Lesson: Classroom Trash Audit

Grade: 4-5
Subject: Math, Science
Objectives:

- define, give examples of, and sort waste
- identify the amounts of solid waste produced by individuals and groups

Teaching Time: 15 minutes introduction; return to lesson at the end of the day or the following day for about 35 minutes

Materials: 1 large garbage bag per student; large plastic or paper tarp; transparency, What's In Our Garbage?; worksheet, Garbage Audit and If Bagging Trash is Your Game; bathroom scale; gloves

(Optional:) A five gallon bucket to estimate the volume of materials sorted; video: *"Time's A Wasting: Garbage and Recycling in Oregon"* (see Resource section for availability)

Background

If students are going to help solve the garbage (waste) problem, they first need to understand the size of the problem. Throwing away a single gum wrapper or banana peel doesn't seem very important, until we see the cumulative impact of everyone's combined trash over a period of time. By performing a classroom or school wide waste audit, students will gain the necessary perspective to realize that everyone's individual waste contributes to solid waste management problems.

In this exercise, students will collect their own personal garbage for an entire day. Another option for this lesson is to assign your class as a team to collect representative samples from the school's waste bins. By performing a school waste audit, you can qualify to become an Oregon Green School. For details visit the Oregon Green School web site at www.oregongreenschools.org. Read about the Oregon Green Schools Association in the Teacher Resource section. You may also want to use Oregon Green Schools Tools as an additional resource for this lesson available at: www.deq.state.or.us/wmc/solwaste/edu.html.

Procedure:

INTRODUCTION

- **Who can tell me what garbage is? What is waste? Waste (garbage, trash) is material thrown away because it is worn out, used up, or no longer needed.**
- **Can anyone tell me some examples of waste.** Note: one person's garbage may be another person's treasure!
- **Let's see what kind of waste we make. Today you will be putting all of your garbage in your own personal trash bag. We will NOT be using the class garbage can (or recycling box). Remember, all of your waste goes in your bag.** Hand out a bag to each student. You may wish to cover the classroom garbage can and recycling box. Students should be told to take their trash bag to the cafeteria, too. You might tell students to collect DRY materials only, or use a separate plastic bag for food scraps, if desired. CAUTION: NO SHARP ITEMS OR BATHROOM WASTE.
- Ask the class to hypothesize which type of material will be present in the greatest amount at the end of the day.

END OF DAY

- **Let's look inside of our garbage bags and see what we have.** Get examples from students of what they have thrown away.
- Individually or as an entire class, sort and tally the number of pieces of garbage. Use Garbage Audit sheet for this activity.
- **What do you notice from doing the garbage audit?** Students should notice how much garbage is thrown away at school, and what types of things are thrown away.
- **How large will the pile be if we do this all week? All year?** (Get students thinking in terms of volume.)

- **How much do you think your trash weighs?** Weigh the individual bags or dump the trash on a tarp, pull it together and weigh it as one pile. **How much would a week's supply of garbage weigh? A year?** Do the calculations to find the answers!
- Show transparency, "What's in Our Garbage". **How does our garbage compare to what all of Oregon throws away?** You may fill in the data for Oregon on the picture of the garbage can.
- Have students identify the largest proportions of the trash—by weight and by volume—is there a difference?

Reflection/Response:

- Have students answer questions at the bottom of the Garbage Audit.
- **What would happened if there really was no place to throw our trash? What could you do to make less waste?**
- Have students write an imaginative essay about a make-believe town that no longer could collect its citizen's trash. Students should include what caused the problem and how the people tried to solve it.
- Assign the worksheet "If Bagging Trash is Your Game".

Extensions:

- Show video: "Time's A Wasting." Have students discuss what they saw in the video, especially the people making deliberate purchasing choices at the end of the video in order to create less garbage.
- Assign the Extension Lesson: "Take Home Trash Audit" or extend waste collection time and post results for a week or a month. Complete the weighing activity at the end of each day.
- Repeat this lesson after you complete several other lessons in this book. See if students are able to reduce the amount of waste generating by trying the suggestions they learn about reducing, reusing, and recycling.

Oregon Benchmark Standards:

Mathematics: Measurement; Statistics and Probability

- Read, construct, and interpret displays of data using appropriate techniques and technologies (e.g., charts, graphs, tables).
- Select the appropriate standard and nonstandard units and tools of measurement to measure to the degree of precision and accuracy desired in particular situations.
- Generate, compare, and analyze data to draw inferences and make predictions, using experimental and theoretical probability.

Science: Scientific Inquiry

- Formulate and express scientific questions and hypotheses to be investigated.

Grade 5 Benchmark:

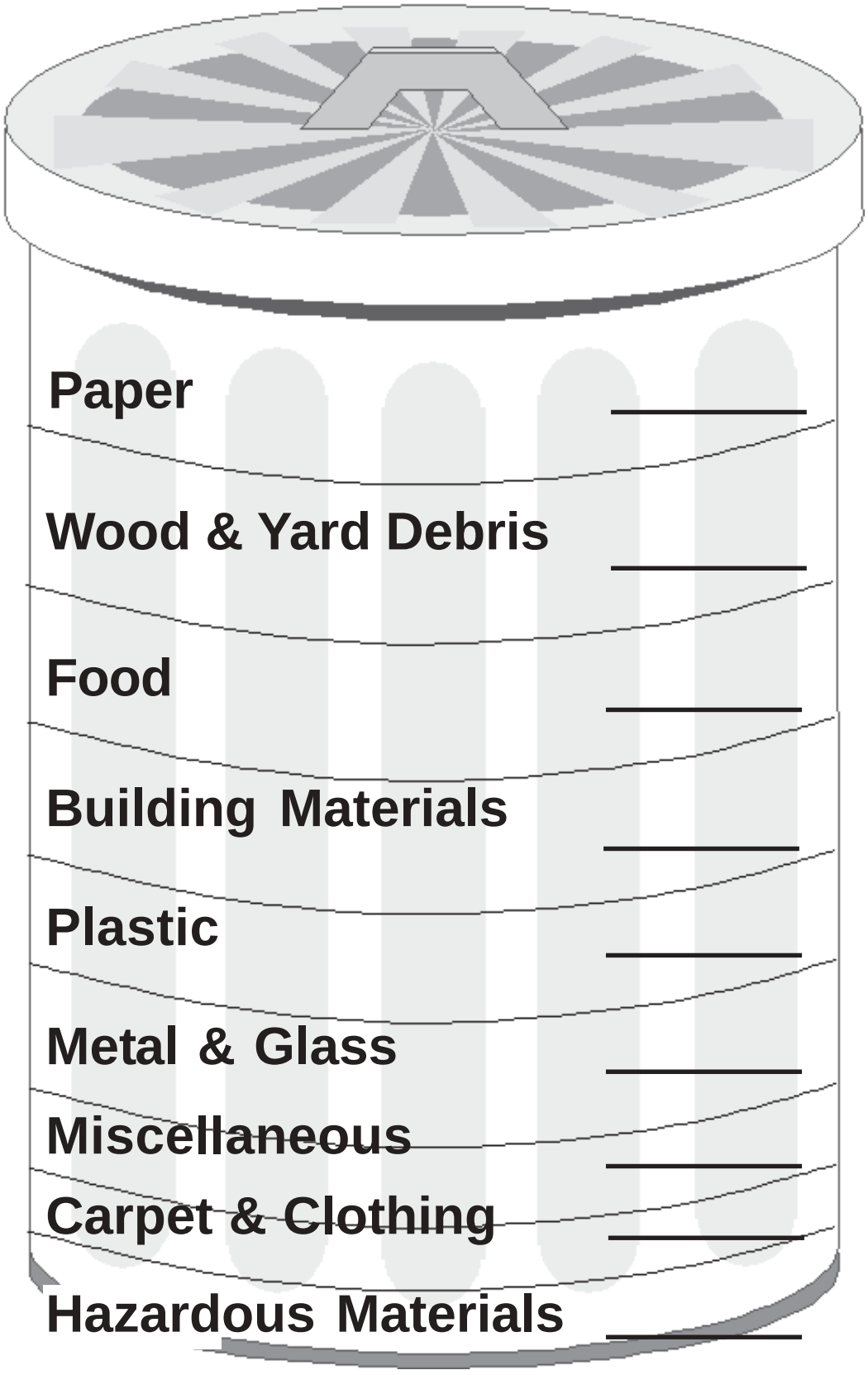
- Formulate and carry out simple experiments and simulations. Collect and analyze data using measures of central tendency.
- Select the appropriate units and tools to measure length, perimeter, weight, area, volume, time, temperature, money and angle.
- Collect, organize, display, and analyze data, using number lines, bar graphs, line graphs, line graphs, circle graphs, stem and leaf plots, and histograms.
- Ask questions and make predictions that are based on observations and can be explored through simple investigations.
- Analyze data to determine possible questions for further investigation.

1999 Data from the Oregon Department of Environmental Quality on Waste Composition:

Paper 24%
Wood and Yard Debris 16%
Food Waste 14%
Metal and Glass 10%
Plastics 10%
Building Materials 10%
Miscellaneous 9%
Carpet and Clothing 6%
Hazardous Waste 1%

To find updated statistics visit the Solid Waste website: http://www.deq.state.or.us/wmc/solwaste/rsw.htm or contact the Solid Waste Education staff at 503-229-5913 or 800-452-4011.

Overhead: What's In Our Garbage?



Worksheet: Garbage Audit

Name or Class or School_____

Area of Audit (check one)

☐ Classroom ☐ Staff Room or Office ☐ Cafeteria ☐ Kitchen ☐ Other_____

Instructions: Students should appreciate that individual garbage may be only a small amount. However, this garbage must be combined and total weights and volumes will be recorded so that you may calculate daily/weekly/monthly/yearly amounts for your class, your school or per person. Combine all individual bags into one large bag. If you are auditing a large area, weigh each container for the area.

Total weight of garbage including container or person's body weight _____**lb.**

Subtract the weight of the empty container or person's weight _____**lb.**

Total weight of garbage _____**lb.**

Total volume of the garbage _____**gal.**
(estimate based on the fullness of the bag or container)

Total weight of the garbage that is recyclable _____**lb.**

Waste Composition--What's in the Can?
(To do an in depth audit, you will need to classify materials into types under each category. For example, Paper: writing, brown bags, cardboard, etc.)

Material Type	Weight		Number of Items	Volume	
	Pounds	%Total		Gallons	%Total
Paper					
Plastic					
#1					
#2					
Other					
Metal					
Aluminum					
Other					
Glass					
Bottle Bill (deposit)					
Other					

Worksheet: If Bagging Trash Is Your Game

If Bagging Trash is Your Game, This Match is for You.
Match each word on the left with the phrase that best describes it.

Trash	_____	A. To find a new use for something instead of throwing it away.
Litter	_____	B. A recyclable material made from trees.
Reuse	_____	C. To buy less and to throw away less trash.
Natural Resources	_____	D. Leaves and grass clippings that are broken down by natural forces and can be used on gardens.
Landfill	_____	E. Our garbage, all the things we throw away.
Recycling	_____	F. Trash that is in the wrong place, such as on the ground or in the street.
Aluminum & Tin	_____	G. Damage to the environment from chemicals or other human activities.
Paper	_____	H. Metals that are made from minerals in the ground.
Reduce	_____	I. A special place in the ground where trash is buried.
Compost	_____	J. Things that are found in nature such as air, water, trees, minerals that we use to make energy and to help us make other things.
Pollution	_____	K. A process that makes something new out of something old.

Extension: Take Home Trash Audit

Grade: 4-5
Subject: Math
Objectives:
Students will:

- estimate the amount of waste they personally create
- calculate the amount of waste they can save from landfills and incinerators if they recycle at different rates

Teaching Time: daily 10 minutes; wrap-up lesson 40 minutes at the end of the week

Materials: worksheet, How Much Waste Do I Create?

Background:

Before students can begin to understand the need for waste reduction and recycling, it is necessary first to understand the magnitude of the waste problem. The impact of a home waste audit is one of the most personal for students—it will allow students to calculate a per person average for garbage generation and recycling in their homes and is a very good math exercise.

Before completing the handout in this lesson, let students know that if their families do not recycle to enter zero in the spaces provided. Explain that not everyone in the same community has the same access to recycling in some parts of Oregon and that other families may choose not to participate for one reason or another. (For example, in some areas, people may only have recycling at curbside if they own a home, but not if they live in apartments, or in other areas people may have to drive their recycling to a facility in order to recycle).

Procedures:

- **How much trash do you through away each day? Each person in the United States makes about four pounds of waste each day. This amounts to 3/4 of a ton per year. Do you think this is true for you?**
- Tell students they will weigh waste at home for one week and complete the worksheet, "How Much Waste Do I Create?" and by the end, they will be able to estimate how much waste they create every day.

Reflection/Response:

- When students are finished with their worksheets, have them bring them to class and compare the amount of waste created in different households. Note that you are creating a "data set". All the numbers vary from family to family depending on what they were doing that particular day.
- Calculate (or ask students to calculate) the average amount of waste generated in one year for the entire class. Now calculate the amount created per person/day. **Is this number the same or different from your individual calculation? What happens when we take a large data set and average the numbers together?**
- Now create a data set for the class on the percentage of waste that they recycle (from question 10). Envision different scenarios and do the calculations for the students, (e.g., if a person is recycling 10%, how many more materials would they conserve if they recycled 20% or 35% or 50%). Use the class average for percentage recycled to create hypothetical improvements.

Oregon Benchmark Standards:
Common Curriculum Goal:
Mathematics: Measurement

- Describe, estimate, and use measures of length, perimeter, weight, time, temperature, money, and capacity.

Mathematics: Calculations and Estimations

- Demonstrate conceptual meanings for addition, subtraction, multiplication, and division.

Grade 5 Benchmark:

- Measure length, perimeter, weight, area, volume, time, temperature, and angle using standard and nonstandard units of measurement.
- Perform calculations on whole numbers, fractions, and decimals using paper and pencil and calculators.

Worksheet: How Much Waste Do I Create?

Dear Parent(s): Your child is currently learning about natural resources, solid waste issues and the environment. Part of the lesson includes helping the student understand their household's and their individual contribution to generating waste. Most of the calculations required on this worksheet are simple subtraction, addition, multiplication and division problems. However, the numbers may be larger than your child is used to working with, so guiding your child through these calculations may be necessary. Also, your help setting up the exercise is appreciated (see question #1). If you do not have a weight scale in your house, please estimate the weight of your trash and recycling for your child.

1. Weigh every bag of household trash that was generated over a one week period of time. (If possible, empty all the bags out and start from zero, then weigh the total household trash at the end of seven days).
   Hint: You can weigh the trash by weighing yourself on a bathroom scale first, then weigh yourself while holding all the trash in one bag. If your family has more than one bag, do this for each bag. Now, subtract your weight from the weight of you and the trash bag. This is the weight of the trash only. Do this for each bag, if you had more than one, now add all the weights of the trash bags together to get the total.

   Enter your household trash weight here:_____

2. Multiply the total for one week by 52 weeks in one year to find the amount of trash your family generates in one year:_____

3. Part 1. If you bag your leaves or grass, multiply the weight of one bag (about 40 pounds) times the number of bags you throw out in I year. (Use a rough estimate if you cannot remember).

   _____

   Part 2. Do your leaves and grass get collected separately from the trash by your garbage company or collected separately at the drop off station or dump?* (YES or NO)
   Note: if you live in apartments, condos, or other residence where your green waste is taken care of by a business gardening service, you will not count green waste as part of your recycling or garbage.

4. Weigh one week of recyclables. (Aluminum, steel, newspaper, plastic, glass, cardboard--whatever you recycle--using the same method as in step number one).

   The weight of our household's recycling for one week is:_____

5. Multiply the answer in #4 times 52 weeks in one year to find how much your household recycles in one year:_____

6. Add the answers for 2 + 3 + 5 to find out how much TOTAL waste (including recycling) your household generated for one year._____

**If you answer yes, this number gets counted as part of your household recycling rate because your yard waste is being collected for composting. If you answer no, this number gets counted as part of your landfilling or incineration rate.*

7. Divide #6 by the number of people in your household. This is the average waste you created or GENERATED in I year per person._____

8. If you answered “no” to the second part of #3, then add the answers for #2 and #3 together.

   _____

   Now divide the number above by the number of people in your household. This is the average waste you create per person which goes to the landfill or incinerator in 1 year.

   _____

   If you answered “yes” to the second part of #3, then divide the answer from #2 by the number of people in your household. This is the average waste you create per person that goes to the landfill or incinerator in one year.

   _____

9. If you answered “yes” to the second part of #3, then add the answers for #3 and #5 together.

   _____

   Now divide the number above by the number of people in your household. This is the average waste you create per person which is being recycled in one year.

   _____

   If you answered “no” to the second part of #3, then divide the answer from #5 by the number of people in your household. This is the average waste you create per person which is being recycled in one year._____

*THESE ARE NATURAL RESOURCES THAT YOU HAVE CONSERVED!

10. What percentage of the waste you create in one year do you recycle?

    (Divide the answer of #9 by the answer in #7)_____

11. Bonus: Can you calculate how much trash you generate every day?

    (Hint: Use the answer in #8 and divide by the number of days in one year.)

    _____

Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum. Edited by Oregon Department of Environmental Quality.*