

Plastics Investigations Unit

Grades K-5

Grade Level:

Grades K-5

Concepts Taught:

Sorting/grouping objects, personal expression through poetry, recognizing sight words, graphing, density, temperature

Activity Time(s):

PLEASE NOTE: The activities contained in this lesson packet can be:
 Conducted as a unit: 4 periods of 30 minutes each
 Conducted individually: 30 minutes per lesson

Unit Essential Questions:

- Where can I find plastic in the everyday world around me?
- What is plastic made of?
- How are plastic items different?
- Why is there numbers on the bottom of some plastics?
- How is each number plastic different from another?
- What are the properties of plastics? How are they similar? How are they different?

NCCore/Essential Standards:

Kindergarten: Reading Foundational Skills Std 1, 2,3; Writing Std 2, 3; Science Standards K.P.2.1, K.P.2.2; Math Standards K.CC.4.1—K.CC.7; K.MD.1—K.MD.3; Science K.P. 2.1-2.2

Grade One: Reading Standard 1, 3,7; Writing Std 3, 5; Science Standards 1.E.2.1; Math Standards 1.MD.4, 1.G.1

Grade Two: Writing Standard 2, 5, 6; Speaking & Listening Std 1,6; Math Standards 2.MD.3, 2.MD.1

Grade Three: Reading For Informational Text Std 7; Writing Std 3, 4,5,10; Language Std 3; Math Standards 3.MD.2—3.MD.4;

Grade Four: Writing Standards 1-5; Speaking & Listening 6;; Language Std 1, 3; Math 4.MD.4; Science 4.L.1.1, 4.L.1.3;

Grade Five: Writing Standards 1—5;

Unit Objectives:

- Students will name which kinds of plastics can be recycled at their school.
- Students will sort and identify plastics by their number.
- Students will recognize that plastics can be found in our homes and at school.
- Students will investigate some of the properties of plastics.

Materials:

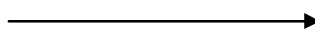
Lesson 1: *Plastics Poetry*—“Puppy” cinquain; copies of cinquain graphic organizer sheet for each student; one plastic item per student.

Lesson 2: *Plastics Sight Words*- Plastic items collected from students; number and color sight word cards (below), counting worksheet (included), Unifix cubes (optional).

Lesson 3: *Living Bar Graph*—Masking tape; plastic items collected from students; graphing sheet (below).

Lesson 4: *Properties of Plastics*- Pieces of cut up plastic bottles number 1-7; container of water for each student group; prediction worksheet; aluminum foil; #1 2-liter plastic soda bottle with cap; #2 1-gallon milk jug; hot tap water; 4 thermometers; Styrofoam coffee cup; 1-liter plastic bottle with the neck cut off; paper cup; plastic picnic-style disposable cup; pieces of fabric-OPTIONAL (fur, flannel, silk, cotton, synthetic fabrics).

Preparation: Ask students to bring in different numbered plastic items from home. These should be collected by the teacher and kept aside until the day of the lesson. Please be aware that you will likely receive more 1’s and 2’s since they are the most prevalent type. Have examples of numbers 3-7 in case those are not collected and brought in. Students should not bring in items that may be dangerous, such as motor oil containers.



Examples:

- One (PETE): soda bottle
- Two (HDPE): milk jug
- Three (PVC): coffee container, cooking oil bottle, shampoo bottle
- Four (LDPE): mustard container
- Five (PP, say "double P"): yogurt tub, syrup bottle, ketchup bottle
- Six (PS): coffee cup, some plastic flowerpots
- Seven (Other): mixed plastics containers, detergent bottles

Lesson 1: Plastics Poetry

Grade Level:

Grades K-5

Concepts Taught:

Sorting/grouping objects, personal expression through poetry

Essential Questions:

What is a cinquain poem?

Activity Time:

20-30 minutes

NCCore/Essential Standards:

Kindergarten: Science Objective K.P.2.1, K.P.2.2

Grade One: Reading Standard 1, 3,7; Writing Std 3, 5;

Grade Two: Writing Standard 2, 5, 6; Speaking & Listening Std 1,6;

Grade Three: Writing Std 3, 4,5,10; Language Std 3;

Grade Four: Writing Standards 1-5; Speaking & Listening 6,; Language Std 1, 3; **Grade Five:** Writing Standards 1—5;

Materials:

"Puppy" cinquain (below); copies of cinquain graphic organizer sheet for each student; one plastic item per student.

Objectives:

Students will collaborate as a class to create a type of poem called a cinquain to describe a plastic item.

Procedure:

Students can choose from items such as a plastic bottle, plastic fleece, plastic ruler, or others. According to your grade level, you can simply write the poem as a class and count out syllables or look for patterns in the words, or write a class poem as well as individual poems.

1. Explain to students that a cinquain is a poem that has five lines and does not rhyme.
2. The structure of the poem is:

First Line: One-word title (noun)

Second Line: Two descriptive words (adjectives)

Third Line: Three words that express action (verbs)

Fourth Line: Four words that express feeling

Fifth Line: One word that is a synonym or reference to the title in line 1.

3. Review parts of speech included in the poem: nouns, adjectives, verbs, adverbs, synonyms if appropriate.
4. Review the "Puppy" cinquain with students, classifying each word as one of the parts of speech as appropriate or with younger students, clap out the syllables in each line.
5. Using a plastic bottle as the subject, have students brainstorm words for Line 1, writing their suggestions on the board or an overhead. Continue brainstorming for all five lines, making sure to count out syllables for each word.
6. Select the appropriate number of words from each line of suggestions to create a model cinquain.



Lesson 1: Plastics Poetry Continued...

Extensions for Grades 3-5

For older students, use the "true" cinquain format:

First Line: One-word title, two syllables

Second Line: Two descriptive words, four syllables total

Third Line: Three words that express action, six syllables total

Fourth Line: Four words that express feeling, eight syllables total

Fifth Line: One word that renames title, two syllables

Using the same poem, students should use a thesaurus to choose replacement words for the words in their poem. Instruct students to continue to be mindful of the number of syllables required in each line.

Divide students into groups to inspect different areas of the classroom. Students should sit in one location and without getting up, record all objects that are made of plastic.

Write a haiku that describes how plastics are everywhere

Name _____

Cinquain Poetry

A cinquain is a five – line poem that describes a person, place, thing, or animal.



Puppy
Fluffy, Playful
Jumping, Barking, Running
Always makes me laugh
Pet

Use the boxes below to write your own cinquain.

What is your poem about? (one word)

Write two words that describe it.

Write three words that describe something it does.

Write four words that describe how you feel about it.

Write one word that renames your poem.

Lesson 2: Plastic Sight Words

Grade Level:

K-2

Concepts Taught:

matching, basic numbers 1-7

Activity time:

Center activity: 10-20 minutes

Essential Questions:

- What do the numbers on plastic containers mean?
- How do I spell/write numbers?
- What does matching look like?

NCCore/Essential Standards:

Kindergarten: Writing Std 2, 3;
Math Standards K.CC.4.1—
K.CC.7; K.MD.1—K.MD.3

Science K.P.2.1—2.2;

Grade One: Math Standards
1.MD.4, 1.G.1

Grade Two: Math Standards
2.MD.3, 2.MD.1

Materials:

Plastic items collected from students

Number and color sight word cards
Unifix cubes (optional)



Objectives:

students will match color and number words as they correlate to the number on a plastic object. (This lesson uses numbers commonly found on plastics)

Preparation:

1. Arrange different-numbered plastic containers for students at their center.

One: soda bottle

Two: milk jug

Three: coffee container, cooking oil bottle, shampoo bottle

Four: mustard container

Five: yogurt tub, syrup bottle, ketchup bottle

Six: coffee cup, some plastic flower pots

Seven: mixed plastics containers, some detergent bottles

2. Encourage students to look for the three-arrow recycling symbol with number.

3. Have students match the number they find with the appropriate sight word card (use cards below).

4. Show students that plastics can be many different colors, no matter what number they are. Have students match the color of the plastic item with the appropriate sight word card (use cards below).

5. Students can also use the worksheet below to count items and write the appropriate number word.

Extensions:

Have students draw pictures of an imaginary bottle for numbers 8-10 and make their own word card.

Have students count plastic Unifix cubes and match to word cards.

one

two

three

four

five

six

seven

orange

black

brown

yellow

red

blue

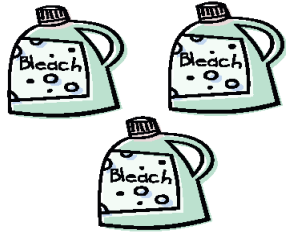
green

white	purple

Name _____

Count the  .

Write how many. Use words.



three



Lesson 3: Living Bar Graph Activity

Grade Level:

K-5

Concepts Taught:

Identification, bar graphing

Activity Time:

15-20 minutes (lesson)

10 minutes (follow-up activity)

Essential Questions:

- What are the different types of plastics?
- What are the numbers on plastics used for?
- What type of graph can be used to display differences in results?
- Which plastics are used more often? Less often?
- Can all plastics be recycled? Why or why not?

NCCore/Essential Standards:

Kindergarten: Math K.MD.3

Grade One: Math Standards 1.MD.4, 1.G.1;

Grade Two: Math Standards 2.MD.3, 2.MD.1

Grade Three: Reading For Informational Text Std 7; Writing Std 4; Math 3.MD.2—3.MD.4;

Grade Four: Math 4.MD.4;

Grade Five: Math 5.G.1

Materials:

Masking tape; plastic items collected from students; graphing sheet (next page).

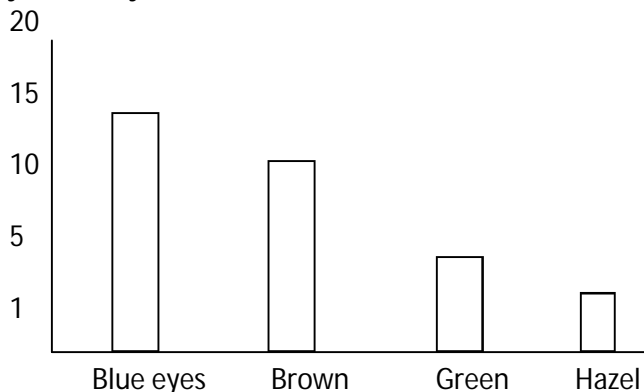


Objectives:

- students will identify the seven types of plastics and sort them by arranging a “living human bar graph”.
- Students will discuss differences and similarities in the plastic types using the bar graph as a visual aid.

Procedure:

1. Review graphing by asking each student to call aloud his or her eye color.
2. Instruct all students to keep track of each response by making tally marks or other techniques.
3. Discuss different methods students used to collect data: tally marks, numbers, etc.
4. Explain that using a bar graph is one way of displaying information in an organized way.
5. Make a sample bar graph on the board or on a transparency of the eye colors.



1. Explain to students that bar graphs are a way to count numbers of different things.
2. Using a line drawn on the floor or a piece of masking tape, create a “baseline” or x-axis with the numbers 1-7 so that students can use their bodies to create a bar graph. Use page 42 from the NEED book [Trash Flipbook](#) or the information located in the background section to identify common items with the different numbers.
3. Give each student a piece of plastic with a different number. The numbers on plastic are usually found on the bottom of the container inside the three-arrow recycling symbol.
4. Have students stand in a line at the number that matches their container.
5. Have students in each line count off and record numbers.
6. Ask students questions about the graph while still standing:

Which line is longest? Shortest? Did any lines have the same number?

7. Have students return to their seats and use the worksheet below to graph the data generated by the activity if appropriate for their level.

Extensions for Grades 3-5:

1. Have students make another bar graph using favorite colors or foods of students.
2. Students can make Venn Diagrams using certain characteristics of plastics such as color, presence of a neck on the bottle, etc.
3. Discuss which plastics were easiest to find in the classroom and at home. Why do you think this is?
4. Have students create another graph of favorite colors, foods, etc. using different colors of construction paper for the bars. Discuss how graphs visually depict data and the importance of neatness and simplicity in making a graph.

All About Plastics

Student Graphing Sheet

Name _____



1. Shade in the boxes below to show how many of each kind of plastic you saw today.

2. Answer the questions below.

eleven							
ten							
nine							
eight							
seven							
six							
five							
four							
three							
two							
one							

Kinds
of
Plastic

Lesson 4: Properties of Plastic

Grade Level:

Grades 3-5

Concepts Taught:

Density, heating/cooling

Activity Time:

30 minutes

Essential Questions:

- What is a property in science?
- What are some properties of plastic?
- How might the effect of a refrigerator or a microwave have on plastic containers?
- Can plastic float? Sink?
- How might plastic effect oceans, streams, lakes, or rivers?

NCCore/Essential Standards:

Grade Three: Math Standards 3.MD.2—3.MD.4; **Grade Four:** Math 4.MD.4; Science 4.L.1.1, 4.L.1.3

Materials:

Pieces of cut up plastic bottles number 1-7
 1-container of water for each student group
 prediction worksheet
 aluminum foil
 #1 2-liter plastic soda bottle w/ cap
 #2 1-gallon milk jug
 hot tap water
 4 thermometers
 Styrofoam coffee cup
 1-liter plastic bottle with the neck cut off
 paper cup
 disposable plastic party cup
 pieces of fabric-OPTIONAL (fur, flannel, silk, cotton, synthetic fabrics)

Objectives:

students will investigate how different numbered plastics have different properties: such as the ability to sink or float; the ability to change shape or be malleable when heated and insulated.

Procedure:**Sink/Float display:**

1. Using some common objects found in the classroom and a clear container filled with water, demonstrate that some objects sink and some float. Those that have a greater density than water will sink and those that have less density than water will float. Plastics also behave the same way. Show students the cut up pieces of plastic. Explain to students that some of these plastics will sink and some will float. Using the attached chart, have students predict which pieces will sink and which will float. Allow students to examine the plastic in small groups.

a.#1: sinks

b.#2: floats

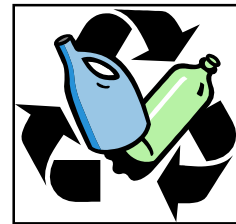
c.#3: sinks

d.#4: floats

e.#5: floats

f.#6: sinks if condensed (party cups, etc.); floats if "expanded" (polystyrene coffee cups, etc.)

g.#7: some will sink and some will float since it is an unpredictable mixture of plastics



2. Put all plastic pieces in the water and record observations.

3. Have students answer the questions on the sheet.

Heating and Cooling:

1. Explain to students that when heat is applied to substances, they can change state. When heat is applied to ice (a solid), it will melt into liquid water and will remain a liquid at room temperature. When wax is heated by the wick of a candle, it melts from a solid to a liquid. However, when it is allowed to cool at room temperature, it returns to a solid.

2. Plastics behave more like wax when heated. To demonstrate this, pour hot water (as hot as your tap allows) into a clean, empty, 2-liter soda bottle. Fill $\frac{3}{4}$ full and cap. Using gloves, demonstrate to the students that the bottle becomes more flexible when it is heated

All About Plastics

by gently squeezing the sides of the bottle.

3. Note that the plastic used in the above step was a number 1 plastic bottle.
4. Repeat the same experiment using a plastic milk jug, a number 2 plastic. Allow students to predict the results. The milk jug will not become as malleable when hot water is added.
5. Continue this line of thinking by arranging four containers for the students: a Styrofoam coffee cup, a 1-liter plastic bottle with the neck cut off, a paper cup, and a plastic picnic-style disposable cup.
6. Using hot tap water, fill each container with 50 mL of water. Immediately put a thermometer in each container and record the temperature.
7. Using the worksheet, have students predict which container will be the best insulator after 15 minutes and write one sentence to explain their reasoning.
8. During the 15-minute wait time, discuss with students the transfer of energy that occurs when something cools.
9. After 15 minutes, note the temperature in each container for students.
10. Have students complete the data collection and answer the critical thinking questions.
11. Discuss with students how to increase the insulation value of different plastics. They could wrap material around each one (fur, flannel, silk, cotton, synthetic fabrics) and retest results. Also, they could stack the cups in different ways to increase heat retention. Retest ideas if desired.

Extensions for Grades 3-5:

1. Discuss with students how the shape of an item can affect its ability to float or sink. Demonstrate with an empty soda bottle with the cap on. Why does it float? Now take the cap off and fill it with water? Why does it sink?
2. Have students use pieces of aluminum foil and make "boats" that will float.
3. Discuss why floating litter would be a problem for aquatic animals.
4. How would the plastics behave if the water was very salty (like the ocean)? To test this, add several heating tablespoons to the water and stir well. Retest plastics.
5. Discuss how to keep warm on a cold day. What kind of clothes do we wear? Investigate animals that must have insulation. How do you think they would adapt to a warmer climate considering the amount of insulation they have? How do humans adapt to a warmer climate?

Name _____

Will it Float?

	Kind of Plastic						
	1	2	3	4	5	6	7
Do you think it will float? Write yes or no.	yes						
Did it really float? Write yes or no.	no						

Name _____

Will it Float?

	Kind of Plastic						
	1	2	3	4	5	6	7
Prediction: Will it float							
Results: Did it float or							

- Which pieces float: number 1 or number 2? _____
- How many of your predictions were correct? _____
- Did number 3 plastic sink or float? Why? _____

Which cup insulates best?

	Plastic bottle	Coffee Cup	Paper Cup	Picnic Cup
Prediction: Put a check under which cup you think will keep the water warmest.				
Starting temperature				
Temperature after 15 minutes				

- Which cup was the best insulator (kept the water warmest)? _____
- Which cup was the worst insulator (did not keep the water warm)? _____
- What was the difference in temperature between the best and worst insulator? _____
- What is one way you could help the picnic cup keep the water warmer? _____