

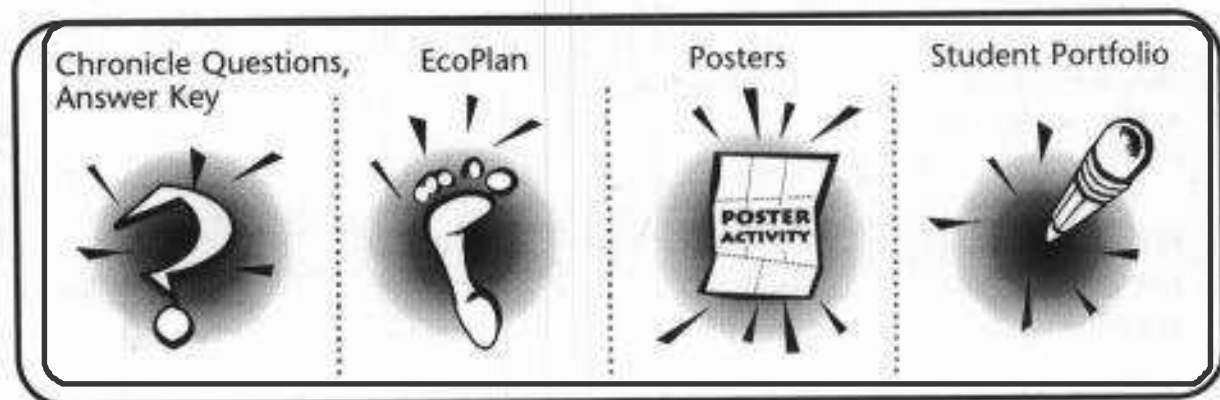
CHAPTER 2

LEARNING TO WALK

In this chapter, students collect data samples of their own Ecological Footprints to develop an understanding of the combined effect of many footprints.

CONTENTS

- **Learning to Walk – Part I T25**
- **Learning to Walk – Part II T30**
- **Learning to Walk – Part III T42**



CHAPTER 2 PART I

WHAT YOU NEED

- Copies of, or blackline master Everybody has a Footprint Activity, pages S20-S21
- Copies of EcoGuardians' 3rd Chronicle, pages S22-S24
- Copies of 3rd Chronicle Questions, page S25
- Copies of the Student Footprint Survey Activity, pages S26-S27
- MP3 Download



INTRODUCTORY ACTIVITY

1. Prepare for and complete Everybody Has a Footprint Activity.
2. 3rd Chronicle Vocabulary

To help students fully appreciate and understand the chronicles, you may wish to introduce this section with this vocabulary exercise. On the day before you plan to read the chronicles in class, assign one word from the vocabulary list to each student (or group of students). Ask them to look up the meaning in a dictionary or encyclopedia or top research it on the Internet. Students should present their word to the class, with a formal definition and a visual representation to illustrate the meaning. The definitions and pictures should be presented on the paper leaves and posted around the "vocabulary tree."

Word list	companion	lifestyle	scutes	eastern cougar
	boulder	meadow	deliberately	sleek
	sensitive	reflection	leatherback	turtle

3. Have the students brainstorm as a class what images the words create. Have students suggest possible storylines that might arise from these words.
4. Divide students into small groups. Assign each student in the groups several new words. Pass out copies of the EcoGuardians' 3rd Chronicle and have the groups read it aloud. As the children hear one of the listed words in the story, the student responsible for the word should identify it and supply the meaning. Reassemble the class as a whole and listen to the EcoGuardians' 3rd Chronicle on the download.

ACTIVITY

1. 3rd Chronicle Questions. Have students discuss the questions, record their answers and place them in their portfolio. Suggestions for presenting the answers to the questions include:
 - mind map/web
 - answer questions in the student shield, page S13
 - draw cartoon/comic strip
 - summarize the story and write it on a scroll
 - interview format
 - write a letter from Solana to the kids
 - write a song or poem
2. Student Footprint Survey Activity. Have students prepare and complete the student survey.

EXTENSIONS

1. Have the students refer to the simplified consumption-land use matrix on the Tree of Life poster to compare the Canadian footprint to the World Average footprint (7.5 ha: 2.2 ha). Using graph paper and different coloured pens for Canada and the World Average, have students compare the size of the footprints by devising an accurate scale drawing to represent them.



ANSWER KEY

EVERYBODY HAS A FOOTPRINT ACTIVITY

WHAT YOU NEED

- graph paper
- magazines
- pens/crayons/pencils
- tape measure(s)

ACTIVITY

1. Have students trace an outline of one of their feet on graph paper. Estimate and then measure the area of the footprint. Have students cut out their footprints. On one side of it, have students draw or paste a collage of things that they think makes up their Ecological Footprint.

Question: How would you measure the effect of each of the things in your collage on the environment? **Answers will vary.**

2. Take students outside and measure off 7.5 hectares (one hectare equals 100 m x 100 m) by walking around its perimeter. 7.5 hectares is the size of the average Canadian Ecological Footprint. Now have students measure off 2.2 hectares. 2.2 hectares is the average amount of productive land currently used to support the world's population. Finally, have students measure off 1.8 hectares. This is the land available per person on the earth. Have students note the difference in size between the three footprints.

Productive land is biologically active land—it excludes desert, ice caps, oceans, mountains and areas of concrete or pavement. This 1.8 hectares of productive land currently available per person includes only 12% wilderness areas or biodiversity areas.¹⁹

GO TO THE TREE OF LIFE POSTERS

Here are suggested answers to the Activity questions on pS20:

3. There are 8.9 billion hectares of productive land available on the earth.
4. The 2006 world population is 6.5 billion people and rising.
5. There are 1.8 hectares of land available for each person on the earth (8.9 billion hectares divided by 5.8 billion people = 1.5 + .5 hectares of sea space and 0.2 hectares to absorb CO₂ = 2.2 hectares. Less land for biodiversity = 1.8 hectares).
6. Currently, the average amount of land being used by each person on the earth is 2.2 hectares.
7. The average Canadian uses 7.5 hectares of land to support his/her lifestyle.
8. We would need almost four Earths if everyone lived like the average Canadian.



ANSWER KEY



QUESTIONS

EcoGuardians' 3rd Chronicle: EVERYBODY HAS A FOOTPRINT

The purpose of the third chronicle is to introduce the three companions to the students. A relationship is drawn between "real" footprints and the metaphoric Ecological Footprint.

Some suggested answers to the questions on page S25 are provided below.

1. The three companions are a peregrine falcon named Arial, an eastern cougar named Terian, and a leatherback turtle called Marina. Each was chosen for its specific qualities that would aid in the students' voyage. Those qualities are:

ARIAL

ability to fly
good eyesight
very fast
can bring messages quickly

MARINA

plates have clues
old and wise
patient

TERIAN

clever
hears well
listens carefully
determined

The name *Arial* means air, *Terian* means land, and *Marina* means water.

2. "Think first, then act" means that before we take action we should observe, listen and think about what we are going to do and the possible consequences. By doing this, we will not have to go back and fix our mistakes.
3. An Ecological Footprint is the impression that our lifestyle leaves on the earth. It is a measure of the amount of the land that we use to live the way we do.
4. There are 13 markings on Marina's shell. One is a shield. Three are pictures of Arial, Terian and Marina. Three are the "footprints" that each of the animals leaves. The remaining six markings are symbols. I think they are important because they provide information the kids will need to solve the puzzles.

ANSWER KEY

THE STUDENT FOOTPRINT SAMPLE SURVEY

In this exercise, students complete a sample survey to gather information that will help them assess their own Ecological Footprint. They will document their day's consumption in the five footprint areas. This survey forms the basis for all future activities in EcoVoyageurs.

The questions provided in the survey reflect the five categories of the Ecological Footprint described in the introduction to EcoVoyageurs. The data that students gather is intended to encourage understanding and appreciation of what their footprints are, and the ripple effect that footprints have on their community, and the larger communities across the globe. The survey questions may be written on the board, shown on overhead or dictated orally. The survey answers are to be recorded and placed in the EcoGuardian portfolio.

My Individual Student Footprint

1. I flushed the toilet five times yesterday.
2. I came to school today by car.

3. # OF ENTERTAINMENT DEVICES	TIME USED
CD player 2	6
Stereo 1	1
Radio 3	3
Video Game System	
Television/VCR 2	6
Computer	
Other	
TOTAL = <u>8 DEVICES</u>	<u>16 HOURS</u>

We have 8 home entertainment devices at our house and they were turned on for a total of 16 hours yesterday.

4. For lunch I ate a ham and cheese sandwich, chocolate milk, gummy bears, carrot sticks, and apple and pudding.

Meat 1	Grain Product 2
Meat Alternative 1	Fruit 1
Vegetable 1	Other 2
Dairy Product 2	

5. The garbage I threw away included a brown paper bag, wax carton, straw, plastic bag, plastic wrap, plastic container and foil lid. I did not recycle any of it.

Note: Not all survey questions may fit neatly into your school's day-to-day activities. For example, the question of eating lunch at school and the amount of garbage that this lunch produces may not be applicable if your school is one that sends students home to eat. Therefore, alternative questions should be developed that will allow for the same type of activity, but would work better for your class. For example, become a trash can for a day. Collect all the garbage students would normally throw out during a school day and analyze how much and what was thrown out.



CHAPTER 2 PART II



WHAT YOU NEED

- Copies of EcoGuardians' 4th Chronicle, pages S28-S30
- Copies of 4th Chronicle Questions, page S31
- Copies of the Data Organizer and Graphing Activities, pages S32-S37
- Copies of How Big is Your Ecological Footprint? Summary Activity, page S38
- MP3 Download

INTRODUCTORY ACTIVITY

1. 4th Chronicle Vocabulary

To help students fully appreciate and understand the chronicles, you may wish to introduce this section with this vocabulary exercise. On the day before you plan to read the chronicle in class, assign one word from the vocabulary list to each student (or group of students). Ask them to look up the meaning in a dictionary or encyclopedia, or to research it on the Internet. Students should present their word to the class, with a formal definition and a visual representation to illustrate the meaning. The definitions and pictures should be presented on the paper leaves and posted around the "vocabulary tree."

Word list	solid	patterns	challenge	scroll
	illustrate	limb	dramatic	analyze
	impressed			

2. Have the students brainstorm as a class what images the words create. Have students suggest possible storylines that might arise from these words.
3. Divide students into small groups. Assign each student in the groups several new words. Pass out copies of the EcoGuardians' 4th Chronicle and have the groups read it aloud. As the children hear one of the listed words in the story, the student responsible for the word should identify it and supply the meaning. Reassemble the class as a whole and listen to the EcoGuardians' 4th Chronicle on the download.

ACTIVITY

1. 4th Chronicle Questions. Have students discuss the questions, record their answers and place them in their portfolio. Suggestions for presenting the answers to the questions include:
 - mind map/web
 - answer questions in the student shield, page S13
 - draw cartoon/comic strip
 - summarize the story and write it on a scroll
 - interview format
 - write a letter from Solana to the kids
 - write a song or poem
2. Data Organizer. Have students get out their completed Student Footprint Surveys. Use the Data Organizer to compile the individual students' answers into class data. They can keep this in their portfolios.
3. Graphing Data Activities. Have students represent and analyze the class data using the graphing data activities.
4. Have students complete "How Big is Your Ecological Footprint?" Summary Activity.

EXTENSIONS

1. Have students design a large footprint with the title "Areas That Make up Our Ecological Footprint." Have students use the compiled class graphs to make displays that they paste onto their large footprint. The completed footprint can be posted beside the Tree of Life posters.
2. Students have only examined a small portion of their impact in each of the five footprint areas. Have them make a list of other ways they impact in each of the areas.
3. Extend the survey. Have students ask each question or similar questions included in the sample survey to other classes. Calculate a school footprint with the data.

ANSWER KEY



QUESTIONS

EcoGuardians' 4th Chronicle: THE RIPPLE EFFECT

In this chronicle, the EcoGuardians begin to appreciate the connection between their own actions and the wider circle that they impact. This story is also used as an introduction to the graphing activities that follow.

Some suggested answers to the questions on page S31 are provided below.

1. A ripple effect is when a small action can have a larger effect than what we expected. Therefore, my small Ecological Footprint, added with other small Ecological Footprints, has a very large overall effect.
2. The five tasks that the EcoGuardians are to complete to fulfil their voyage were in the envelope.
3. I think Chronos is a tall, thin, sober-looking man. He looks unhappy. I think that he is helpful to the EcoGuardians although he is not very pleasant about it. He helps them by keeping track of how much time is left for the EcoGuardians to finish their quest.

Organizing Water Data Activity – Answer Key

1. Have students get out the Data Organizer.
2. Have students represent the class water data on a bar graph using the information from the Data Organizer.
3. Have students complete the questions in the Organizing Water Data Activity.

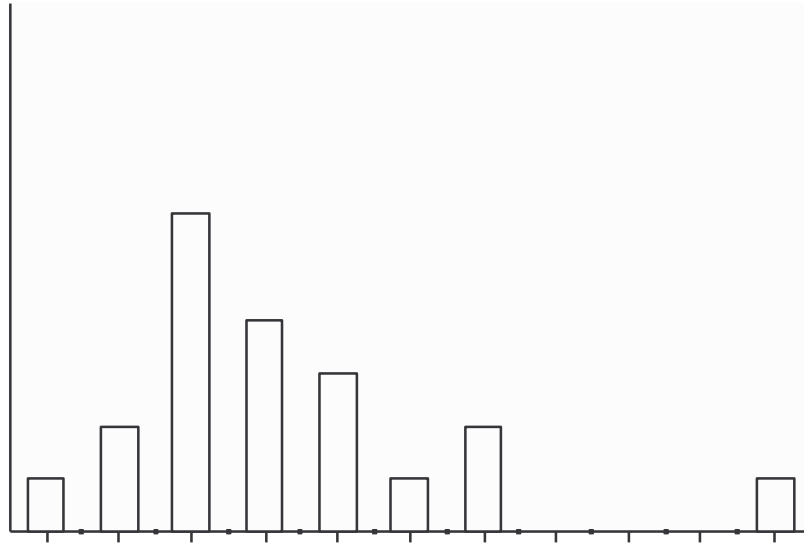
Vocabulary

- Bar Graph. A bar graph uses the lengths of bars to compare data.
- Mode. The data value that appears most often in a group.
- Median. The number in the middle of a set of data when the numbers are ordered from least to greatest or greatest to least. If there are an even number of data items, the average of the middle term valued forms the median.
- Mean. The average of all scores.
- Range. The interval from the lowest value to the highest value in a data set.
- Population. All of the members of a particular group or item.

1. # Of TIMES OUR CLASS FLUSHED THE TOILET

Number of times	Number of Students
1	1
2	2
3	6
4	4
5	3
6	1
7	2
8	
9	
10	
11	1





An example of what a student graph might look like.

ANALYZING YOUR GRAPH

1. The range of toilet flushes is 1 to 11 flushes.
2. The population sample is 20 students in my grade 8 science class.
3. The median is 4; it is the average of the 10th and 11th value of the sample of 20.
4. The mode is 3; most of the students in the group flushed the toilet 3 times.
5. The mean, or average as it is often referred to is 4.25. This is 85 flushes divided by 20 people.
6. The average toilet flush uses 23L. There are 20 students in my class x 23L for a total of 460L of water.
7. If each toilet used 1L less per flush, the class would use $20 \times 1L = 20L$ less.
8. You could use a toilet dam or plastic bottle filled with water.
9. Answers will vary. Sample: All the water we use, both indoors and outdoors, in the kitchen, washroom and laundry room ends up at a water treatment plant. There everything must be cleaned and purified so that you can use it again. Drinking water can be depleted if we continue to use ever increasing amounts of it. It increases your Ecological Footprint to use more than you need.

Organizing Transportation Data

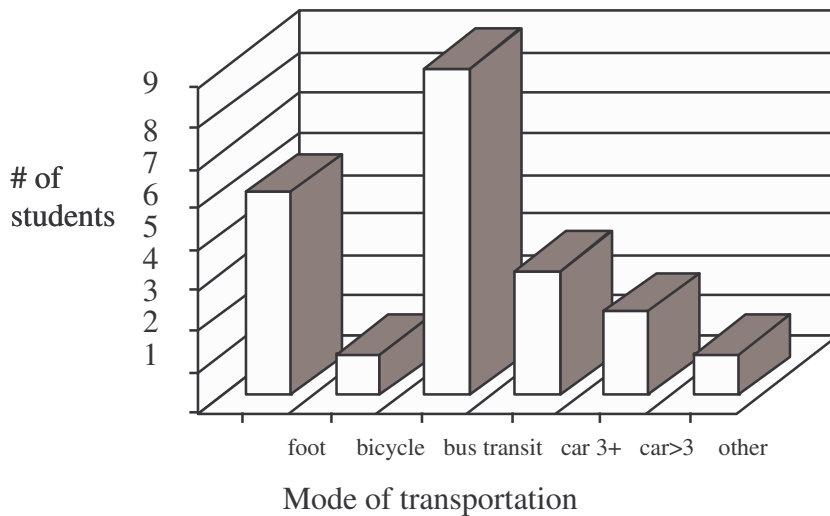
Activity Answer Key

How we get to School	# of Students
Foot	5
Bike	1
Bus/transit	8
Car (3+ people)	3
Car (2 people)	2
Other	1



1. Have students get out the Data Organizer.
2. Have students represent the class transportation data on a bar graph using the information from the Data Organizer.
3. Have students complete the questions in the Organizing Transportation Data Activity.

An example of what a student graph might look like.



**HOW OUR CLASS
GETS TO SCHOOL**

ANALYZING YOUR GRAPH

1. The range of the transportation data sample is 1 to 8.
2. We sampled 20 grade 8 science students.
3. Most students in my class come to school by bus. Thirteen people came to school in vehicles that use fossil fuels.
4. Answers will vary

An interesting concept that you might want to discuss with your students before going over their answers to these questions is the following. . .

John Whitelegg, Head of the Geography Department at Lancaster University has some interesting thoughts on the time and convenience of our modern transportation systems. In his article "Time Pollution" printed in *The Ecologist*, he states:

"Although time-savings provide the principal economic justification for new road schemes, the expansion of the road network and the increase in traffic does not seem to have given people more free time. This is because pedestrian time is not evaluated, because cars are deceptively time-consuming, and because people tend to use what time savings they do gain to travel further."

Traditionally, we only consider time spent travelling from place to place. Social speed takes into account all the costs and time spent in transport including: the average speed of the transportation, the annual cost to maintain it, the monthly net income of the vehicle owner, the amount of time needed at work to earn the yearly cost of the mode, the average social speed, and the external cost per km. When a person calculates all these costs into the transportation equation, the average social speed of a car is only 4 kph higher than biking. This does not include the environmental costs of the alternate forms of transportation.

MODE	FUN WAY TO TRAVEL?	EFFECT ON THE ENVIRONMENT	ENERGY FUEL NEEDED	SPEED	EXPENSES	COST TO YOU/YOUR FAMILY
Foot	Can talk to friends, enjoy nice weather, feel healthy, enjoy surroundings	Not much	I need food to give me energy	Slowest	FREE!	FREE!
Bicycle	Fun, can enjoy the weather, feel healthy, enjoy surroundings	Raw materials to make the bike (metals, plastic) and accessories (helmet, reflectors, etc)	I need food to give me energy	Faster than walking- maybe 15kph average	The cost of the bike and maintenance (air for the tires, safety equipment, etc.)	Time to earn the money for bicycle, its upkeep (a few weeks?)
Car (+3)	Can talk to friends if we car-pool, traffic can be frustrating, finding parking difficult, have to gas up car	Raw materials to make the car (metals, plastic, fabrics, etc.), land lost to pavement, car parking, emissions	Fossil fuels-nonrenewable resource	Fastest- 60 kph average	The cost of the car, its maintenance, gas, insurance, parking-road, maintenance, traffic policing, tolls	Time to earn the car and its upkeep, cost of gas and parking, insurance, (years?)
Bus	Can talk to friends, can read or do homework	Raw materials to make bus, land lost to pavement, bus depots, emissions	Fossil fuels-nonrenewable resource	Stop-and-go; 50 kph at its fastest	Bus fare per ride or monthly pass	

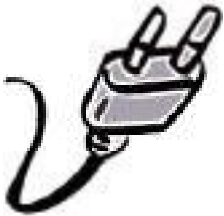
Organizing Energy Data Activity - Answer Key

1. Have students get out the Data Organizer.
2. Have students represent the class energy data on a bar graph using the information from the Data Organizer. Before graphing the data, have the students define each home entertainment device to avoid confusion (e.g., radio only, stereo system, TV/VCR and computer, etc.)
3. Have students complete the questions in the Organizing Energy Data Activity.

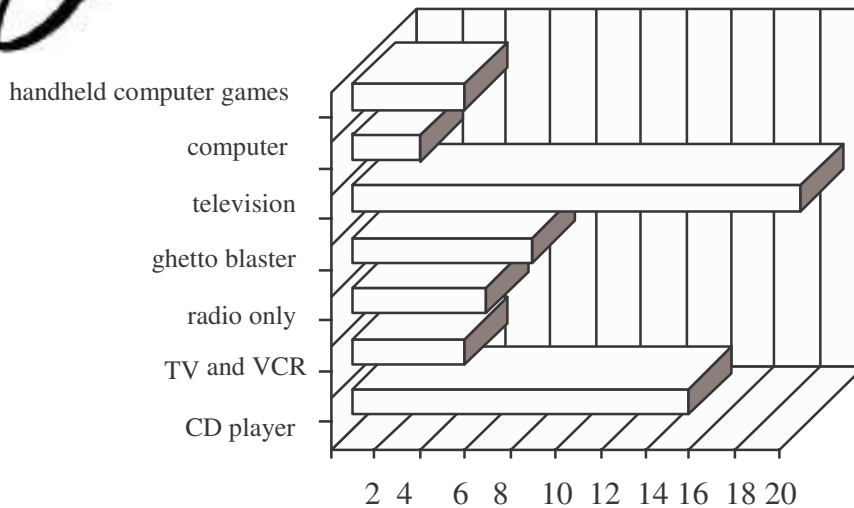
Class Energy Data from Data Organizer

HOME ENTERTAINMENT DEVICES AND HOURS USED

<u>Device</u>	<u># of Entertainment Devices</u>	<u>Time used</u>
CD Player	20	15
Stereo(record player)	4	0
Radio	30	9
Cassette Player	15	11
Television	33	19
TV and VCR	29	5
Computer	10	4
Gaming Device		
Total	141	63



An example of what a student graph might look like.



of hours class spent using entertainment devices

ANALYZING YOUR GRAPH

1. Answers will vary.
2. Answers will vary.
3. Answers will vary.
4. Have students calculate the total number of hours the class used the television, and divide it by the number of students in the classroom.
5. My choice of entertainment affects my Ecological Footprint in a number of ways. First, the more devices I have, the larger my footprint. More raw materials are needed to make the various devices, more fuel is needed to make and transport them, more packaging is needed to present them in the store and so on. Then there is also the amount of energy each device consumes as I use it. Finally, there is the waste produced every time each device is made (packaging, excess materials in production) and when it is finally disposed of. Many of the materials used in these devices are nonrenewable (metals, plastic).
6. Answers will vary.



Organizing Food Data Activity - Answer Key

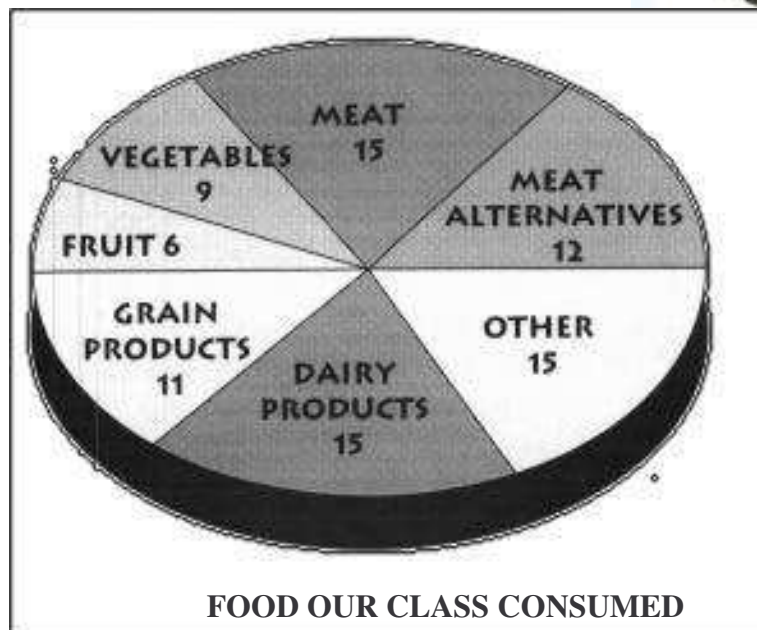
1. Have students get out the Data Organizer.
2. Have students represent the class food data on a circle graph using the information from the Data Organizer.
3. Have students complete the questions in the Organizing Food Data Activity .

Vocabulary:

- Circle graph. A circle graph represents data expressed as parts of a whole. The circle equals 100%. Each part of the circle graph is called a sector. Circle graphs are also known as pie charts.

FOOD OUR CLASS CONSUMED

	# of servings
Meat Alternatives (peanut butter, beans, tofu)	12
Meat	15
Vegetables	9
Fruit	6
Grain Products	11
Dairy Products	15
Other	15



FOOD OUR CLASS CONSUMED

An example of what a student graph might look like.

ANALYZING YOUR GRAPH

1. For the "other" category we included candy, "junk" foods like licorice and potato chips, and desserts.
2. Answers will vary.
3. I think meat might contribute to a larger Ecological Footprint. Cows and other animals that give us meat need grains and hay to feed them. Growing grains and hay uses up energy and other resources. Animals also need to eat a lot of food to produce a little meat. Foods that are frozen/dried/prepared also require more energy to change into a form that can stay on the shelf longer. Foods that require packaging use both renewable and nonrenewable materials, and thus leave a larger footprint.

Candace Savage in her book *Eat Up: Food for a Healthy Earth* notes that a chicken eats twice its weight in grain, a pig eats four times its weight and a cow eats eight times its weight in grain.²⁰ However, it is important to acknowledge that meat is a valuable food and provides vitamins, minerals and proteins that we need to stay healthy.

4. I could reduce my Food Footprint by eating less meat; eating more fresh foods; eating fewer packaged and processed foods; eating foods grown nearby so they do not have to be transported long distances; and eating foods in season so they do not have to be processed to preserve them.

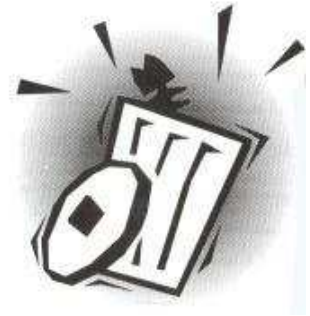


Organizing Garbage Data Activity - Answer Key

1. Have students get out the Data Organizer.
2. Have students represent the class garbage data on a bar graph using the information from the Data Organizer.
3. Have students complete the questions in the Organizing Garbage Data Activity.

Garbage our class

	Threw Away	Recycled	Reused
Plastic	16	5	
Glass	6	2	4
Metal	4	4	3
Paper		11	
Wood	4	2	
Food	4	3	
Other	1		



An example of what a student graph might look like.



ANALYZING YOUR GRAPH

1. Answers will vary. Percentage of the total pieces of garbage thrown away is calculated by dividing the highest number by the total number of pieces thrown away. Using the chart above as an example, $16 \div 35 = 45.7\%$. Note that plastic, glass, metal, paper and in some cases food can all be composted or recycled and do not need to be sent to landfills.
2. Answers will vary. Students should understand that garbage can be calculated and analyzed by weight or volume and that the two are not necessarily the same.
3. A typical Canadian throws away 150 kg of paper (both newspapers and other), 125 kg of yard trimmings, 50 kg of food scraps, 45 kg of glass, 25 kg each of metal and plastic, 15 kg of cardboard, and 10 kg of wood, disposable diapers and fine paper. The top three items that are thrown away could all be composted or recycled.
4. Answers will vary. Sample answer: I could reduce my Garbage Footprint by reducing the amount of waste I produce. There are many things I could reuse, or as a last resort compost, rather than simply throwing them away.
5. Canada produces the most kg of garbage per person per day. Answers will vary.



CHAPTER 2 PART III

What You Need

- Assembled posters
- Copies of Learning to Walk, Introductory Activity Worksheet, page S40
- Copies of Learning to Walk, Activity Worksheet, page S40
- Copies of Learning to Walk, Post Activity Worksheet, page S41

INTRODUCTORY ACTIVITY

1. Have the students complete the Part III Introductory Activity Worksheet using the assembled posters.

Answers : 1 - b; 2 - d; 3 - a; 4 - water, transportation, energy, food, garbage; 5 - four earths.

2. Discuss the answers as a class.

ACTIVITY

1. Have the students answer the questions on the Part III Activity Worksheet.

Answers: 1 - northern country, physically large, thinly spread population, consumer society, high-income country, resource-rich. . . ; 2 - having basic "needs" met, having money and time for "wants," choosing how to live. . . ; 3 - Answers will vary; 4 - Answers will vary; 5 - Yes, we don't have three additional earths for everyone to live like us; 6 - Answers will vary.

2. Discuss the answers as a class.

POST ACTIVITY

1. Have the students complete the Part III Post-Activity Worksheet.

Answers: 1 - the land required to support a person's lifestyle forever; 2 - d 7.5 hectares; 3 - water, transportation, energy, food, garbage; 4 - b;

5 - e.

2. Discuss the answers as a class.

