

Lesson Title	Plastics, Bioplastics, and Health
How many days are needed to teach this lesson?	Two
Grade Level(s)	9
Subject(s)	Physical Science
Lesson Summary	Students explore plastics' health impacts, discuss gaps in research, and assess the limitations of alternatives. They brainstorm and present community solutions to reduce plastic pollution locally.
Standards	<p>Next Generation Science Standards</p> <p>HS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.</p> <p>Students will investigate the structure and properties of conventional and alternative plastics, exploring why certain materials degrade differently. This standard can be addressed through discussions on why plastics and bioplastics don't readily break down and the role of chemical additives in durability.</p> <p>HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.</p> <p>In the lesson, students analyze the environmental and health impacts of plastic pollution from the Pacific Garbage Patch and the shortcomings of alternative plastics, identifying criteria for effective solutions. They then propose community-based interventions, considering constraints like local infrastructure and funding.</p> <p>HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems."</p> <p>Students assess alternative plastics, evaluate potential solutions and limitations of biodegradable materials, and brainstorm new ideas to mitigate plastic pollution in their local environment.</p>
Focus Pulitzer Center news story/stories	<p>"There's Almost No Research on the Health Impact of Plastic Chemicals in the Global South" by Aryn Baker for <i>TIME</i></p> <p>"Trash Sorters in Ghana Face Health and Safety Risks" by Ridwan Karim Dini-Osman for <i>The World</i></p>

Additional Resources	The Minderoo-Monaco Commission on Plastics from Boston College [Template] Interview: Plastics and Global Health [.pdf][.docx]
Notes on Context	My students ' reading levels in my class vary from 2nd to 12th grade, so some students may find the articles challenging. I implement strategies like reading aloud, using graphic organizers, jigsaw activities, or pairing students to support understanding. The lesson is designed to guide students in thinking about connections to their community in Ka‘ū, Hawaii, but the lesson questions can be adapted to reflect any location.

Lesson Plan

Lesson Objective(s) or Essential Question(s)
<p>Students will...</p> <ol style="list-style-type: none"> 1. Analyze the health impacts of plastics, particularly the gaps in research on this issue in the Global South, and assess the limitations of plastic alternatives 2. Brainstorm sustainable solutions to reduce plastic pollution in the community of Ka'ū. <p>Essential Question: "What can Ka'ū do to reduce the impact of plastic pollution on our community's health and environment?"</p>
Focus Pulitzer Center News Story/Stories
<p>"There's Almost No Research on the Health Impact of Plastic Chemicals in the Global South" by Aryn Baker for <i>TIME</i></p> <p>"Trash Sorters in The Minderoo-Monaco Commission on Plastics Human Health Ghana Face Health and Safety Risks" by Ridwan Karim Dini-Osman for <i>The World</i></p>
Introducing the Lesson
<p>This lesson focuses on the global health and environmental crises caused by plastic pollution. It links its impacts on human health, ecosystems, and vulnerable communities worldwide to the students' community of Ka'ū. Teachers should teach this lesson because it allows students to understand a pressing issue directly affecting their local and global environment. The lesson cultivates critical skills like problem-solving, empathy, and social responsibility, encouraging students to explore actionable solutions to reduce plastic pollution's impact.</p> <p>The pedagogical vision underlying this lesson emphasizes real-world connections and student empowerment. Through activities like brainstorming, gallery walks, and collaborative projects, students actively engage with global health themes, making learning meaningful and relevant. By understanding both the local and global stakes, students are inspired to take informed action and advocate for positive change within their community and beyond.</p>
Warm-up/Opening
<p style="text-align: center;">"What types of plastic pollution have you noticed around Ka'ū? Can you spot the plastics we use daily in places like the cafeteria, classroom, or even at home?"</p> <p>Group Brainstorm: Students will write their ideas about the questions above in their notebooks. They will identify types of plastic pollution they've observed or know about in Ka'ū (e.g., microplastics in the ocean, littered single-use plastics) and plastics commonly used in our daily lives. (i.e. in the cafeteria, classroom, or home.)</p>
Preparing to Engage with the Focus Resource(s)

1. **Identify Impact Areas:** Each group will identify and potential impacts of these plastics on one or more of the categories below and write down their responses on color-coded sticky notes:
 - **Human Health** (e.g., possible chemical exposure) - pink sticky note
 - **Environmental Health** (e.g., harm to local wildlife, pollution of water sources) - blue sticky note
 - **Community Livelihoods** (e.g., tourism, fishing) - neon sticky note

There will be three areas with chart paper where the students can place sticky notes with their ideas: One for human health, another for environmental health, and the last for community livelihoods.

2. **Silent Gallery Walk:** Students will silently walk around the classroom to read their peers' ideas on the post-it notes. They will place a checkmark next to an idea if they agree. If they have a new thought or perspective, they can write it on a new sticky note and add it to the display.
3. Ask volunteers or random students to collect the sticky notes with more checkmarks and share them with the classroom.

Exploring the Resource(s)

1. Students will read the article "[There's Almost No Research on the Health Impact of Plastic Chemicals in the Global South](#)" in small groups. The article might be adjusted to students' reading levels.
2. Students will listen to the article "[Trash Sorters in Ghana Face Health and Safety Risks](#)" as a whole group. They will have the hard copy to read while listening. As they read and listen, students answer the following questions:
 - a. According to the articles, what are some known health risks associated with plastic chemicals, and why is research on these risks important?
 - b. How is the Global South particularly impacted by plastic waste, and what challenges are mentioned that make studying health effects in these regions more difficult?
 - c. What does the article suggest about the differences in exposure and vulnerability to plastic chemicals between communities?
 - d. Why are waste pickers vulnerable to health hazards, especially in places like Ghana? What risks do they face due to a lack of protective measures and sanitation?
 - e. Identify two potential solutions or strategies that could help address the health impacts of plastic pollution in affected communities.
3. To conclude the first day's lesson, the teacher will assign one discussion question from the list above to each table or group (e.g., in a class of 24 students, there will be 6 groups of 4 students). Each group will read its assigned question aloud to the class. After the group shares their initial response, the rest of the class is encouraged to contribute additional insights. One student from each group will act as the recorder, writing down the key ideas on chart paper. These chart papers will be reviewed during the next class session.

Processing the Resource(s)

1. To start the second-day lesson, students will review their answers to the discussion questions from the previous session.

2. Next, students engage in an interview-style activity in which the students adopt the roles of interviewer and interviewee. For this interview, students will use the questions below, and one additional question they write on their own to include. They will have five questions.
 - a. What social justice issues arise from plastic production and pollution, and which populations are most affected by these issues?
 - b. How does plastic pollution impact marine ecosystems and human health, especially concerning microplastic and nanoplastic particles?
 - c. Considering Hawaii's challenges with plastic pollution, what lessons from the conditions in the Kpone Landfill could be applied to improve waste management practices here?
 - d. Identify two potential solutions or strategies that could help address the health impacts of plastic pollution in affected communities.
 - e. Student-generated question.

Students will use the interview template [[.pdf](#)][[.docx](#)] to plan and document their interviews.

2. Students will add new ideas from the interview using the same chart paper as before. They will also add one more Post-it note for solutions. We will follow the same color-code sticky notes as the previous day. The areas will represent:
 - **Human Health** (e.g., possible chemical exposure)- pink sticky note.
 - **Environmental Health** (e.g., harm to local wildlife, pollution of water sources)- blue sticky note.
 - **Community Livelihoods** (e.g., tourism, fishing). - neon strictly note.
 - We will add a new chart paper called "**Solutions**," where students can share their proposed solutions with the rest of the class. - yellow sticky note.

Performance Task(s)

Students will work collaboratively (two people) to create a social media carousel in Canva to educate the Ka'ū community about the **health impacts of plastic pollution**, highlight **research gaps**, assess the limitations of existing alternatives, address **social justice** and **environmental health findings**, and propose actionable solutions to reduce plastic pollution locally.

Students can create this carousel using information from previous articles and the study "[The Minderoo-Monaco Commission on Plastics and Human Health](#)" from Boston College.

The carousel will have at least four pictures, including at least four of the following:

1. Background information about plastics.
2. **Health impacts of plastic pollution.**
3. Research Gaps.
4. Limitations of existing alternatives.
5. Social Justice
6. Environmental Health Findings.
7. **Call to action.**

Topics 2 and 7 are non-negotiables. Students will pick two more to create a carousel with four photos. They can use ideas from the previous activity.

Option: Create a presentation for a school-wide showcase, so that visitors can explore the different carousels.

Assessment
Students reflect on their learning experience and discuss what they discovered about the health impacts of plastic, the importance of research, and how they can contribute to positive change in Ka'ū. The assessment will happen during the class discussions, and their product will be the social media carousel created in Canva.