

I TOWARD A PLASTIC-RESPONSIBLE FUTURE

Welcome! Whether you have already begun teaching this unit or are previewing it in preparation for the future, this document will give you a deeper understanding of this unit’s primary content, its project-based structure, and the pedagogical approaches underlying its design.

BIG IDEAS

Most of us come into contact with plastic many times on any given day. It is an inexpensive and durable material that is a popular choice in fields such as healthcare and technology. However, when we throw plastic away, it does not break down like materials found in nature. Instead, it accumulates and creates serious environmental problems. In the unit, [Toward a Plastic-Responsible Future](#), students are community changemakers advocating for policy changes to how their community manages plastic waste. Building on students’ understanding of plastic in the waste stream, students use the National Geographic Society Sea to Source expedition on the Ganges River as a model for social science research and data collection to study plastic waste in their community. This research drives the development of a policy proposal for plastic waste reduction that can be shared with relevant policymakers.

In addition to developing an understanding of the ubiquity of plastic and the 3 Rs framework for plastic waste reduction (reduce, reuse, recycle), students also learn about complicating factors that make solutions challenging, such as economic disparities, disabilities, and unintended consequences of well-intended solutions. On the Ganges, the Expedition team was researching plastic pollution in the river, where local communities are deeply impacted by socioeconomic differences and have strong spiritual connections with the river. Many believe that the river maintains its cleansing and healing properties, despite high levels of chemical pollution. Students are challenged to consider unique factors about their local context when creating their proposed solutions, similar to how solutions for reducing plastic waste on the Ganges need to be sensitive to the local context.

Students develop their research skills as they create their proposals and campaigns. They conduct online research, interrogate text sources, and also gather interview and geospatial data about plastic from the community. The synthesis of this information is communicated in a comprehensive policy proposal brochure that students use to actively campaign for change. Key skills in the unit include data collection and representation, and civic engagement.

UNIT DRIVING QUESTION

What can we do to reduce the effects of plastic pollution?

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CHALLENGES AND OPPORTUNITIES

Prepare for possible challenges that students may have with particular concepts, as well as for opportunities to make connections to students’ ideas and authentic disciplinary practices as they engage with this unit.

Challenges

What are the challenges your students may face in this unit? In this section, you will find guidance and ideas to support your students’ understanding of content and/or practices that might be challenging.

1. Students may believe that plastic waste is only a problem for people in poverty. This belief may be more prevalent in areas of higher socioeconomic status in which plastic waste is not as visible as it is in poverty-impacted places.

Guidance:

- Use data visualizations from [Our World in Data: Plastic Pollution](#) to illustrate the relationships between plastic waste generation, disposal, wealth, and poverty. Specifically, use the page on the website, [Which Countries Produce the Most Plastic Waste?](#), to represent these relationships.

- Be aware of socioeconomic and cultural differences among your students and their perceptions of poverty and cultures from poor countries. Use resources such as [What is Poverty?](#) and [Critical Practices for Anti-Bias Education](#) from Teaching Tolerance to support your teaching about these sensitive topics.
- Avoid overgeneralizing about racial and ethnic groups in poverty-impacted areas, and instead focus on specific practices related to plastic consumption, waste, and waste disposal.

2. Students may feel overwhelmed and disturbed by images of plastic pollution. The images may lead students to perceive the problem with plastic waste as insurmountable.

Guidance:

- Emphasize solutions to poor plastic waste management, and pair these examples with problems.
- Provide examples of [youth changemakers](#) who are fighting for causes they believe in, such as [Mari Copeny](#), [Greta Thunberg](#), and Greenpeace’s [Terrific Teens](#).
- Empathize with students and the feelings they experience when seeing images that bother them, e.g., strangled animals or rivers overrun with plastic.

Opportunities

What opportunities are present in this unit that you can leverage to create a rich learning environment? Read below to understand how this unit foregrounds students’ prior knowledge and experiences and connects to authentic disciplinary practices.

1. Elicit students’ existing knowledge of daily practices to reduce plastic waste pollution. Have students consider the ways in which they already employ the 3 Rs (reduce, reuse, recycle), and how they can build on these practices to make them more effective.
2. Use data from the school and local community to connect the problem of plastic pollution with students’ immediate lives. Advocating for local changes can build students’ sense of agency and empowerment.

LESSON DRIVING QUESTIONS

Lesson 1:
What is the problem with plastic?

Lesson 2:
How do we measure and remove plastic from the waste stream?

Lesson 3:
How can we implement our solutions?



PRACTICE-FOCUSED SUPPORT

Think about your students and their needs. You may want to modify some of the activities in this unit. Leverage the following instructional practices to enhance students' learning and provide opportunities to differentiate, according to the needs in your classroom.

Use 2-Column Notes as Note-taking Strategy Throughout this Unit.

Have students keep a journal of ongoing 2-column notes that they can continually reference as they develop their knowledge. This strategy is an opportunity for students to record facts and observations, and then respond with opinions, inferences, and connections. It is a useful formative assessment tool for teachers to see not only what information is salient for students, but also how they are thinking about that information. It can also be used as a dialogic journal for teachers to collect and respond to students throughout the unit. This [Facing History](#) resource provides a description and a video of the practice in action.

Teach Across Perspectives and Scale to Engage with Interdisciplinary Issues

For today's students to become the next generation of planetary stewards, they must learn to grapple with complex and interdisciplinary issues in productive ways, as explained in this SERC article [Why Teach with an Interdisciplinary Approach?](#) At National Geographic, this approach is integral to developing geographic understanding. For additional educator tips, read [Teaching Across Perspectives](#) and [Teaching Multiple Scales](#). Watch interdisciplinary instruction in action in this video from [Edutopia](#).

Teach Strategies for Local Data-collection to Support Claims with Evidence

Collecting local data supports students' connections to the disciplinary skills and practices used by experts in the field. Social scientists use various strategies to collect different types of data, such as interview data, geospatial data, and observational data. The National Geographic course, [Collecting Data to Explore Plastic Pollution in Our Communities](#), supports teachers' integration of data collection practices in the classroom.

LEVERAGING PBL FOR SUCCESSFUL TEACHING AND LEARNING

Project Based-Learning (PBL) is a teaching approach in which students gain knowledge and skills by working to investigate and respond to a complex problem or challenge. Driven by the project, students explore a variety of resources that will help them understand essential content and perspectives for tackling the challenge. Student learning is presented in a culminating product that showcases disciplinary skills and knowledge as they apply to a local or global solution. The sections below outline how this unit is guided by a PBL approach.

Unit Driving Question

What can we do to reduce the effects of plastic pollution?

Students are community changemakers, campaigning for policy changes that reduce plastic pollution in the community. Students collect interview and geospatial data to drive the development of solution proposals. Students develop a school campaign and petition for their proposals that are presented to the class for a vote.

Leading with Engagement

This unit begins by engaging students through eliciting their prior knowledge and introducing an authentic problem and Driving Question. This creates a reason for learning that drives students through the arc of the unit.

1. Students learn about the ubiquity of plastic by conducting a plastic inventory of their classroom. They visualize their data with a graph and discuss the implications for the environment when the classroom plastics are eventually disposed.
2. Following the inventory activity, students watch a video to learn about challenges with disposing of plastic, and are introduced to reasons why plastic waste is an environmental problem.
3. The video poses the question, "What solutions do YOU have to reduce the impact of plastic in our world?" which introduces students to the final project.

Learning Together: Collaboration Structures

This unit includes several opportunities for collaboration. Consider the collaboration structures that will work best in your classroom.

1. Students work together in policy proposal groups from the third activity through the duration of the unit. They are in these groups for discussion, data collection, and development of their proposal brochures.
2. Students engage in frequent partner discussions to process and revise their notes before sharing ideas with the entire class.

ENGAGING IN AUTHENTIC PRACTICES AND IMPACTS

Throughout the unit, students engage in authentic disciplinary practices and skills through their project work, enabling them to develop disciplinary expertise and identities. Additionally, consider expanding the impact of students' learning beyond the classroom by providing opportunities such as the ones listed below.

Disciplinary Skills and Practices:

- Data collection, analysis, and representation
- Engagement with civic processes
- Critical thinking and problem solving
- Collaboration and discussion

Ideas for Impact:

- Community Engagement: Develop students' sense of agency with civic engagement. Identify a local issue of concern and collectively advocate for change. Read about National Geographic's ideas for how to [Connect with Your Community](#).
- Going Green: National Geographic's tips on [Going Green](#) are helpful as you and your students consider going beyond the 3 Rs and making changes in your daily practices to reduce your impact on the environment.
- Make improvements in your school: Students can engage in different kinds of school improvements to make the environment a better place. [Improve Your School](#) lists projects that leverage students' skills from the classroom in their school community.

Constructing Solutions:

Arc of the Project

In line with the Project-Based Learning approach, project work is structured to unfold over the course of the unit, as students learn content that addresses their questions elicited during the launch of the unit.

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Assessing the Learning

Units intentionally assess student learning over time, through informal and formal assessments. This table highlights assessments you can use to inform your instruction and ensure students can demonstrate their learning of disciplinary content, skills, and practices.

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CONSTRUCTING SOLUTIONS: ARC OF THE PROJECT

PBL PHASE	ACTIVITY	WHAT STUDENTS ARE DOING
<p>Engagement with an authentic, local problem provides a need to know.</p>	<p>Lesson 1, Activity 1: Introducing the Plastic Problem</p>	<p>Students inventory their classroom to consider their own regular interactions with plastic, and how the utility and durability of plastic have contributed to its widespread use. Students build on this activity to learn about the driving question and the project.</p>
	<p>Lesson 1, Activity 2: Our Plastic History</p>	<p>Students use text and video to learn about how plastics became so ubiquitous over time, and their effects on the environment. This knowledge is reflected in the problem statement in their policy proposals.</p>
	<p>Lesson 1, Activity 3: Plastic on the Ganges River</p>	<p>Students use the National Geographic expedition on the Ganges River to learn about plastic’s impact on the river’s communities. They use this expedition to begin planning their own research on plastic waste in the community.</p>
<p>Relevant knowledge is explored and applied to the problem through disciplinary skills and practices.</p>	<p>Lesson 1, Activity 4: Geographies of Inequality</p>	<p>Students learn about the relationship between socioeconomic differences and the impacts of plastic pollution. They make connections between this activity’s content and their local systems for plastic waste management.</p>
	<p>Lesson 1, Activity 5: In the Air, Water, and Soil</p>	<p>Students continue to build their understanding of the prevalence of plastic and develop an evidence-based problem statement for their policy proposals.</p>
	<p>Lesson 2, Activity 1: How to Research Plastic Pollution</p> <p>Lesson 2, Activity 2: Entering the Field</p> <p>Lesson 2, Activity 3: Representing the Data</p>	<p>Students use data collection methods of the Explorers on the Ganges to collect, analyze, and represent plastic waste data from their community.</p>
	<p>Lesson 2, Activity 4: The 3 Rs Framework</p>	<p>Students learn about the 3 Rs (reduce, reuse, and recycle) as the basis for their solutions to plastic waste in their community.</p>

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CONSTRUCTING SOLUTIONS: ARC OF THE PROJECT, *cont.*

<p>Relevant knowledge is explored and applied to the problem through disciplinary skills and practices.</p>	<p>Lesson 3, Activity 1: Implementing Solutions</p>	<p>Students learn from model case studies about successful solutions to plastic waste to inform their solution proposals.</p>
	<p>Lesson 3, Activity 2: The Who and What of Policy Change</p>	<p>Students conduct a policymaker analysis to determine which decisionmakers are appropriate to propose their changes to.</p>
<p>Learning is applied to the development of a discipline-appropriate product.</p>	<p>Lesson 3, Activity 3: Taking It Out of the Classroom</p>	<p>Students actively campaign for plastic waste reduction using their policy proposals, and the class votes on the most effective and viable solution.</p>

ASSESSING THE LEARNING

ACTIVITY	ASSESSMENT OPPORTUNITY	SS STANDARD(S) ADDRESSED
<p>Lesson 1, Activity 2: Our Plastic History</p>	<p>Students create timelines to demonstrate their understanding of the causes and effects of the development and use of particular plastic items over time.</p>	<p>D2.HIS.14.6-8</p>
<p>Lesson 1, Activity 3: Plastic on the Ganges River</p>	<p>Through discussion, students explain what kinds of questions can help them understand the problem of plastic pollution.</p>	<p>D1.1.6-8</p>
<p>Lesson 1, Activity 4: Geographies of Inequality</p>	<p>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.</p>	<p>D2.Geo.4.6-8 D2.Geo.10.6-8</p>
<p>Lesson 1, Activity 5: In the Air, Water, and Soil</p>	<p>Students explain on an exit ticket how geographic inequality is related to plastic waste management.</p>	<p>D2.Geo.4.6-8 NGS 18 8th CCSS.ELA-LITERACY.RH.6-8.2</p>
<p>Lesson 2, Activity 1: How to Research Plastic Pollution</p>	<p>Use the Plastic Policy Proposal Rubric/ Project Checklist to informally assess students' synthesis of the content in their written statements about the problem of plastic pollution.</p>	<p>D1.5.6-8</p>

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ASSESSING THE LEARNING, *cont.*

<p>Lesson 2, Activity 2: Entering the Field</p>	<p>Use students' Plastic Waste Research Packet to assess whether the data that students collected will address their research questions.</p>	<p>D1.5.6-8</p>
	<p>Students demonstrate their reasoning for which data sources address their research questions in an exit ticket.</p>	
<p>Lesson 2, Activity 3: Representing the Data</p>	<p>Students create infographics to represent their data and demonstrate their conclusions about plastic waste in the community from their analysis.</p>	<p>D4.3.6-8</p>
<p>Lesson 2, Activity 4: The 3 Rs Framework</p>	<p>Use the Plastic Policy Proposal Rubric/ Project Checklist to informally assess students' written explanations of data-driven solutions based on the 3 Rs framework.</p>	<p>D4.1.6-8 CCSS.ELA-LITERACY.WHST.6-8.1.A CCSS.ELA-LITERACY.WHST.6-8.1.B</p>
<p>Lesson 3, Activity 2: The Who and What of Policy Change</p>	<p>Students complete the Policymaker Analysis as an application of their understanding of policy change processes.</p>	<p>D4.7.6-8</p>
<p>Lesson 3, Activity 3: Taking It Out of the Classroom</p>	<p>Students create their final plastic policy proposal brochures to be evaluated against the Plastic Policy Proposal Rubric/ Project Checklist.</p>	<p>D2.Civ.7.6-8. CCSS.ELA-LITERACY.SL.7.4</p>