Cleaning up the Plastic Beach (Elementary School Version)

OVERVIEW

ESSENTIAL QUESTION

What is plastic, how is it harmful for the environment, and how can it be used more responsibly?


Photo: Rob Noble

OVERVIEW

The Gorillaz might be the most outlandish band to ever exist. The group has recorded in a haunted studio, fought zombies, voyaged on a floating island, and traveled in a caravan of submarines. One member of the group is a martial arts master with amnesia, and another has been known to grow to the size of a skyscraper. Clearly, the Gorillaz are not human; they are a cartoon band. However, while the Gorillaz' members may be fictional characters, the music they perform often explores serious, real-world issues.

The real-world inspiration for the 2010 album *Plastic Beach* struck Gorillaz co-founder Damon Albarn upon watching plastic trash wash ashore on a beach next to his house. "Just looking at all the plastic within the sand," Albarn said in an interview with *The Guardian*, "That's where [Plastic Beach] came from." Disturbed by the sight, Albarn chose to turn the Gorillaz' attention toward ideas of pollution and human excess.

The album is timely: in late 2018, there is approximately 6.9 billion tons of plastic waste on earth, 6.3 billion of which has never made it to a recycling plant. 40-50 percent of such plastic waste comes from "single-use" plastics: bags, straws, bottles, and other packaging that is used on average for less than an hour before being discarded. If not recycled, scientists suggest these plastics will take 450 years or longer to fully decompose, clogging our waterways and harming many species of marine wildlife.

In this lesson, the music of the Gorillaz album *Plastic Beach* is used to introduce students to the issue of plastic waste. After learning how plastic waste ends up in the ocean, students use modeling clay to construct models of plastic polymers. Students then reflect on how they use plastic in their own households, and develop an action plan to encourage the environmentally-conscious use of plastic.

Materials required for this lesson:

- Toothpicks and molding clay or dough (two colors)

OBJECTIVES

Upon completion of this lesson, students will:

1. KNOW (KNOWLEDGE):

- About the creation, history, chemical makeup, and use of plastics
- About the impact plastic waste has on the environment
- How students themselves might become involved in fighting plastic waste

2. MASTERY OBJECTIVE

- Students will be able to create personal action plans that address plastic waste by learning about plastics and the threats they pose to the environment.

ACTIVITIES

ENTRY TICKET ACTIVITY:

- A few days before the lesson, ask students to collect all the plastic they and their families would otherwise recycle or throw away, wash it, and bring it to class.

MOTIVATIONAL ACTIVITY

1. Show **Image 1, Lyrics to "Plastic Beach."** Tell students that these are lyrics to the song "Plastic Beach" by the band Gorillaz. Read the lyrics out loud, and ask students:
   - What kind of place do you think is being described by these lyrics?
   - What is a "landfill"? Where do you think landfills usually are?
   - What is "Styrofoam"? What is it used for?
   - What is a "Casio" (*Casio is a company that creates keyboards that are generally considered by musicians to be cheap and, to a degree, disposable.*)
   - What do you think of when you hear the words "plastic beach"?
2. Tell students that Damon Albarn, one of the founders of Gorillaz, wrote the lyrics after seeing plastic float up on the shore of a nearby beach. Ask students:
   - How might have the plastic Albarn saw gotten into the ocean?
   - Why did the plastic Albarn saw wash up on the beach? Why didn't it dissolve in the ocean?
   - What problems might plastic trash cause for people and animals in the ocean or on the beach?

PROCEDURE:

1. Display **Image 2, Plastics in the Ocean**, from the National Oceanic and Atmospheric Administration. Ask students:

    - Based on this illustration, what sort of ways does plastic end up in the Ocean?
    - What kinds of plastic are commonly found in the ocean?
    - How might plastic hurt animals in the ocean?
    - What happens to plastic if it stays in the ocean a long time? (*If necessary, draw student's attention to the yellow water bottle above the word "Microplastics," which is breaking up into smaller and smaller pieces.*)
    - Why might plastics not disappear as quickly as other types of trash, like food or paper?

2. Tell students that scientifically, plastics are known as polymers. Polymers are groups of special molecules called monomers that can be chained together to create different kinds of things.

3. Tell students plastic is a man-made, created by using heat to join together monomers into polymers. To better understand this process, tell students that they will be making a model of a polymer called **polyethylene**, one of the most common plastics used for packaging. Divide students into groups, and give each group two different colors of molding clay and some toothpicks.

4. Display **Image 3, Ethylene Monomer**. Tell each student that this is the scientific symbol for ethylene. Ethylene is built from two elements, hydrogen (H), and carbon (C). Tell students to roll a small portion of the modeling clay into balls - one color for the hydrogen element, and one color for the carbon. Then, use the toothpicks to connect the clay together. Encourage students to try to make their three-dimensional model look like the scientific symbol in **Image 3.** At the end of the activity, each group should have one ethylene monomer per student.

5. Display **Image 4, Polyethylene Polymer**. Using the image as a guide, ask students to figure out as a group how to connect their ethylene monomers together to create a polyethylene polymer. Notice that when an ethylene monomer becomes a polymer, one of the carbon bonds is removed (in image 3, two lines connect the carbon molecules, while in image 4 only one line connects the carbon molecules). Therefore, one toothpick needs to be removed when attaching the monomers together. Once they have chained together their polymers, ask students:

    - Can you bend your model a little without breaking it? Is it flexible?

6. Tell students that plastic is man-made, and is very strong and flexible—but this makes it very difficult to destroy. It is also very inexpensive to make, which means there is a lot of it.

7. While still in groups, ask students to get the plastic they collected, and dump it on their group table. Ask student groups to count and report how many pieces of plastic they have on their table. Write each group's report on the board.

8. Next, ask students to divide their pile of plastic into two piles. One pile will be plastic that they used more than once, and another pile will be plastic that they only used once before throwing away. Ask students:

- Which pile is bigger on your desk? The plastic that you used once and threw away, or the plastic that you used more than once?

- How many pieces of plastic are in the "one-use" pile? How many pieces of plastic are in the "multiple-use" pile?

9. Note on the board how many pieces of "one-use" plastic each group has, next to their total number of plastic. Ask groups to calculate the ratios between the amount of single-use plastics versus multiple-use plastics, and share the ratios they discovered to the class. (*If desired, teachers may work with the class to reduce each ratio to its simplest form.*)

10. Tell students that close to 50% of all plastics produced today are single-use. Ask students to calculate what percentage of their plastics are single-use by dividing the number of single-use plastics by the total number of plastics at the table. Ask each group to report the percentage of single-use plastics in their group. Ask students:

    - Do you think single-use plastics are a helpful or harmful invention?

    - How might we help solve the environmental problems created by single-use plastics?

11. Display **Image 5, The Three R's.** Ask students:

    - Have you ever seen these words before?

    - What does "Reduce" mean? Can you give me an example of how reducing works?

    - What does "Reuse" mean? Can you give me an example of how reusing works?

    - What does "Recycle" mean? Can you give me an example of how recycling works?

12. Ask student groups to choose one single-use plastic from their pile. It could be a plastic wrapper, a water bottle, a cup, etc. Have each group present the object they chose, and ask the class:

    - How could we reduce how often we use this kind of plastic?

    - How could we reuse this object, so it could have multiple-uses before being thrown away?

    - How could we make it easier for people to recycle this kind of plastic?

SUMMARY ACTIVITY

1. Display **Image 6, Action Plan**. Ask student groups to complete the sentence, and then brainstorm how they bring their plan into action. Some sample action plans might include:

    - "I will help recycle plastic bottles by writing a song about the importance of recycling"

    - "I will help reduce water bottles by asking my family to buy refillable water containers"

    - "I will help reuse plastic containers by using them for my lunch"

    - "I will help reduce plastic bags by asking my grocery store to sell reusable bags at the counter"

- "I will help reduce plastic straws by buying my own reusable straw."
- "I will help reduce soda can holders by inventing a better way to hold them."

2. Have students provide periodic updates on their action plans, and share updates on your pursuit of the action plan with us at info@teachrock.org!

EXTENSION ACTIVITY

1. Learn about your city's recycling program, and organize the plastics brought into class by what can and can't be recycled.

2. Visit a local recycling plant, to learn how recycling works first hand

EXPLORE FURTHER

The following websites offer more information on the plastic waste crisis, and what is being done to address it:

National Geographic: Planet or Plastic?: https://www.nationalgeographic.com/environment/planetorplastic/

The Ocean Conservancy: https://oceanconservancy.org/

The United Nations: Beat Plastic Pollution: https://www.unenvironment.org/interactive/beat-plastic-pollution/

Plastic Pollution Coalition: https://www.plasticpollutioncoalition.org/

Green Education Foundation: Tips to Use Less Plastic: http://www.greeneducationfoundation.org/nationalgreenweeksub/waste-reduction-tips/tips-to-use-less-plastic.html

Lonely Whale: https://www.lonelywhale.org/

COMMON CORE STATE STANDARDS

Math Standards

6.RP: Understand ratio concepts and use ratio reasoning to solve problems.

6.NS: Compute fluently with multi-digit numbers and find common factors and multiples.

College and Career Readiness Anchor Standards for Reading (K-12)

Reading 2: Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

Integration of Knowledge and Ideas 7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Range of Reading and Level of Text Complexity 10: Read and comprehend complex literary and informational texts independently and proficiently.

College and Career Readiness Anchor Standards for Language(K-12)

Language 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Vocabulary Acquisition and Use 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

College and Career Readiness Anchor Standards for Speaking and Listening (K-12)

Comprehension & Collaboration 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Comprehension & Collaboration 2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. and orally.

Presentation of Knowledge 4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

NEXT GENERATION SCIENCE STANDARDS (NGSS)

MS-PS1-1: Develop models to describe the atomic composition of simple molecules and

extended structures.

MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

HS-PS2-6: Communicate scientific or technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-ESS3-3: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

NATIONAL CURRICULUM STANDARDS FOR SOCIAL STUDIES – NATIONAL COUNCIL FOR THE SOCIAL STUDIES (NCSS)

Theme 1: Culture

Theme 2: Time, Continuity, and Change

Theme 3: People, Place, and Environments

Theme 5: Individuals, Groups, and Institutions

Theme 7: Production, Distributions, and Consumption

Theme 8: Science, Technology, and Society

Theme 10: Civic Ideals and Practices

COLLEGE, CAREER & CIVIC LIFE (C3)

Dimension

D4.1.6-8: Construct arguments using claims and evidence from multiple sources, while acknowledging the strengths and limitations of the arguments.

D4.6.6-8: Draw on multiple disciplinary lenses to analyze how a specific problem can manifest itself at local, regional, and global levels over time, identifying its characteristics and causes, and the challenges and opportunities faced by those trying to address the problem.

D4.6.9-12: Use disciplinary and interdisciplinary lenses to understand the characteristics and causes of local, regional, and global problems; instances of such problems in multiple contexts; and challenges and opportunities faced by those trying to address these problems overtime and place.

NATIONAL STANDARDS FOR MUSIC EDUCATION – NATIONAL ASSOCIATION FOR MUSIC EDUCATION (NAFME)

Core Music Standard: Responding

Interpret: Support interpretations of musical works that reflect creators' and/or performers' expressive intent.

Core Music Standard: Connecting

Connecting 11: Relate musical ideas and works to varied contexts and daily life to deepen understanding.