it takes so long, coal and oil are considered to be non-renewable. An apple, on the other hand, does not take millions of years to be replaced. An apple, then, is considered renewable.**

- Ask students the following:
  - Is the energy produced from corn (ethanol) renewable? *(yes)*
  - Is the energy produced by wind renewable? *(yes)*
  - How long does it take new water to replace water falling in a dam? *(not long!)*
  - Is the energy that is produced from falling water (hydro-electricity) considered renewable? (yes)

Ideas for teaching the worksheet

- Review the introduction paragraph with the class and have students complete the worksheet, taking their best guess at whether each source if energy listed is renewable or non-renewable.

- Take up the answers together. The answers are listed below.

- Ask if anyone knows why corn has become such a controversial type of energy even though it is renewable? *(More farmers are growing corn for energy than for food – is this okay given that there is a global food crisis?)*

Answer Key
natural gas: non-renewable / solar: renewable / hydro: renewable / wind: renewable / coal: non-renewable / biomass: renewable / oil: non-renewable / uranium: non-renewable

Lesson 7: Renewable energy - is it worth the cost?

Part 1 – Student group activity

Which costs more: energy that is produced from renewable sources or non-renewable sources?

Examples of renewable sources are: wind, solar, biomass; examples of non-renewable sources are: coal, oil, natural gas and uranium.

To answer this question, think about what the term "cost" means. Does the word "cost" refer to money? If it does, then you would likely answer that renewable energy costs more. You would be right if you were thinking about immediate dollar cost. But, what if you were thinking about the cost to our health and the environment? You might answer that non-renewable energy costs more. For example, energy from coal is cheap to produce, but it creates air pollution that can harm our lungs. For the three types of renewable energy listed below, decide if these types of energy are worth their cost. Think about whether the information in each bullet is an advantage or a disadvantage for that type of energy. Use a happy face for an advantage and a frowning face for a disadvantage. A few bullets are left blank for you to create your own points!

1. **What is wind energy?** Did you know that wind energy…

- Is pollution-free; (example) _____advantage_____
- Is energy that comes from the wind; _____
- Does not produce greenhouse gases; _____
- Does not produce toxic waste; _____
- Can only be produced when there is wind; _____
- Is expensive to produce; _____
- _____; _____

(What else do you think about wind?)

Lesson 7: Renewable energy - is it worth the cost?

Part 1 – Student group activity (continued)

2. **What is solar energy?** Did you know that solar energy…
- Is energy that travels to the earth from the sun; _____
- Comes free from the sun and it is almost unlimited; _____
- Requires expensive panels and equipment to trap the sun's energy; _____
- Is pollution-free; _____
- Depends on how strong the sun is during the day; _____
- _____; _____

(What else do you think about solar?)

3. **What is biomass energy?** Did you know that biomass energy…
- Is produced by the release of energy that is found in plants; _____
- Can be produced from corn or other crops; _____
- Results in less carbon dioxide than energy from fossil fuels; _____
- Uses land that could be used to produce crops to eat ; _____
- Uses fuels (like corn, wheat and barley) that grow in warm weather; _____
- _____; _____

(What else do you think about biomass?)

If your group is interested in learning more about these sources of energy, go to the Natural Resources Canada website at **www.canren.gc.ca**.

Lesson 7: Renewable energy - is it worth the cost?

Part 2 – Student worksheet

Use this chart to organize the most important advantages and disadvantages of each energy type from the previous page. Discuss with your group and choose the **top three** "advantages" and/or "disadvantages" for wind, solar and biomass and enter them in the space provided. When you are finished, think about whether you think renewable energy is "worth the cost".

Type of Energy	What are the advantages?	What are the disadvantages?
(example) ***Wind*** 	***1. Wind energy is pollution free*** ***2. Does not produce toxic waste***	***3. Wind energy is expensive to produce***
Wind		
Solar		
Biomass		

Lesson 7: Renewable energy - is it worth the cost?

Teacher instructions

(Note: it is important for students to have completed Lesson 6 prior to this exercise.)

Introducing the activity

- Write this question on the front board: "Which costs more: energy that is produced from renewable sources or non-renewable sources?" Ask students to think about this question quietly for a moment, and then ask them what is meant by the word cost. Explain that when we ask how much something costs, we usually refer to money; then poll them to find out if they think that there are other kinds of costs. *(Using non-renewable energy, such as coal for example, can cost us our health because of the air pollution it produces.)*

Ideas for teaching Part 1 – student group activity

- Organize students into small groups of three or four. In these small groups, students will read through the hand-out together. Encourage students to take turns reading. The activity will also work if you read the handout out loud with the class. At the end of each bullet, students should pause to discuss whether the point is an "advantage" or a "disadvantage" and draw a happy or sad face accordingly. You may want to discuss ahead of time what is meant by an advantage or disadvantage. What should emerge by the end of the activity is that there are more advantages than disadvantages to using renewable energy. However, you may find that what one student considers an advantage, another student may see as a disadvantage. Of course, there is far more research regarding advantages and disadvantages if students wish to continue their investigations independently.

Ideas for teaching Part 2 – student worksheet

- Students should still be in their small working groups for this exercise. This worksheet consolidates the learning from the previous one but challenges them as a group to pick the top three advantages and/or disadvantages for each source of renewable energy.

- At the end of the exercise, ask each group to present the results from one energy source and explain how they arrived at their choices.

- Conclude the exercise by asking students whether they think renewable energy is "worth the cost". Generate even more discussion by asking them why they think the debate over shutting down coal-fired electrical generating stations in Ontario continues!

Lesson 8: Earth Hour won over 85% of GTA adults

Media article

April 17, 2008
Peter Gorrie
ENVIRONMENT REPORTER

Note: This article has been modified from www.thestar.com

Toronto residents, it seems, love their candlelight dinners! They were far more likely than other Canadians to celebrate last month's Earth Hour by eating in the light of a warm flickering flame, according to a poll conducted for event organizer World Wildlife Fund-Canada.

The online survey revealed that an overwhelming 85 per cent of adults in the Greater Toronto Area (GTA) said they participated on March 29, 2008 when people around the world were asked to turn off their lights between 8 and 9 p.m. to support action on climate change. Almost everyone who participated said they turned out lights during the hour, and many shut down computers, televisions and other appliances. In Toronto, though, 13 per cent dined by candlelight, compared with just six per cent elsewhere in Canada.

Across Canada, 49 per cent said they took part in Earth Hour. Equally important, most of those surveyed recognized that Earth Hour was meant to lead to further steps to reduce energy use and greenhouse gas emissions.

In the GTA, 71 per cent of respondents said that after Earth Hour they're more likely to reduce energy use at home by at least 30 per cent.

Earth Hour began in 2007 in Sydney, Australia, but Canada took a lead role this time, with 150 communities participating and 130,000 people (out of 300,000 globally) registering on the event's website (**www.earthhour.org**.)

Lesson 8: Earth Hour won over 85% of GTA adults

Student worksheet

Answer the following questions:

1. When was this article written? _____
2. Which newspaper carried the article? _____
3. Who wrote the article? _____
4. What percent of Greater Toronto Area (GTA) residents participated in Earth Hour in 2008? _____
5. Which group conducted the survey (or poll)? _____
6. What was the purpose of Earth Hour? _____

_____

7. In which country did Earth Hour begin? _____
8. Which country took over the "lead role" for participation in 2008?

_____

9. Have you ever participated in Earth Hour? If so, describe what you did.

10. Given the opportunity, would you participate in Earth Hour when the event takes place again March? Why or why not?

Lesson 8: Earth Hour won over 85% of GTA adults

Teacher instructions

Introducing the activity

- Poll students to find out if any of them have ever experienced a power outage and ask them what it was like.

- Then ask:

    - What would it be like to be without energy for an entire day?

    - How would things be different?

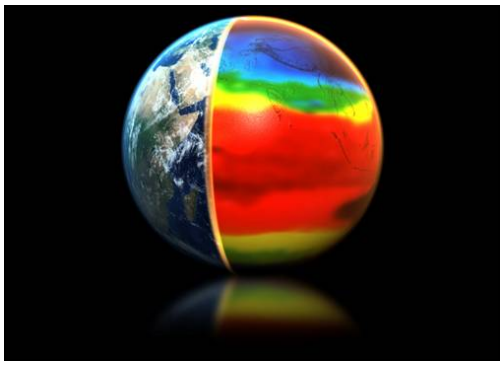
    - Would anyone voluntarily go without power for one hour?
      (Explain to students that on March 29th, 2008, more than ¾ of all adults in the GTA turned off their lights for one hour in the evening. This hour of darkness has come to be known as Earth Hour.)

    - Why is this hour of darkness is called Earth Hour?

Ideas for teaching the article and worksheet

- Have students quickly scan the article and then ask them to select five words or phrases that capture their interest. Write these words on the front board and ask them to read the word list out loud with you. If there are any words that they don't know, discuss them and use members of the class as consultants.

- Read the article with the students and review the questions out loud. Record the answers on the front board to make it easy for students to complete their own worksheet.



Lesson 9: As Olympics near, smog blankets Beijing

Media article

July 27, 2008
Anita Chang
ASSOCIATED PRESS

Note: This article has been modified from www.thestar.com

BEIJING – Thick pollution blanketed the Chinese capital on Sunday – one of the smoggiest days seen in the past month. But a city environmental official promises, the air quality will be good by the time the Beijing Olympics start in 12 days.

Even though city residents drove their own vehicles much less often, it was still difficult to see in parts of the city.

The city's badly polluted air is a serious problem for the athletes. Some athletes are training in South Korea and Japan to avoid breathing the Beijing air until the last possible minute.

The thick haze may be hanging around because the light wind is unable to blow away the fog and pollution. Pollution levels, however, are apparently 20 percent lower than one year ago in similar weather conditions.

Drastic efforts to control pollution include:

- taking half of Beijing's 3.3 million vehicles off the roads
- closing factories in the city
- stopping most construction in the capital

Around 300,000 heavily polluting vehicles, including old industrial trucks, have been banned since July 1, 2008. Even though Beijing has tried to reduce pollution, there is no guarantee that the sky will be blue during the games. No one can control the wind. If the wind blows, it may blow pollution from thousands of kilometres away to Beijing. If the wind does not blow, pollution will not be blown away and it could build up in the city.

Lesson 9: As Olympics near, smog blankets Beijing

Student worksheet

Answer the following questions. Use the article about the air problems in Beijing to help guide your answers.

1	What were the athletes worried about during the 2008 Olympics in Beijing?	
2	Why was the wind so important during the Olympics?	
3	What actions did Beijing take to lower pollution levels by 20 percent?	
4	What do you think would happen in Beijing if the “drastic” actions to reduce air pollution were done all year round?	
5	Do you think the Beijing government would have been concerned about pollution if the city had not hosted the Olympics?	

Lesson 9: As Olympics near, smog blankets Beijing

Teacher instructions

Introducing the activity

- Explain to students that during the summer of 2008, one of the concerns about the Beijing Olympics was that the air would be unsafe to breathe. Engage students in a discussion about the Olympics by asking them if they are familiar with the event and whether they watched and remember some of Beijing 2008 summer Olympics.

- Locate the city on a map and ask students if they know how many people live in Beijing and have them estimate the number of people who drive vehicles. *(Some estimates put the population at 15 million.)* Knowing that cars create air pollution, ask them what they think might happen if everyone (or even half of the people) in Beijing drove a car. *(There are more than 3 million vehicles on the Beijing roads - more vehicles than there are people in the City of Toronto! Vehicles were pulled off the road before the 2008 Olympics in an effort to control pollution, but there was still smog.)* Ask students why they think that the smog stuck around and what conditions might help remove it? *(Rain and wind moves it away from the city.)*

Ideas for teaching the article

- Read through the article together with the class, stopping to check for comprehension. After you have finished the article, ask students to recall what they learned about Beijing and its efforts to curb air pollution. Challenge them to think about whether the Beijing government will keep up their efforts to curb air pollution or if they will allow all normal activities to resume.

Ideas for teaching the worksheet

- This exercise is intended to test knowledge (question 1), comprehension (questions 2&3), creative thinking (question 4) and critical thinking (question 5). It can be done as a written assignment or an oral exercise. For the former, review the questions with the class in advance. For the latter, arrange students in groups and have them choose one to be the “journalist” (or interviewer) and one to be the recorder. The journalist will pretend that he/she is interviewing the others for a television news report. The recorder will jot down the responses in 15 second clips. Once completed, have the students present some of their responses. Put the clips together to form a short documentary reflecting the diversity of opinions in the classroom.

Lesson 10: The cost of gassing up – do the math!

Student worksheet

Over a six-year period, the price of gas can change. Find the difference in the price of gasoline between 2002 and 2008.

Write your answer in the appropriate spot in the "Difference" column.

Price of gas and year	Approximate price per litre	Difference
Average price of gas in 2008.	**$1.35**	0
Average price of gas in 2007.	$1.08	**$1.35** - $1.08 =
Average price of gas in 2006.	.97	**$1.35** - .97 =
Average price of gas in 2005.	$1.08	**$1.35** – $1.08 =
Average price of gas in 2004.	.77	**$1.35** - .77 =
Average price of gas in 2003.	.67	**$1.35** - .67 =
Average price of gas in 2002.	.69	**$1.35** - .69 =

(Source: **http://www.ontariogasprices.com/retail_price_chart.aspx**)

Lesson 10: The cost of gassing up – do the math!

Student worksheet (continued)

1. What pattern(s) you see? Create a bar graph to represent the difference for each year.

2. Once you have determined the price pattern between 2002 and 2008, make a prediction about the price of gas by the year 2015 and 2020?

_____

_____

3. Can you think of any advantage to rising gas prices? *(Consider that higher prices may cause people to want to use less gas!)*

_____

_____

_____

Lesson 10: The cost of gassing up – do the math!

Teacher instructions ***(Note: Teachers should know the current cost of gas before introducing this exercise to students.)***

Introducing the activity

- This exercise examines the fluctuation in gas prices over a 6-year period, from 2002 to 2008. To begin, determine if students understand how much one litre represents. You may wish to hold up a one-litre jug of milk or pop and ask them if they know how much it costs.
- Ask the class to tell you what they think people in their city pay for one litre of gas. Record all answers on the board and keep a tally for the prices that are repeated. Circle the lowest guess and the highest guess and explain these two numbers represent the "range" of prices. Explain that the price suggested most often is called the mode. Ask students where they could go to find out the actual price of gas per litre. *(The internet; television; local gas station; their parents.)* Tell them what the current price is.
- Ask students if they think that the price of gas has gone up or down over the past ten years. *(Up!)* Have them write on a piece of paper what they believe was the price of gas per litre in 2002. When everyone has made a guess, let them know what the actual price was. (*69 cents per litre.)* See who was closest.
- Have students calculate, with you, the difference between the 2002 and current gas prices. Ask them if they think it is possible to predict future prices by finding patterns in the past prices.

Ideas for teaching the worksheet

- Have students scan the page and ask them how many columns they see and what type of information is listed in each column. What do they think the price trend is from 2002 to 2008? *(The price has increased.)* Have students proceed with the worksheet by calculating the differences and listing the answers in column 3. You may wish to look at how the prices in this 6-year period compare with current gas prices.
- Review questions 1, 2, and 3 on the student worksheet. These may be completed with the class or in small groups. Small groups may produce an interesting diversity of responses that could be presented to the class.
- At some point during this exercise, you may wish to introduce the concept of supply and demand or "Peak Oil". Videos that can support teaching this concept include: "A Crude Awakening", "Crude Impact", or "The End of Suburbia". They explore the idea that the oil supply has a definite end. *(Videos are available for on-line purchase at: **www.endofsuburbia.com**)*

Lesson 11: Environmental heroes

Student worksheet - internet activity

Who is your hero? _____

Do you know anyone who is an environmental hero? _____

_____

How about Dr. Roberta Bondar, David Suzuki, Robert (Bob) Hunter, Farley Mowat, or Rachel Carson? These Canadians have all made very significant contributions towards our environment. Select one of these heroes to study and write their name here: _____

1. Log onto ***www.ene.gov.on.ca*** (The Government of Ontario's website) and choose "English". Who is the Minister of the Environment?

_____

2. Click on the section "Information for Kids" and describe what you see.

_____

_____

_____

3. List the cartoon kids who have started an E-Zone Campaign at their schools.

_____

4. Find the "learn" button and click on "famous heroes". Now click on the name of the environmental hero of your choice. Flip over your hero's card, read all about him/her and answer questions 5 and 6.

Lesson 11: Environmental heroes

Student worksheet - internet activity (continued)

5. Give two (or more) reasons why he/she is an environmental star.

6. What are four (or more) things that you find interesting about your hero?

Lesson 11: Environmental heroes

Student worksheet

Environmental Superhero

_____

(Write your name here)

Attach a real photo or sketch an image of yourself here.
I was born…
My school is…
I am an environmental star because…
Other facts about me are…
The most awesome thing I did was…

Lesson 11: Environmental heroes

Teacher instructions

Introducing the activity and internet worksheet

- Ask students if they have someone in their lives who they would call their hero. What do they think someone needs to do to become a hero? *(Some define a hero as someone of great strength and celebrated for their courage.)* Ask students if they think that they are strong and courageous. *(To be strong and courageous they must have a passion about something that is greater than their fear of failing.)*

- Some believe that Roberta Bondar, David Suzuki, Robert (Bob) Hunter, Farley Mowat, and Rachel Carson are heroes of the environment because of their courage. Ask students what they think is the common "enemy" that all of these heroes have to face. *(An enemy could be a person, an idea, or even a lifestyle.)*

- Ask students to turn to the internet activity and review the assignment before they begin. Students can work on this in groups or individually, depending on your access to computers. Encourage students to choose different characters so that there will be a variety of reports. Students can report back to the class about the character they researched and what they found most interesting about him/her.

Ideas for teaching the Environmental Superhero worksheet

- This is a fun activity that will help students to envision themselves as environmental superheroes and empower student activism for the environment. Seeing is believing! It may be necessary to work closely with students to help them identify their own strengths and values. Copy student profiles (with their permission) and place them around the room or the school.

Lesson 12: Cars and bikes – can they share the road?

Media article; vocabulary builder

Council Approves Jarvis Bike Lanes

May 25, 2009
Paul Moloney & Donovan Vincent
CITY HALL BUREAU

Note: This article has been modified from www.thestar.com

Toronto city council has approved a plan to build a bike lane on Jarvis Street. The $6.3 million "Jarvis streetscape improvement" was approved by a 28-16 vote after a day-long debate. The bike lane idea was supported by those councillors who are enthusiastic cyclists, but not supported by councillors who are worried about the increased amount of traffic the bike lane would produce.

The Jarvis streetscape improvement includes:

- widening the east sidewalk;
- planting more trees; and
- adding heritage plaques.

The improvement project will now go to the province so that it can be approved. The bike lanes would cost about $75,000 to build and be fairly easy to install. They may possibly be completed as early as the fall of 2009. The remaining improvements would require longer to complete.

Councillor Kyle Rae, who pushed for the changes, said the road should be shared among drivers, cyclists and pedestrians. "What you want on Jarvis is to maintain the traffic, but to share that with all the users - not just for the car alone," he said.

Lesson 12: Cars and bikes – can they share the road?

Media article; vocabulary builder (continued)

Mayor David Miller kicked off the debate by calling on motorists to accept longer driving times to provide more space for the growing number of cyclists to ride safely. "We're not talking about a huge transformation for drivers; we're talking about minimal inconvenience, if any," Miller told council, noting that there is a two-minute difference in driving time. “The current situation just doesn't work for cyclists,” he said.

The city needs a network so cyclists can travel their entire trip safely using bike lanes, Miller said. "Cycling and the number of people who cycle in this city is booming," he said.

Lesson 12: Cars and bikes – can they share the road?

Part 1 – Student worksheet for media article

Each morning, you get up and go to school by car, walking, biking or taking public transit. Thousands of other kids and working adults use the same types of transportation. With all these people trying to get somewhere at the same time, the streets can get crowed with vehicles. The result of having so much traffic is traffic jams. This causes increased emissions of greenhouse gases (such as carbon dioxide), which are warming the planet. It also causes air pollution which makes it hard to breathe.

We need to be able to use a variety of ways to get to school and work. We need different ways of travelling that are less polluting like walking, bike riding, or carpooling.

Answer the following questions. Use the article to find the answers:

1. What has City council approved on Jarvis Street? _____

2. Did all councillors agree this should happen? _____
   Explain:_____
   _____

3. Do you think having a bike lane on Jarvis Street is a good idea? _____
   Explain: _____
   _____

4. If you were told to recommend more bike lanes on city streets, which streets would you recommend? _____
   Why? _____

5. We make bike lanes by painting a line on the side of existing roads. Is there another way to create bike lanes that will get more people biking in the City? Explain: _____
   _____
   _____

Lesson 12: Cars and bikes – can they share the road?

Part 1 – Student worksheet for media article (continued)

6. Sketch a map of your neighbourhood below. Outline in green, all the routes that you could take your bike on.

Lesson 12: Cars and bikes – can they share the road?

Part 2 – Student survey worksheet

Step 1: How do students in your classroom travel to school?

(A) Survey the students in your classroom. Tally how many:

Are driven to school	Take public transit	Take the school bus	Walk/cycle	Come in a carpool with other students	Other (e.g. skateboard, rollerblade)

(B) Draw a bar chart to show the final results

Step 2: How willing are your classmates to try more non-polluting ways to get to school?

(C) Survey students in your classroom who **are driven to school**. Find out if they would like to try another cleaner option for a two-week period. (For those who say "yes", put the tally in the option they would like to try.)

Take public transit	Walk/cycle	Join a walking school bus	Come in a carpool with other students	Other (e.g. skateboard, roller blade)

Lesson 12: Cars and bikes – can they share the road?

Part 2 – Student survey worksheet (continued)

Step 3: If all the students who are driven to school were able to switch to cleaner transportation, how much could your classroom reduce vehicle use? Find out the percentage of reduction by filling in the blanks below!

1. The total number of students tallied in (C) are: ____
2. The number of students who **are driven to school,** tallied in (A) are: ___
3. Take your answer from number 1 and divide it by your answer in number 2. Like this:

$$\frac{\text{total number of students tallied in (C)}}{\text{number of students who are driven to school, tallied in (A)}} = \_\_\_\_\_$$

4. Take your answer from number 3 and multiply it by 100. Enter your answer here: _____%. Your classroom could reduce vehicle use by this much!

CARS and BIKES

Can they share the road?

Lesson 12: Cars and bikes – can they share the road?

Teacher instructions

Introducing the activity

- Ask students about the different ways students might be able to get to and from school. Answers will likely include being driven, taking the school bus, walking, cycling or public transit.

- Ask students to estimate how long they think it took them to get to school that day, whether they thought it was a faster or slower trip than usual and why. This will likely lead to a discussion about traffic. If is does not, probe further by asking students if they think the roads (and school area) are busiest with traffic in the morning, lunch or after school.

- Poll students to find out their favourite way to get to and from school. This thinking will set them up for their worksheet exercises and may even spawn some new ideas for future transportation options!

Ideas for teaching Part 1 – student worksheet for media article

- Have students read the article and then ask them to select five words or phrases that they find most interesting or don't know.

- Write those words on the board and if there are any words that they don't know, discuss them and use the members of the class as consultants.

- Read the article again with the students and review the worksheet questions out loud. Record their answers on the front board to make it easy for students to complete their own worksheet.

- When taking up the answers to question 3, you may want to divide the classroom and set up a debate. For example, students could craft some arguments that they think may have been put forward during the vote "for" and "against" bike lanes.

- When taking up the answers to question 5, ask your students if they know of other countries that have a better bike-path system than Canada. *(Holland has the best cycling lane network in the world, with 19,000 kilometres of dedicated bike paths and lanes).* You may want to turn this question into a research project.

Lesson 12: Cars and bikes – can they share the road?

Teacher instructions (continued)

Ideas for teaching Part 1 – student worksheet for media article (continued)

- This article also provides you with an opportunity to explore issues related to government and municipal politics. Ask students which level of government was responsible for the vote on the Jarvis Street Improvement. Poll students to find out how many have gone with their parents to vote and whether they know how old you need to be to vote. *(18 years of age.)* Do they think this age too old or too young and why? Probe their knowledge of other levels of government or government bodies such as the United Nations.

Ideas for teaching Part 2 – student survey worksheet

- **This is a good exercise to do in class before you begin the transportation part of the 20/20 Planner**. It simply gets students to think about or imagine how they might "clean air commute" to school, which is a good lead in to the actual commitment they (and their Clean Air Buddy at home) make in the 2-week transportation program outlined in the 20/20 Planner.

- Review the student survey worksheet with your class. For **Step 1,** you can divide your students into small groups and rotate them to survey each other. You can also simply poll the classroom out loud and have students record the answers on their worksheet.

- For **Step 2**, you may want to open this up to a classroom discussion, with students who get driven to school taking the lead. It will allow all students to brainstorm ideas for helping each other find cleaner ways to get to school and overcome some of the obstacles for doing so (e.g., how does a child convince a parent not to drive? how does a child deal with the fear about biking?)

- **Step 3** requires math skills, so depending on your grade level, you may either have students work through this on their own or else guide them through it out loud. The final result should give students a sense of the potential reductions in vehicle use that their classroom could achieve when kids who are driven to school are able to switch to cleaner options.

Lesson 13: Celebrate clean air in 2020

Outline for student presentation

***Imagine*:** The year is 2020. You and your classmates have worked very hard over the past several years to make people across Ontario aware of the connection between their energy use and air pollution. Although there were times when you felt discouraged, you never gave up. Yes, there were people who did not want to change their energy use habits, but you were determined to change their minds. You knew it was important to the future of the Earth and your determination paid off! The air is now cleaner and healthier to breathe than it was in the year you participated in 20/20 The Way to Clean Air. Amazing! Not to mention that people go to the hospital less now because their lungs are healthier and their eyes do not hurt.

Write your acceptance speech for the 20/20 Way to Clean Air Award. In your speech, you must include:

- A brief outline of who you are and what you are now doing in the year 2020 (use your imagination!)
- A brief overview of the state of the air so many years ago when you first began this project.
- How you felt as you learned more and more about what you could do to change the future of air quality.
- The challenges that you faced and how you overcame them.
- The people you want to thank for helping you succeed along the way.

Lesson 13: Celebrate clean air in 2020

Teacher instructions

(Note: Students should complete the 20/20 The Way to Clean Air "at home" program before they do this activity.)

Introducing the activity

- This activity is a great way to celebrate the end of the 20/20 The Way to Clean Air "at home" two-week program. Students must use a variety of creative, analytical, and critical thinking skills to complete this exercise.

- Set the stage for students by asking them to take themselves forward to the year 2020. Then read them the "imagine" paragraph from the student presentation outline:

  "The year is 2020. You and your classmates have worked very hard over the past several years to make people across Ontario aware of the connection between their energy use and air pollution. Although there were times when you felt discouraged, you never gave up. Yes, there were people who did not want to change their energy use habits, but you were determined to change their minds. You knew it was important to the future of the Earth and your determination paid off! The air is now cleaner and healthier to breathe than it was in the year you participated in 20/20 The Way to Clean Air. Amazing! Not to mention that people go to the hospital less now because their lungs are healthier and their eyes do not hurt."

- Explain to students that they will be writing an acceptance speech for the 20/20 The Way to Clean Air Award. Ask them what they think are important things to include in an acceptance speech. Record their suggestions on the front board.

- Hand out the "student presentation" and review the outline of what is expected in their speeches.

- This culminating activity is meant to help you assess student success as well as help students celebrate their success.

Glossary of Terms

Air Pollution
Something that occurs when polluting substances exist in the air. These substances can affect human health in a negative way.

Alternative Green Energy Sources
Energy sources that are not based on the burning of fossil fuels or the splitting of atoms. Alternative energy sources have a less damaging impact on the environment. Examples include solar energy, wind energy, geothermal energy, tidal energy, and hydroelectric energy.

Asthma
Asthma is a breathing disease of the lungs. It causes shortness of breath, tightness in the chest, coughing and wheezing. Asthma is triggered by things like dust, air pollution and mould.

Atmosphere
The atmosphere extends a few hundred kilometres above the Earth's surface, but most of the Earth's atmosphere lies within 50 kms above the Earth's surface. It is made from a mixture of gases and particles that surround the planet. It provides us with the air we breathe. Its greenhouse gases trap the heat that warms the Earth. It has a protective layer of ozone that shields us from the damaging rays given off by the sun.

Carbon
Carbon is a natural element which forms most living things. It is the fourth most abundant element in the universe and plays a very important role in the health of the planet.

Carbon Dioxide
Carbon dioxide is the most important greenhouse gas released by human activities. It has no colour or smell. It is produced when we burn fossil fuels, like coal, gas and oil. It is also released from forest fires, rotting plants, volcanic eruptions, and when we breathe.

CFLs
Compact fluorescent light bulbs are energy saving light bulbs that can last up to 10 times longer than regular light bulbs.

Climate
The long-term, average weather conditions in a region, including temperature, precipitation, wind patterns and cloud cover.

Climate Change
The change in the average weather that a given region experiences. Different areas of the globe will have different changes, including higher or lower temperatures, increased rainfall, more storm activity or extended drought periods.

Conservation of Energy
Conserving energy is when you reduce the amount of energy used to do something. For example, turning a computer off when not in use is conserving energy. Conservation of energy saves money and reduces air pollution.

Disease
A disease is an illness or sickness of the body that causes the body not to function properly. For example, heart disease is an illness that causes the arteries that carry blood to the heart to become blocked.

Glossary of Terms (continued)

Electrical Energy
Energy produced by the movement of electrons.

Energy
The ability to do work or the ability to move an object.

Energy Audit
An investigation that shows how much energy a building uses and how someone can make the building more energy-efficient.

Energy-Efficient
Something that uses a minimum amount of energy to get the job done. For example, compact fluorescent light bulbs make light by using less energy than regular light bulbs.

Energy Consumption
The act of using energy.

Environment
The surroundings in which all plants, animals and humans live.

Fossil Fuels
Fuels that are made from decomposed ancient plants and animals. Examples include coal, oil, and natural gas. They are buried deep in the ground and took millions of years to form.

Global Warming
An overall increase in world temperatures which may be caused by additional heat being trapped by greenhouse gases.

Greenhouse Effect
This effect occurs when heat is trapped and builds up in the lower atmosphere near a planet's surface. Some of the heat flowing back towards space from the Earth's surface is absorbed by water vapour, carbon dioxide, methane and other gases in the atmosphere.

Greenhouse Gases
Any of the gases that contribute to the greenhouse effect. These include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_20), ozone (O_3), water vapour, and hydrochlorofluorocarbons (HCFCs).

Hydroelectricity
A type of electricity that is produced by using the energy of moving water.

Idling
Idling is when the engine is running but the car is parked.

Non-Renewable Energy Source
An energy source that is limited and cannot be renewed naturally. Examples include fossil fuels (natural gas, propane, coal, petroleum) and uranium.

Nitrogen Dioxide
Nitrogen dioxide is colorless, odourless gas that can be released by burning fuels and by smoking tobacco products.

Oxygen
Oxygen is a colorless, odourless and tasteless gas that makes up about 20% of the air we breathe. Oxygen is essential to human, animal and plant life.

Glossary of Terms (continued)

Particulate Matter
A type of air pollution that includes dust, soot and tiny bits of solid materials that move around in the air.

Pollution
Substances in the environment which result in damage to the water, air, or soil.

Renewable Energy
Energy that can be replaced by natural processes (e.g., energy from the sun, wind, tides, waves, and biomass).

Renewable Resource
Any natural resource that can be replaced naturally over time, such as a forest.

Smog
A haze that forms when sunlight reacts with pollutants in the air. Smog makes it difficult for many people to breathe and can cause lung problems.

Sulphur Dioxide
Sulphur dioxide is a colourless gas with a very strong smell. It is usually produced by burning coal. It pollutes the air when present in large amounts.

Thermostat
An automatic temperature control on heating and cooling systems. Thermostats sense the temperature in the environment and can automatically turn the furnace on or off to keep the temperature in the room steady.

Utility Company
A company that supplies gas and electrical power to homes and other buildings.

Weather
The condition of the lower atmosphere at a particular place and time in terms of temperature, precipitation, wind patterns, cloud cover and air pressure.

Wheeze
A breathing sound caused when the airways of lungs are blocked or swollen. It is a common sign of asthma.

Many definitions were taken and/or modified from:

- Cool Climate Kid's Club: **www.coolclimate.org**
- The Ontario Curriculum – Science and Technology
- **www.srh.noaa.gov**
- **www.science.org**
- Energy Kid's Page: **www.eia.doe.gov/kids/glossary/#E**
- Environment Canada's Great Art for Great Lakes: **http://www.on.ec.gc.ca/community/classroom/c4-big-picture-e.html**

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