Recycling Plastics

OBJECTIVES:

Students will:

1. identify and sort a variety of plastic products and distinguish which types can be recycled in their community.
2. observe and describe the properties of different types of plastic.
3. list ways to reduce or reuse plastics that cannot be recycled.

STANDARDS: Science

SKILLS: Analysis, classification, description, problem solving

SETTING: Homework assignment and Classroom

TIME:
Classroom: 50 minutes
Homework: 10 minutes

VOCABULARY:
Petroleum
Plastic

Introduction

Overview:
In this lesson, students will learn about different types of plastic by collecting and examining examples of plastic from home. They will identify the seven different types of plastic, observe and record the properties of each plastic type, and research which types they can recycle in their community.

Teacher Background:

Today, most plastic is made from natural gas and crude oil; both are classified as nonrenewable resources. Plastics are made by linking tiny molecules together in long, repeating chains, which form polymers. Plastic makes up a growing portion of the products we use every day ranging from food packaging and beverage bottles to the outer shells of TVs, boats, and automobiles.

Different polymers make up different types of plastic. Each type can be categorized based on observable properties unique to that type of plastic. The plastic industry has developed an identification system to label and divide plastic into seven groups with different properties using a number code on the bottom of the container. Some plastic types are flexible; others are rigid. Some plastics are translucent, transparent, or opaque, and many have different densities. Each type melts at a different temperature. These properties determine various uses for different types of plastic.

Most plastic is recyclable in theory, but many types of plastic are not economical to collect for recycling. In addition, the properties that make plastic useful also make it a difficult waste item if it is not recycled. Reducing the need for and purchasing of plastic products conserves nonrenewable natural resources as well as other resources used during the extraction of fossil fuels (crude oil and natural gas). It also helps prevent a common source of litter and pollution in the environment.

Materials:

Students:

- ❑ At home: bring examples of different types of plastic, e.g., bottles, wrappers, packaging pellets, cups, etc.
- ❑ "Types of Plastic" handout (one per student)
- ❑ StopWaste.Org *Recycling Guide* (one guide per pair of students)
- ❑ "Plastics at Home" worksheet

Teacher:

- ❑ Examples of different types of plastics (water bottle, detergent bottle, yogurt container, plastic bag, etc.)
- ❑ "Types of Plastic" handout overhead
- ❑ Rubric overhead
- ❑ Rubrics (one per student)

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Preparation:

Call to request a set of StopWaste.Org *Recycling Guide*s at the Recycling Hotline at 1-877-786-7927 or at **www.StopWaste.Org**. Begin collecting examples of different plastic types several days before lesson.

Assign students to bring in a variety of plastic items from home the day before the lesson.

Be prepared to put students in pairs for part of the activity.

You may need to collect and redistribute plastic items to each pair of students.

ACTIVITY

Discussion

1. Ask the students to describe how they use plastic at home or school.

2. Have students state why they think some plastic items can be used many times, while others must be disposed of after one use. For example, plastic baggies are not as rigid as a reusable plastic container.

3. Describe how different types of plastic have different characteristics or properties such as being rigid or flexible.

4. Show an overhead of "Types of Plastic." Explain to the students the different types of plastic. Show students examples of each type of plastic and where to look for the numbered code on the bottom of the container.

5. Explain that plastic is made from crude oil, which is a nonrenewable natural resource. These resources need to be conserved because they are limited in availability. Explain that nonrenewable resources such as oil take millions of years to form; so once they are used up, they cannot be replaced.

6. Ask students to share what they do with plastics at home or school after use. Are they recycled or thrown away?

7. Tell the students that they will be learning about the properties of different plastic types while researching which types can be recycled in their community.

8. Show an overhead of the lesson rubric and review the expectations for this lesson.

Procedure

1. Homework (day before activity): Assign students to bring in different types of plastic. Have them collect a variety of items, e.g., one plastic water bottle, one food wrapper, one beverage container, one film canister, etc. Encourage students to collect different colors, shapes, and forms.

2. Put students into pairs and pass out the handout "Types of Plastic" to each student and give each pair an *Alameda County Recycling Guide*.

3. Ask the students to share their plastic items from home with their partner (walk around the room and distribute plastic items to pairs of students that do not have an adequate variety).

4. Using their handout, ask students to locate the code and identify the type of plastic for each item brought from home. Then sort the samples into those that can be recycled in their community and those that cannot. Have them refer to their *Recycling Guide* for a list of plastics commonly accepted for recycling by cities in Alameda County. Have students observe the different characteristics of each type of plastic, e.g., stiffness, transparency, color, etc.

5. Ask some students to present their findings to the class such as what type of plastic they identified, specific properties or characteristics, and whether it can be recycled in their community.

6. Pass out the student worksheet "Plastics at Home." Model how to complete the worksheet for one plastic item. Each student will complete their own worksheet and brainstorm ways to reduce or reuse plastics that can't be recycled in their community.

Wrap-Up

1. As a class, have students share ways to reduce or reuse plastic, especially those that cannot be recycled in their community. Make a list of their ideas on the board, and have the students vote on two or three ideas to implement in the classroom, e.g., reuse plastic bags, collect plastic bottle tops for classroom art projects, etc.

Final Assessment Idea

Have students create a template for a plastics recycling refrigerator magnet for their family that states which plastic types can be recycled in their community, some common examples of each type of plastic, and a drawing or picture of each plastic type and number.

Extensions:

Have students discuss and record the properties of different types of plastic on a chart such as whether it is opaque, colored, textured, flexible, rigid, etc. Next, have the students predict how different types of plastic can be sorted in a recycling facility based on the properties that are unique to each type.

Teacher Materials:

California State Content Standards

The standards below represent broad academic concepts. This lesson provides connections to these academic concepts through hands-on activities and exploration. This lesson is not designed for a student to master the concepts presented in the standards. Additional lessons in the classroom that build on this lesson or the standard(s) ensure that students will have the opportunity to master these concepts.

SCIENCE	CONTENT STANDARDS
Grade 4	**Life Science** 6.a. Students will differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
Grade 5	**Investigation and Experimentation** 6.a. Students will classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.

Teacher

Recycling Plastics Rubric

A rubric is a scoring tool that defines the criteria by which a student's work will be evaluated. This rubric is provided to assist you in setting expectations for students and assessing their performance and engagement during the lesson based on specific tasks. Ideally, a rubric is developed with the cooperation of the students. Two blank rows have been provided for you and your class to develop and add your own assessment criteria.

CATEGORY	4	3	2	1
Identify plastic types and whether they can be recycled	All items were correctly identified.	Most of items were correctly identified.	Some of the items were correctly identified.	None of the items were correctly identified.
List at least one creative way to reduce or reuse three plastic items from home	Ideas were exceptional and original.	Some ideas showed originality and creativity.	A few ideas showed originality or creativity.	Ideas lacked variety and creativity.

Tipos de Plástico

Por lo común hay muchos tipos de plásticos que se utilizan. Para ser reciclados, los plásticos tienen que ser separados de acuerdo al tipo que pertenecen porque cada tipo tiene diferentes propiedades, por ejemplo como diferentes temperaturas de derretimiento. La industria del plástico ha desarrollado un sistema de identificación para poder etiquetar los diferentes tipos de envases plásticos. El sistema divide los plásticos en siete grupos diferentes y usa un código normalmente encontrado al fondo del envase.

1 PETE **Plástico #1: Tereftalato de Polietileno (PET or PETE)**
Usos Comunes: sodas de dos litros, botellas de agua, botellas de aceite de cocinar, jarros the manteca de cacahuate. Todo programa de reciclo residencial acepta recipientes PET de cuello estrecho.

2 HDPE **Plástico #2: Polietileno de Alta Densidad (HDPE)**
Usos Común: botellas de detergente, jarros de leche y agua, bolsas de comestibles, tazas de yogurt. Todo programa de reciclo residencial acepta envases/recipientes HDPE de cuello estrecho. Las bolsas #2 pueden ser recicladas en tie das grandes de comestibles.

3 V **Plástico #3: Cloruro de Polivinilo (PVC o V)**
Usos común: pipas plasticas, muebles de patio, envoltura termoencogible, botellas de agua, envases de detergente liquido. Los centros de reciclaje raramente aceptan plástico PVC #3. Busque alternativas cuando sea posible.

4 LDPE **Plástico #4: Polietileno de Baja Densidad (LDPE)**
Usos Común: bolsas de lavado al seco, bolsas de productos vegetales, forros de basureros, recipientes para almacenar comida. Muchos programas de reciclo residencial aceptan envases/recipientes LDPE de cuello estrecho. Las bolsas de productos vegetales #4 pueden ser recicladas en tiendas grandes de comestibles.

5 PP **Plástico #5: Polipropileno (PP)**
Usos Común: botellas de salsa de tomate, tapón de aerosol, pajas de beber, envasos de yogurt. Los centros de reciclo raramente aceptan plásticos PP #5. Busque alternativas cuando sea posible

6 PS **Plástico #6: Poliestireno (PS)**
Usos común: bolitas pequeñas de embalaje o cachuetes hechos de espuma de poliestireno, tazas, plásticos para servicio de mesa, bandejas de carne, recipientes plásticos para comida rápida, recipientes de huevos, bloques de transporte. Muchos negocios de transporte y embalaje aceptan los cacahuetes de poliestireno y cualquier otro tipo de material de embalaje para reutilizarlo. Tazas, bandejas the carne y otros recipientes que han tenido contacto con comida raramente son aceptados para reciclar. Buscar otras alternativas cuando sea posible.

7 OTRO **Plástico #7: Otro**
Usos común: Botellas de agua reusables de tres a 5 galones, botellas de salsa de tomate. Este tipo de plástico, como su nombre "otro" indica, es cualquier otro tipo de plástico no mencionado en los plásticos #1 a #6. Estos recipientes pueden ser plásticos polimeros de diferente tipos. Muchos de los centros de reciclaje no aceptan plástico #7. Busque alternativas cuando sea possible.

Nombre:_____ Fecha: _____

Estudiante

Plásticos en la Casa

Describa el producto plástico	Identifique el tipo de plástico (vea el código al fondo del artículo plástico)	¿Puede ser reciclado Dónde vive Ud? Si/No	Describa Algunas de las propiedades de este tipo de plástico (e.g., flexible, rígido, transparente, etc.)

Indique una ó dos ideas como se puede reducir ó reutilizar tres de los recipientes que no se pueden reciclar donde vive Ud.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

Nombre: _____ Fecha: _____

Vocabulario:

Petróleo: Una sustancia que occurre naturalmente en la tierra en forma sólida, líquida o en estado gaseoso que es formada por una mezcla compleja de hidrocarbonos usados para producir productos como el aceite, gas natural, plástico, y combustible.

Plástico: Un material producido del petróleo. Puede ser moldeado, extrudido ó hecho en una forma deseada.