NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
LESSON

The Plastic Problem

Students draw from rich resources to learn about the history of plastic use, why they are so widespread, and why their use has become a social, economic, and geographic problem. They use the "Sea to Source: Ganges" river expedition to learn about ways that people are trying to solve the problems plastic creates. This lesson is part of the Toward a Plastic-Responsible Future unit.

GRADES

6 - 8

SUBJECTS

Conservation, Geography, Social Studies, U.S. History

CONTENTS

5 Activities

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ACTIVITY 1: INTRODUCING THE PLASTIC PROBLEM | 1 HR 15 MINS

DIRECTIONS

***Toward a Plastic-Responsible Future* Unit Driving Question:** *What can we do to reduce the effects of plastic pollution?*

***The Plastic Problem* Lesson Driving Question:** *What is the problem with plastic?*

1. Activate students' knowledge of plastics in their daily lives.

- Lead students in a class brainstorm to think about as many things made of plastic that they touched that day that they can remember. Record their ideas on chart paper. Note that students may continue to add to this list in future activities.
- Ask students to look at the list that the class has generated and elicit their ideas about why plastic makes sense as a material to use for those items.

    - You may want to ask students to consider what these items would be like if they were made of wood, metal, or other materials to help them understand why manufacturers chose plastic for the items listed in their brainstorm. For example, what if toothbrush bristles were made of metal? What would be different about a glass or wood shampoo bottle?

2. Have students inventory the plastic used in their classroom.

- Divide the room into a grid (5' x 6' units that go to the ceiling) and assign pairs or a small group of students to each unit of the grid.
- Direct each group to quickly look around their grid unit and call out the first piece of plastic they see. Model for students writing those items on sticky notes (one sticky note per item).
- Distribute sticky notes and give students five minutes to identify and record every item of plastic they can find in their grid unit.

3. Have students create a bar graph to visualize the data gathered by the teams.

- Inform students that they will now be creating a bar graph so they can see which types of plastics are in their classroom.
- Ask teams to group their sticky notes into like items based on the purpose of the plastic (e.g., food packaging, furniture, electronics).
- Draw an x- and y-axis on the board. Label the x-axis "Types of Plastic Items" and label the y-axis with "Number of Plastic Items." Then, add the following categories of plastic on the x-axis:

    - Food packaging
    - Electronics
    - Furniture
    - Fixtures

    - Clothing
    - School
    - Supplies
    - Other

- Have students place their sticky notes along an x-axis on the board, creating a bar graph.

4. Facilitate students' analysis of the data with a debrief discussion.

- Ask students what this data tells them about the plastic used in the classroom:

    - *What kind of plastic is used the most? The least?*
    - *What plastics do the students bring in?*
    - *What is provided by the school?*

- Ask students to describe some of the differences in the characteristics of the plastics found in different categories (possible responses include: plastic in clothing is very thin and flexible, but furniture is hard and thick; some plastic is clear, and some is opaque; food packaging is sometimes mixed with paper, and electronic plastic is sometimes mixed with metal).
- For each category, ask students:

    - *When you do discard this plastic (quickly or after you've used it for a long time), how would you get rid of it (garbage, recycle, donation)?*
    - *What effects do you think this plastic might have when you discard it?*
    - *What are the implications for our school and community?*
    - *Can you think of any alternatives to this plastic that would serve the same or very similar purpose?*

5. **Introduce students to the problem of plastic pollution and their project.**

- Introduce the video, *The Reality of Plastics*, by reiterating that there are many fantastic uses for plastic, but the amazing properties of plastic come at a substantial environmental cost.
- Tell students that they will be taking two-column notes as they watch. In one column, they should take notes on the facts that they learn from the video. In the other column, they note why those facts are important. In the second column, they should also note any opinions, thoughts, reactions, connections, or questions they have.

- Watch the video *The Reality of Plastics* (2:08).
- After the video, have students discuss with a partner:

    - *What are two facts you learned from the video?*
    - *Why are these facts important to you?*

- Have several pairs share their discussion with the class.

6. Introduce students to the project.

- Tell students that they have an opportunity to do something about the plastic problem. They are going to answer the question asked in the video, *What solutions do you have to reduce the impact of plastic in our world?*, and use their learning to develop a policy proposal for plastic waste reduction in the community.
- Explain that they are going to learn about the impact of plastic on their community, collect data to use as evidence, identify solutions, and create a campaign for change. The class will vote on a proposal to be presented to actual decision-makers who can implement the solutions.
- Project and distribute the *Plastic Policy Proposal Description* and *Plastic Policy Proposal Brochure: Checklist and Rubric* handouts to students for them to understand the criteria that they will be working toward.
- Have students read through the project description and rubric and identify areas of confusion. Then, with a partner, have students summarize the criteria on the rubric.
- Answer clarifying questions.

7. Have students complete the exit ticket.

- On a piece of paper, have students respond to the following questions based on the data collected in this activity:

    - *What are some ways that plastic has been useful for our class?*
    - *What are some ways that plastic is a problem?*
    - *What are some ways that our class is contributing to the plastic problem?*

- Collect the exit ticket and review responses.

Tip

Step 2: Be aware of plastic use that may be sensitive topics for students (e.g., hearing aids, prosthetics, and dental devices). You may want to restrict the inventory to only plastics used by the classroom community, but not personal items.

Tip

Step 3: Prior to class, create the x- and y-axis for the bar graph on the board so that it is ready for students to populate as they finish their inventories.

Tip

Step 3: Visit *Bar Graph: Visualize Data Using a Bar Graph Made from Sticky Notes* for tips and guidance on how to use the sticky notes to create a bar graph.

Tip

Step 6: You may need to do some vocabulary instruction for the word *policy*. This is a critical aspect of the final project, and students will need to understand this term clearly.

Informal Assessment

Identify the plastic items in the room and accurately represent the data on the class graph.

Based on the analysis in the debrief discussion, describe implications for the class's plastic use in their exit ticket.

Extending the Learning

Students keep a "Plastics Use" journal for a week, tracking every bit of plastic they use, noting whether and how they discard that plastic. Then, students research where each type of plastic goes in their community (e.g., to the landfill, recycling center, into the environment as pollution).

OBJECTIVES

Subjects & Disciplines

- Conservation

Social Studies

Learning Objectives

Students will:

- Collect, represent, and analyze data to understand the use of plastic in their classroom.

Teaching Approach

- Project-based learning

Teaching Methods

- Brainstorming
- Discussions
- Research

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
- 21st Century Themes
  - Environmental Literacy
  - Global Awareness
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Evaluating
  - Remembering
  - Understanding

National Standards, Principles, and Practices

NATIONAL GEOGRAPHY STANDARDS

- **Standard 14:**
How human actions modify the physical environment

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **D2.Geo.3.6-8:**
Use paper-based and electronic mapping and graphing techniques to represent and analyze spatial patterns of different environmental and cultural characteristics.

Preparation

BACKGROUND & VOCABULARY

Background Information

Plastic is prevalent in our everyday lives. It is a low-cost and durable material, making it a practical choice for production in many fields such as medicine, manufacturing, and technology. More than 300 million tons of plastic are produced annually. Not only do we use plastic daily, we often throw it away. The problem with plastic waste is that it does not break down like materials found in nature. As we continue to use new plastics on a regular basis, we contribute to a growing problem of plastic pollution as it accumulates in the waste stream.

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
air pollution	*noun*	harmful chemicals in the atmosphere.
bar graph	*noun*	graph using parallel bars of varying lengths to compare and contrast data.
plastic	*noun*	chemical material that can be easily shaped when heated to a high temperature.
policy	*noun*	set of actions or rules.
pollution	*noun*	introduction of harmful materials into the environment.
water pollution	*noun*	introduction of harmful materials into a body of water.

ACTIVITY 2: OUR PLASTIC HISTORY | 1 HR 15 MINS

DIRECTIONS

Toward a Plastic-Responsible Future ***Unit Driving Question:*** *What can we do to reduce the effects of plastic pollution?*

The Plastic Problem ***Lesson Driving Question:*** *What is the problem with plastic?*

1. Lead students in a brief discussion to consider how plastic has replaced other materials.

- Present an array of everyday plastic artifacts that were not always made of plastic, or are made from a variety of materials today, such as picnicware, grocery bags, soda bottles, garbage bags, to-go coffee lids, and synthetic clothing.
- Have students discuss what materials might have been used prior to these being plastic.
- Ask students: *When do you think these things started to be made from plastic?* Record their responses on the board.

2. Show students a video about the history of plastic use in our culture.

- Introduce students to the video by explaining that plastic was fueled by innovation and a desire to improve our way of life. Just as using metal and fabric has changed the way we have lived over time, plastic has served a similar purpose in revolutionizing our lives.
- Show the video *A Brief History of How Plastic Has Changed Our World* (5:22).
- As they watch, have students take two-column notes on themes that they notice with plastic use and important dates.

- Following the video, lead a think-pair-share discussion in response to the question: *What are some themes that you are noticing with plastic use?*

3. Show students a short video to learn about microplastics.

- Transition to this video by explaining that some plastic waste is so small, that it can't be managed by waste-collection facilities. Explain that some plastic just goes down the drain, and we don't even notice it. Ask students to think about what kind of strategies would be needed to reduce or remove these kinds of plastic from the waste stream while they watch the video.
- Watch the video *How to Cleanse Your Beauty Regime of Microplastics* (2:38).
- As they watch, have students take two-column notes, paying close attention to products that they recognize from their homes and daily routines, and any important dates.
- Have pairs engage in a brief discussion: *What kinds of microplastics do you think you may use in your daily routine?*

4. Have students read to learn about two plastic products that are being banned in some places.

- Explain to students that they are going to take a deep dive into two single-use plastic items through reading articles and teaching each other about different items.
- Distribute *From Birth to Ban: A History of the Plastic Shopping Bag* to half the class and *A Brief History of How Plastic Straws Took Over the World* to the other half of the class.
- With a partner, have students read their assigned articles, taking two-column notes that include all important dates and events.
- After students read their article, distribute the *Plastic Timeline Template* to each student. Have students sketch a timeline with the important dates and events of their plastic item, either the plastic bag or plastic straw.
- Have students use their notes from the videos to add those dates to their timelines.
- Have student pairs gather with different student pairs who read the other article, forming groups of four.
- Have each pair use their timeline sketch to teach the other pair a summary of the information in the article about their product, including why these items were created and what the environmental impact has been.
- Collect the completed timelines.

5. Lead a brief wrap-up brainstorm discussion about alternatives to different types of plastics.

- Ask students to brainstorm in response to these questions:
    - *What microplastics might we find in our school* (glitter, paint, art supplies, certain hand sanitizers)? *What could we use instead of those things?*
    - *What plastics are in the school that are small, but bigger than microplastics* (bottle caps, straws, pen caps)? *Are there alternatives to these things? What might they be?*
    - *What plastic items are bigger than the small items you just listed that also might be a problem* (sandwich bags, plastic wrap, water and soda bottles)? *What could be alternatives to those things?*
    - *Based on what you learned when creating your timelines, is there a time in history that you think we should have taken action to change our use of these plastic items? When? What would we have done?*

Tip

Steps 2-4: Students can have an ongoing note-taking journal that they add to during each activity.

Tip

Step 3: Have students add to the list created in the brainstorm from the activity *Introducing the Plastic Problem*, products that they use that may likely contain microplastics.

Tip

Step 4: Students can either write directly on copies of the *Plastic Timeline Template* or use the directions to create their own timelines on a separate sheet of paper or a digital version.

Informal Assessment

Students create timelines to demonstrates their understanding of the causes and effects of the development and use of particular plastic items over time.

OBJECTIVES

Subjects & Disciplines

Social Studies

- U.S. History

Learning Objectives

Students will:

- Identify themes in the causes and effects of our plastic use throughout history.
- Develop a basic understanding of what and where microplastics are.

Teaching Approach

- Project-based learning

Teaching Methods

- Information organization
- Reading
- Visual instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
- 21st Century Themes
  - Environmental Literacy
  - Global Awareness
- Critical Thinking Skills
  - Applying
  - Remembering
  - Understanding

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- **CCSS.ELA-LITERACY.RH.6-8.2:**
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **D2.His.14.6-8:**
Explain multiple causes and effects of events and developments in the past.

Preparation

BACKGROUND & VOCABULARY

Background Information

Mass plastic production started in the 1940s and '50s and has taken off at an exponential rate since. As of 2015, it is estimated that we have produced over 6,300 megatons of plastic waste and, on a daily basis, only recycle about nine percent of the plastic we use. In the European Union, each person uses 100 kilograms (220 pounds) of plastic per year. The plastic pollution problem extends past urban centers, industrial zones, and production areas, however. Plastic has been so successful across industries due to its chemical composition, durability (in some cases), and low price.

Plastic is now a leading source of pollution, yet, has important social and economic uses, such as medical, disability accessibility, and sanitation. Disability rights groups have spoken up in opposition to the recent plastic straw bans claiming a decrease in the way of life for disabled individuals that often feel shamed if they need a straw or bag for medical reasons that are not obvious. Other groups that do not support limiting plastic production include hospitals, medical professionals, and fossil fuel industries. Plastic was wildly successful in reducing sanitation and contamination issues in hospitals, increasing its popularity. There is a strong case to be made for plastic's continued use and production in these kinds of situations.

However, improvements can be made to reduce the quantity of plastic produced and the ways in which it is disposed. Today, plastic is so ubiquitous in our communities and economies that it will require huge shifts in policies to decrease global plastic production.

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
alternative	*noun*	choice or decision.
dispose	*verb*	to throw away or get rid of.
history	*noun*	study of the past.
microplastic	*noun*	piece of plastic between 0.3 and 5 millimeters in diameter.
timeline	*noun*	text and graphics arranged in order along a line to give information about when events or phenomena occurred. Timelines are sometimes used on maps to give a better idea of how time relates to the data or theme represented.

ACTIVITY 3: PLASTIC IN THE GANGES RIVER | 50 MINS

DIRECTIONS

***Toward a Plastic Responsible Future* Unit Driving Question:** *What can we do to reduce the effects of plastic pollution?*

***The Plastic Problem* Lesson Driving Question:** *What is the problem with plastic?*

1. Engage students in a discussion about plastic pollution as a world problem.

- Remind students that they are working to address the problem of plastic pollution around the world by using their community as a starting place to make a change.
- Have students form groups of three that will be their policy proposal groups from this point forward.
- Ask students to discuss the following in their policy groups:

    - *Do you think plastic pollution is a world problem? Explain your reasoning.*
    - Have students share out what their group discussed and record responses.

- Read the first paragraph of the article The World's Plastic Pollution Crisis Explained to the class.
- Ask students to discuss the following with their policy proposal group members:

    - *How does this passage challenge, change, or confirm our thinking?*
    - *Should we care about plastic pollution outside of our community? Why or why not?*

2. Introduce students to the National Geographic "Sea to Source: Ganges" river expedition.

- Share with students that as a model for this project, they are going to learn about a place that is severely impacted by plastic pollution and what a female-led team of scientists is doing to combat the problem.
- Engage students in understanding the power, beauty, and importance of the Ganges River.

    - Have students read the Ganges River Basin encyclopedic entry.
    - Watch the trailer for the movie Life on the Ganges (1:11).

- Have students prepare to take two-column notes as they watch the video related to the following:

    - *Facts that relate to the lesson driving question: What is the problem with plastic?*
    - Thoughts, comments, connections, or questions related to the facts.

- As a class, watch the Tracking Plastics from Sea to Source (4:18) video.
- Debrief students' notes and questions from their two-column notes as a class.
- Ask students:

    - *Do you think this expedition is important? Explain your reason.*

3. Have students read to learn about a data collection method used in this expedition.

- With their project groups, students read the article, Message on a Bottle: How One Expedition is Engaging Communities to Learn About Plastic Waste.
- As they read, have students continue to take two-column notes on facts, connections, and questions.

4. Have students reflect on their learning.

- Student groups review their notes and take a few minutes to discuss the following questions:

    - *What is the purpose of the Bottle Cards?*
    - *When you begin collecting data for your own project, what will be the purpose of your research?*
    - *What kind of information will help you achieve that purpose?*
    - *What questions do you have about the work the "Sea to Source: Ganges" team is doing?*

- With another pair, have students share their response to the last question, *What questions do you still have about the "Sea to Source: Ganges" expedition?* Then, have students add to their own list of questions in their two-column notes as needed.
- Have student pairs choose one question to share with the class and ask them to explain how this question would help us better understand the plastics problem.

5. Lead students in a wrap-up discussion to think about how places might be affected differently by plastic waste.

- Ask students, *What are examples of major rivers in the United States?* (Possible answers: Mississippi, Colorado, Columbia).
- Have students discuss the following with a neighbor:

    - *How are these rivers similar to the Ganges River?* (very large, important to the economy)
    - *Do you think these rivers have similar plastic pollution problems to the Ganges River? Explain your reasoning?* (Yes, they have a lot of commercial traffic; no, we have

different methods for managing waste.)

- Play the video First Rain, Los Angeles (1:00) for students. Draw their attention to the fact that this is in California. Remind students of Step 1, that plastic pollution is a world problem. The United States is one of the largest producers of plastic waste, and plastic pollution is a big problem here, too.

Tip

Step 1: Preview the vocabulary to see if there are any terms you need to teach in order for students to access the content of the videos or text.

Modification

Step 2: Have students annotate hard copies of the text directly or mark with sticky notes if managing the worksheet is too challenging alongside the reading.

Tip

Step 2: Periodically pause the video to give students a chance to discuss, reflect, and record their thoughts on their worksheets.

Tip

Step 3: Students can either read aloud, taking turns, and stopping to discuss after each chunk of text, or they can read silently, stopping at agreed points to discuss and clarify any questions.

Tip

Step 4: Create a “Parking Lot” on the wall in the classroom with common questions students have identified. These can be revisited throughout the unit by choosing a few at the beginning or end of each class period to answer as a group. The class can consider together whether they’ve learned enough yet to answer each question. If not, identify together what research needs to be done to answer that question.

Tip

Step 4: Students may need help describing the purpose of their research. Connect this question with the final project.

Informal Assessment

- Record thinking in the form of two-column notes, gathering information about the “Sea to Source: Ganges” river expedition, and developing relevant questions.
- Explain how questions help to understand the problem of plastic pollution better.

Extending the Learning

Students can find a local waterway and collect data about the plastic they find, then share with the class.

OBJECTIVES

Subjects & Disciplines

- Conservation
  Geography
  Social Studies

Learning Objectives

Students will:

- Understand the problem of plastic pollution on the Ganges River and consider how and why it may be different from river pollution in the United States.
- Identify and then summarize the purpose of the project for their community.

Teaching Approach

- Project-based learning

Teaching Methods

- Multimedia instruction
- Reading
- Visual instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
- 21st Century Themes
  - Environmental Literacy
  - Global Awareness
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Remembering
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information
  - Asking Geographic Questions

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.RH.6-8.2:**
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.
• **CCSS.ELA-LITERACY.RH.6-8.7:**
Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **D1.1.6-8.:**

Explain how a question represents key ideas in the field.

Preparation

BACKGROUND & VOCABULARY

Background Information

The Ganges River runs through India and Bangladesh. It runs from the Himalaya Mountains to the Bay of Bengal. The Ganges, also known as Ganga, is an integral part of society in this part of the world. It is a sacred river for Hindus, and believed to have cleansing and spiritual properties.

Although it is known as a healing purifier, Ganga has become heavily polluted. Plastic pollution is highly visible, and the chemical and fecal contaminate level is far beyond the safety level for humans. Animals in the river as well as the surrounding environment, are in danger.

Prior Knowledge

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Recommended Prior Activities

- Introducing the Plastic Problem
- Our Plastic History

Vocabulary

Term	Part of Speech	Definition
Ganges River	*noun*	(2,495 kilometers/1,550 miles) river in South Asia that originates in the Himalaya and empties into the Bay of Bengal. Also called the Ganga.

Term	Part of Speech	Definition
land pollution	*noun*	introduction of harmful materials into the surface environment.
plastic	*noun*	chemical material that can be easily shaped when heated to a high temperature.
pollution	*noun*	introduction of harmful materials into the environment.
qualitative data	*noun*	descriptive information that does not use numbers.
water pollution	*noun*	introduction of harmful materials into a body of water.

ACTIVITY 4: GEOGRAPHIES OF INEQUALITY | 1 HR 40 MINS

DIRECTIONS

Toward a Plastic Responsible Future ***Unit Driving Question:*** *What can we do to reduce the effects of plastic pollution?*

The Plastic Problem ***Lesson Driving Question:*** *What is the problem with plastic?*

1. Introduce students to plastic sachets.

- Show students an image or an example of a plastic sachet (an example would be a condiment packet or other single-use sealed package).
- Discuss with students:
    - *Can anyone tell me what this is?*
    - *When you've used these or seen these in the past, did you recognize them as plastic?*
    - *Why might these be useful products for a business?*
    - *Where else have you seen packaging like this?*

2. Play segments of an NPR podcast to explain the environmental impact of single-use plastic sachets.

- Remind students that the purpose of this unit is to develop a policy proposal that will reduce or eliminate plastic waste in their community.
- Frame the learning of this activity by explaining to students that they can't propose meaningful changes in their policy proposals until they better understand the impacts of plastic. It is important to understand that not everyone is impacted by plastic waste in the same way.
- Play from 0:00–2:02 of the radio segment *A Small Plastic Package Is A Big Culprit of the Waste Filling Oceans*.
- Have students take a couple of minutes to write down single-use plastics that they use. Then, ask students to discuss with their project group their own use of single-use plastics such as plastic sachets.
- Next, play from 5:00–6:36 of the same radio report.
- Discuss the similarities and differences between the city of San Fernando and the Manila neighborhood of Maysilo, both in the Philippines. Emphasize the economic differences and the common problem of sachets.
- Ask students to discuss with a neighbor:

    - *Whose responsibility is it to dispose of packaging properly? Explain your reasoning.*
    - *What might be some other solutions other than proper disposal?*

- Elicit several student responses.

3. Have students read an article to learn about shipping plastic waste overseas.

- Connect the NPR discussion with the article students will read in this step by explaining that some wealthy countries' solution to disposing of plastic waste is to send it to poorer countries to process.
- Before reading, have students count off by four and assign each group one of the questions below to focus their reading. Direct them to write down that question at the top of a note-taking page.

    - *How might shipping plastic waste to China impact U.S. residents' understanding of recycling?*
    - *How might shipping recycling to poorer countries in Asia impact U.S. residents' views of those countries?*
    - *What do you think happens to plastic waste that is shipped to countries that don't have the means to process it properly?*

    - *How might views of plastic waste change if the United States has to manage all of its own recycling?*

- During the reading, have students take two-column notes on the article in order to answer their chosen question.
- In small groups, have students read the article *Shipping Plastic Waste to Poor Countries Just Got Harder*.
- As students are reading, assign each corner in the room one of the questions that students are focusing on while reading. After reading, direct students to go to the corner of the room to meet with other students who were reading for the same question.
- In these groups, have students compare their notes and come up with the most complete answer they can, citing evidence from the reading. When their answer is complete, have students share summaries of their discussions with the class.

4. Engage students in an analysis of data to connect global income inequality with plastic waste management.

- Project the website, *Plastic Pollution*, and navigate to the section, *Which Countries Produce the Most Plastic Waste?*
- Ask students to use the maps to discuss with a neighbor: *Which countries produce the most plastic waste?*
- Next, scroll down to the section titled *Mismanaged Plastic Waste*.
- Have students use the map in this section to discuss the following:

    - *Which parts of the world have the most mismanaged waste?*
    - *How does this compare with the maps showing the countries that produce the most waste?*

- Read the two bulleted paragraphs above the map aloud to the students.
- Ask students to discuss:

    - *What is the relationship between poor countries and plastic waste?*
    - *Is this relationship problematic? Explain.*

5. Lead students in a brief discussion with their project group to make local connections with the content of the activity.

- Ask students to discuss with their group members:
    - *What kind of recycling systems do we have in our community?* (curbside pickup, take to transfer station, can and bottle collection stations).
    - *What would we do with our plastic if we couldn't recycle it?*
- Connect their responses with less sophisticated waste management systems, such as those in poor countries. Ask: *What assumptions do we make about poorer countries when we try to ship plastic waste that they can't recycle (such as contaminated or mixed plastics)?*
- Remind students that their project is to reduce plastic waste in their community. Knowing what waste management options are available locally will be an important piece of proposing realistic solutions.

6. Have students complete an exit ticket reflection.

- On a piece of paper, have students respond to the following questions:
    - *What is the problem with single-use plastics like sachets?*
    - *What is an example of inequality with plastic waste management in different parts of the world?*
- Collect the exit ticket and review responses.

Tip

Step 2: Connect this discussion with data from the bar graph created in *Introducing the Plastic Problem* activity.

Tip

Step 3: If students are reading printed copies, they can write their focus questions directly at the top of the article and annotate the text itself. If they are reading electronic copies, they should write their focus questions on a piece of paper and take notes to reference during the subsequent small-group discussion.

Tip

Step 5: If students do not know what kind of recycling systems are in the community, this would be a good time to create a *Know and Need to Know* chart for students to refer to when developing interview questions in the activity *How to Research Plastic Pollution*.

Informal Assessment

Use the classroom discussions to informally assess students' explanations and analyses of cultural and economic differences in different parts of the world, and their relationship with plastic waste.

Complete an exit ticket to explain how geographic inequality is related to plastic waste management.

Extending the Learning

Students explore their town or city and record inequalities as they relate to plastic waste, then share their observations with the class.

OBJECTIVES

Subjects & Disciplines

- Conservation
  Geography
  Social Studies

Learning Objectives

Students will:

- Explain how inequality manifests in plastic waste management.

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Reading
- Reflection

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
- 21st Century Themes
  - Civic Literacy
  - Environmental Literacy
  - Global Awareness
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Remembering
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.RH.6-8.2:**
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

• **D2.Geo.10.6-8.:**
Analyze the ways in which cultural and environmental characteristics vary among various regions of the world.
• **D2.Geo.4.6-8:**
Explain how cultural patterns and economic decisions influence environments and the daily lives of people in both nearby and distant places.

Preparation

BACKGROUND & VOCABULARY

Background Information

Although plastic is used worldwide, the volume of plastic used and the ways in which it is disposed of varies from place to place. Population size and quality of waste management systems are key determining factors in where plastic waste originates from. Since well-developed countries have sophisticated waste management systems, they have relatively high rates of recycling (approximately 30 percent; most waste is discarded). Poor countries often lack these types of systems and are more likely to mismanage their plastic waste. Yet they still have a great deal of plastic used as packaging, containers, household items, and other common uses for plastic. Without systems for managing plastic waste in place, plastic is disposed of along with other nonrecyclable or noncompostable solid waste. Even in countries that do have strong systems for waste management systems, most plastic is not recycled. It is treated as garbage and ends up incinerated or dumped in landfills.

Prior Knowledge

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Recommended Prior Activities

- Introducing the Plastic Problem
- Our Plastic History
- Plastic in the Ganges River

Vocabulary

Term	Part of Speech	Definition
economic	*adjective*	having to do with money.
inequality	*noun*	difference in size, amount, or quality between two or more things.
socioeconomic	*adjective*	combination of social and economic factors.
waste	*noun*	material that has been used and thrown away.
waste management	*noun*	collection, disposal, or recycling of materials that people have discarded.

ACTIVITY 5: IN THE WATER, AIR, AND SOIL | 1 HR 40 MINS

DIRECTIONS

***Toward a Plastic Responsible Future* Unit Driving Question:** *What can we do to reduce the effects of plastic pollution?*

***The Plastic Problem* Lesson Driving Question:** *What is the problem with plastic?*

1. Engage students' prior knowledge about plastic waste in the environment.

- Show students each of the images from the article, *For Animals Plastic Is Turning the Ocean Into a Minefield*.
- Facilitate a think-pair-share discussion about what might happen over time as plastic becomes part of the marine ecosystem. Lead them to consider the impacts of plastics on the environment as it breaks into increasingly small pieces over time.

2. Orient students to the goal of the policy proposal project.

- Have students get into their policy proposal project groups. Remind them that they are learning about the problem of plastic pollution so that they can launch a policy campaign to reduce plastic pollution in the community.
- In this activity, each group member will learn about a different type of environmental impact from plastic. Students will share their learning with the group to develop an evidence-based draft of a problem statement for the policy proposal.

3. Have students read to learn about different impacts of plastic pollution on the environment.

- Assign each group member one of the following articles to read, take two-column notes, and then teach their group members about:

    - *For Animals, Plastic Is Turning the Ocean Into a Minefield*
    - *Plastic Planet: How Tiny Plastic Particles Are Polluting Our Soil*
    - *Microplastics Are Raining Down from the Sky*

- After reading, students share and discuss their notes with a partner who read the same article. Give students a few minutes to update their notes based on this partner discussion.
- After discussing, group members return to their proposal groups and share:

    - *What surprised you about this article?*
    - *What are three important facts that this article taught you?*
    - *What is one connection between the article's content and your community?*

- After students have shared with their groups, conduct a class discussion by asking students:

    - *How do plastics of different sizes impact the environment differently?*
    - *What kinds of policy changes might be able to reduce different sizes of plastic in the environment (e.g., large plastic entanglement of marine life, ingesting smaller plastics, and invisible plastics in the air and soil)?*

4. Assign students the task of writing their problem statement for the policy proposal.

- Review the *Plastic Policy Project Description* and *Plastic Policy Proposal Brochure: Checklist and Rubric* with students. These two documents were first handed out to students in the *Introducing the Plastic Problem* activity.

    - Have student groups read through the project description and review each component of the project, stopping to discuss and ask questions.
    - As a whole class, answer clarifying questions as needed.
    - Have student groups review each criterion of the rubric, stopping to discuss and ask questions.
    - As a whole class, answer clarifying questions as needed.

- Next, have students draw on the notes they have taken so far to write the overarching problem statement for their policy proposal. This is a chance for students to take what

they have learned about the global problem of plastic pollution and put their ideas on paper.
- Direct students to the first section of the project description, defining the problem, and have students work on completing this section of the project by the end of the class.
- Allow students time to work together and write their problem statements.
- Collect their problem statements when students are finished.

Rubric

Synthesize the content learned in this lesson, *The Plastic Problem*, to write their problem statement about plastic pollution. Use the rubric and the checklist to guide the writing of the statement.

OBJECTIVES

Subjects & Disciplines

- Conservation
  Social Studies

Learning Objectives

Students will:

- Explain various ways that the environment is affected by different sizes of plastic waste.
- Use evidence to write a synthesis statement of the problem of plastic pollution.

Teaching Approach

- Project-based learning

Teaching Methods

- Jigsaw
- Reading
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
- 21st Century Themes
  - Civic Literacy
  - Environmental Literacy
  - Global Awareness
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Evaluating
  - Remembering
  - Understanding

National Standards, Principles, and Practices

NATIONAL GEOGRAPHY STANDARDS

• **Standard 18:**
How to apply geography to interpret the present and plan for the future.

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.RH.6-8.2:**
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **D2.Geo.4.6-8:**

Explain how cultural patterns and economic decisions influence environments and the daily lives of people in both nearby and distant places.

Preparation

BACKGROUND & VOCABULARY

Background Information

Many different types of animals, both terrestrial and aquatic, are affected by encountering and ingesting plastic. Large plastics are more likely to entangle animals but can be broken apart into small pieces by the sun and mechanical forces (i.e., waves). These smaller pieces and particles are readily available to small animals for ingestion. Plastics have been documented in numerous wild animals, including fish, shellfish, worms, crabs, birds, and whales.

The impact of plastic reaches beyond its physical structure. Plastic is a leading source of pollution and acts as a sponge and a transportation vector for persistent toxic chemicals in the environment. Once ingested, animals may absorb toxic chemicals from the plastics into their bodies. Chemically, plastics and the associated toxins can disrupt immune systems, slow growth, and may be fatal to animals. Mechanically, ingested plastics create a false sense of fullness, ultimately decreasing the amount of nutritional food animals consume. Larger bits of plastic in bodies of water like fishing rope can facilitate what is known as “ghost fishing,” which is when stray plastic entangles and kills fish and nearby scavengers.

Not only are bodies of water affected by different sizes of plastic, it seems to be inescapable as it is now found to be polluting our air and soil. Microplastics are in our farming soil, and a recent study collected microplastic data that found it to be even in the air of the most remote places in the world. The reality of ubiquitous plastic is here.

Prior Knowledge

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Recommended Prior Activities

- Geographies of Inequality

- Introducing the Plastic Problem
- Our Plastic History
- Plastic in the Ganges River

Vocabulary

Term	Part of Speech	Definition
habitat	*noun*	environment where an organism lives throughout the year or for shorter periods of time.
harmful	*adjective*	damaging.
marine debris	*noun*	garbage, refuse, or other objects that enter the coastal or ocean environment.
marine ecosystem	*noun*	community of living and nonliving things in the ocean.
wild animal	*noun*	animal that is not domesticated or trained to live safely around humans.
wildlife	*noun*	organisms living in a natural environment.

NATIONAL GEOGRAPHIC

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