

8th Grade Science Unit 1: Colossal Collisions**Pop-Out 1: What is a Scientist?**

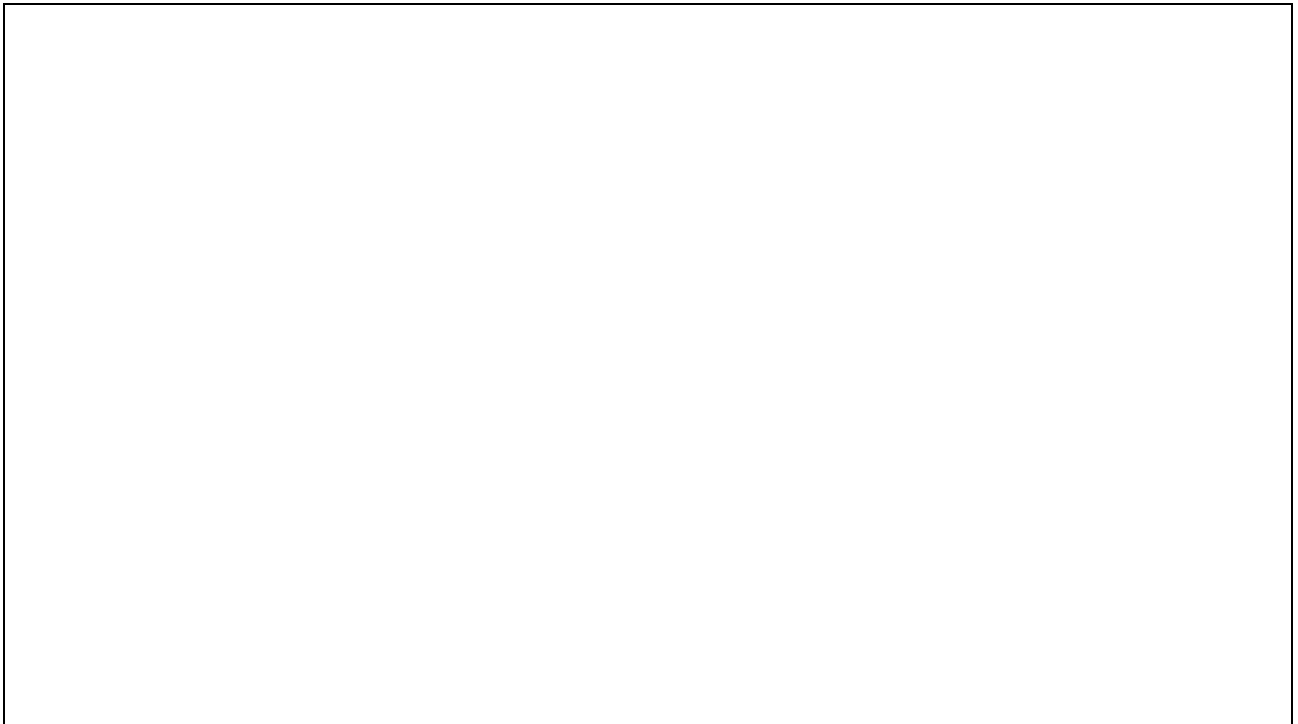
Pop-Out Essential Question: *What makes a person a scientist or engineer?*

There is a lot of debate about what characteristics make a scientist or engineer. History typically tells us that certain, popular people are scientists/engineers. Are they the only scientists/engineers in the world? In this pop-out, we are going to consider what you believe makes a scientist/engineer, explore case studies of varied scientists and engineers, and evaluate what scientists or engineers have in common to determine who is a scientist or an engineer. In this unit, you learn about Isaac Newton and how his work helped us understand gravity. However, there are many other people whose work contributed to how we understand other parts of motion and collisions. This pop-out helps us better understand the variety of people who have contributed to the science behind motion and collisions.

Engage

Individually,

1. Take a few minutes to think about a scientist or engineer. Consider these questions: What does a scientist or engineer look like? What does a scientist or engineer do? What tools does a scientist or engineer use? Using the box below, draw a scientist or engineer in their environment. You may use words to supplement the drawing. Be as descriptive as you can.



2. With your partner, take turns sharing what you drew and wrote. How did each person describe a scientist or engineer? Are there similarities or differences in your drawing and your partner's drawing?

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3. Using information from your class discussion, complete the following table:

What is a scientist and what do they do?	
What is an engineer and what do they do?	

Explore

With your group,

1. Read your group’s case study. Use the annotation strategies provided by your teacher as you read. Questions to keep in mind while you’re reading: What are unique characteristics about this person? What did they do to contribute to science? Is this person a scientist or engineer?
2. As you learn from your case study, please record your analysis in the chart below. You will use this to make a presentation about your scientist or engineer:

Person	Information	What contributions did they make to scientific advancement?
	<p><i>Where did they do their work?</i></p> <p><i>What kind of work did they do?</i></p> <p><i>What was their personality like?</i></p> <p><i>What did they look like?</i></p> <p><i>Where did they come from?</i></p>	<p><i>What work did they do that we use today?</i></p> <p><i>What work did they do that relates to motion or collisions?</i></p>

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	<p><i>What was their personality like?</i></p> <p><i>What did they look like?</i></p> <p><i>Where did they come from?</i></p>	<p><i>What work did they do that relates to motion or collisions?</i></p>
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Elaborate:

1. With your group, decide whether each case study is about a scientist or engineer. Provide detailed support for your answer. Use the notes you've taken and what you've learned about the other group's case studies to help you. Complete the appropriate box below for each of the two people.

Person	
<p>Is this person a scientist or engineer?</p>	

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What characteristics make this person a scientist or engineer? What did they do that makes them a scientist or engineer?

Person	
<p>Is this person a scientist or engineer?</p> <p>What characteristics make this person a scientist or engineer? What did they do that makes them a scientist or engineer?</p>	

Evaluate and Reflection

Individually, think about and answer the following questions. We will discuss these questions as a class.

1. At the beginning of this pop-out, you wrote and drew what came to mind when you pictured a scientist or engineer and what he or she does. Look back at your answer: after reading a case study and learning from your peers, what would you add, subtract or change?

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2. At the beginning of this pop-out, the class created a definition of a scientist and an engineer. Look back at your answer. After reading a case study and learning from your peers, what would you add, subtract or change about your definitions?

 3. Based on what you discovered in this pop-out, think about your own life. Do you believe you are a scientist or engineer? Do you see yourself becoming a scientist or engineer? Why or why not?

 4. What do you envision when you think of a scientist or an engineer? What makes a person a scientist or engineer? How do we know?

8th Grade Science Unit 2: Travelling Through Space

Pop-Out 2: How Power Influences Science

Pop-Out Essential Question: *How do scientific ideas change and who has the power to change them?*

Throughout the history of recorded science, scientists have created many different theories. Some theories are still considered good science whereas others were replaced as scientists have learned more. For example, for a long time, people believed that the earth was flat. Why did people believe that? How does science change over time? Why does it change? In this pop-out, we are going to explore some of the big myths in the history of science. Since you're studying the solar system in this unit, we'll take a closer look at examples of how our ideas about the solar system have changed over time, who has changed them, and why they have changed.

Engage

Individually,

Take a couple minutes to make your best guesses to these questions based on what you already know. It's okay if you don't know the answers.

1. True or False: It is possible to sail off the edge of the Earth.
2. True or False: Over the course of history, people have believed that the Earth is different shapes.
3. True or False: There has been a lot of debate over the shape of the Earth.
4. What shape is the Earth? _____ How do we know?

In partners, read the following passage. Keep in mind the questions that you just answered.

Since the beginning of humanity, cultures have held different beliefs about the Earth. In many cultures, myths (historical stories that try to explain the world) said that the earth was a flat disc floating in a sea of water. Since 100 CE, the Bible (a collection of stories from different authors that describes the beliefs of Christianity) has shared Christian beliefs widely across the world population. Since so many people believed in Christianity, the Christian faith had a lot of power to sway public opinion. In the Bible, characters take journeys around the world, and those stories are written as if the Earth is flat. European explorers and rulers used to think that if a crew of sailors tried to travel around the world, they would sail right off the edge of the planet.



Though cultures across the globe held different ideas about the shape of the Earth over different time periods, the Greeks actually discovered that the Earth is round over 2500 years ago. There is a lot of evidence to support this idea. For example, the stars and planets appear to rotate around the Earth in a circular motion. Also, ships disappear over the horizon in stages: the hull (the bottom part) disappears before the mast and sails (the top part). In more recent years, NASA has gathered images and measurements from space that show the Earth as a sphere. So, why did people believe the Earth was flat for so long?

8th Grade Science Unit 2: Travelling Through Space
Pop-Out 2: How Power Influences Science

Based on what you learned in the reading, answer the questions in the table below. You may be asked to share your ideas in a class discussion.

<p>What was the original idea? What is the evidence?</p>	
<p>What is the new idea? What is the evidence?</p>	
<p>Why was there a controversy? <i>Hint: Who originally believed the Earth was flat? How many people believed the Earth was flat?</i></p>	

Sources:

- <http://www.indiana.edu/~ensiweb/lessons/flatrth1.pdf>
- <https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-earth-58.html>
- <http://www.discovery.com/dscovrd/nature/no-earth-isnt-flat-heres-how-ancients-proved-it/>

Explore

As a group, research a historical controversy (something that is disagreed upon, often in a public sense). Since you're learning about the solar system in this unit, you'll be researching the controversy and history of the Heliocentric vs. Geocentric models of the solar system. The Heliocentric model states that the sun sits in the center of the solar system, whereas the Geocentric model states that the Earth is in the center with the sun and planets orbiting around it.

1. Using a computer, go to the video or article listed in each row of the table below. Then use the guiding questions and your own prior knowledge to analyze the resources. Your group will use your research to make a video in the next activity.

**8th Grade Science Unit 2: Travelling Through Space
Pop-Out 2: How Power Influences Science**

Guiding Questions:

- What was the original scientific idea? What was the evidence for it?
- What is the new scientific idea? What is the evidence for it?
- Why was there a controversy?
 - Who fought for the geocentric model and why? Why did they have so much power?
 - Who fought for the heliocentric model and why? What were the consequences for these people?

Research Source	Notes
<p>Source 1: Prior Solar System Knowledge (Geocentric Model)</p> <p>https://vimeo.com/6397716</p>	<p><i>Hint: What do you notice about how the planets and sun are arranged in the video?</i></p>
<p>Source 2: Heliocentric vs. Geocentric Models Video</p> <p>https://www.youtube.com/watch?v=iiBIFlvu-X0</p>	
<p>Source 3: Heliocentric vs. Geocentric Models Article</p> <p>https://www.universetoday.com/36487/difference-between-geocentric-and-heliocentric/</p>	

8th Grade Science Unit 2: Travelling Through Space
Pop-Out 2: How Power Influences Science

<p>Source 4: The Controversy of the Heliocentric Model Article</p> <p>http://users.sussex.ac.uk/~desw/galileo/life/eands.html</p>	
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Explain

1. With your group, make a 1-2 minute video explaining the Heliocentric vs. Geocentric controversy. Your video should use information from 2-3 of the sources you've researched to help answer the questions:
 - What different ideas did people have about the organization of the solar system?
 - Who held these different ideas?
 - Why did people have different ideas?
 - Why was there a controversy?
 - What led to the acceptance of the Heliocentric model?

Use the space below to plan your video. Your teacher will pick one video to share with the class.

8th Grade Science Unit 2: Travelling Through Space
Pop-Out 2: How Power Influences Science

Elaborate

Building upon what you have learned about historical scientific controversies in the past, you’re going to examine a scenario that has taken place recently.

1. Read the article that examines the case of climate change. Throughout the scenario, keep in mind the questions you have been considering in this pop-out.
2. Using what you have learned, draw your own conclusions about the climate change scenario. Record your responses in the table below.

<p><i>What is the most common belief about climate change?</i></p> <ul style="list-style-type: none"> • <i>What is the evidence for this belief?</i> • <i>Who believes it and why?</i> 	
<p><i>What is the least common belief about climate change?</i></p> <ul style="list-style-type: none"> • <i>What is the evidence for this belief?</i> • <i>Who believes it and why?</i> 	
<p><i>Why is there a controversy?</i></p> <ul style="list-style-type: none"> • <i>Who is resisting the belief that climate change is caused by people?</i> • <i>Who holds the power to resist?</i> • <i>What is motivating them to resist?</i> 	

8th Grade Science Unit 2: Travelling Through Space

Pop-Out 2: How Power Influences Science

Evaluate and Reflection

Throughout this pop-out, you've explored different historical cases of scientific knowledge changing over time, often facing resistance from some part of society. Individually, think about and answer the following questions. You may be asked to share your ideas in a class discussion.

1. Based on what you've learned about controversies, do specific people or groups have more power to change scientific beliefs? How can self-interests influence science? (*Hint: If a person or a company benefit from a current scientific belief, does that impact what science is accepted?*)

2. Do you think that there are scientific beliefs we hold now that could be changed in the future? Does what you've learned in this pop-out affect how you'll consider scientific discoveries or beliefs?

8th Grade Science Unit 3: Adapt or Die?
Pop-Out 3: Right, Wrong, and In-Between

Pop-Out Essential Question: *How do we decide what is most ethical in science?*

Scientific discoveries can often offer new solutions for problems that were previously very difficult to solve. However, sometimes these scientific discoveries have downfalls that come with their benefits. When a scientific discovery helps some people and hurts others, how do we decide what to do?

In this unit, you are learning about how organisms change over time. In recent decades, scientists have made some great discoveries that allow them to intentionally change how organisms change over time. However, with these interesting technologies come many ethical questions of how we determine what is most right and wrong. In this Pop-out task, we will work together to examine the complexity of a couple different ethical dilemmas in science.

Engage

1. Individually, take a couple minutes to read the imaginary case below.

A new medicine, called *Apoptosis*, shows a promising ability to cure lung cancer. It slows the growth of cancer cells and actively kills cancer cells. In studies so far, *Apoptosis* cures 82% of early stage lung cancer. The medicine has many ingredients, one of which is a heavy metal. To get the metal in the form it needs to be in for *Apoptosis*, it has to go through an extraction process that has very negative environmental side effects. The metal is mined and cleaned in a process that uses a series of large, man-made lakes close to the mine. In the process of separating the metal from everything else, this water is polluted with chemicals. The water is then recycled into the community water system. Environmentalists fear that the water pollution will increase illness rates for nearby communities.

2. In partners, discuss the questions below and then use the table below to record your opinions. You may be asked to share your ideas in a class discussion.

What are benefits of the medicine?	
What are downsides of the medicine?	
Would you make the medicine? <i>Why or why not?</i>	

8th Grade Science Unit 3: Adapt or Die?
Pop-Out 3: Right, Wrong, and In-Between

Explore

The last case was an imaginary case to get you thinking about complicated ethical situations created by scientific discoveries. Now let’s explore a scenario that happened in the real world.

1. Individually, read the Zambia Food Crisis article. While reading:
 - Use the annotation strategies your teacher gives you to help you learn from the reading.

2. In partners, discuss the following questions. Record your responses in the table below.

Approximately how many people needed food in Zambia? Why?	
What is genetically modified food?	
There are some people who fear GM foods. Why?	
In Zambia, who supported taking the GM foods? Why?	
Who was against taking the GM foods? Why?	

Explain

1. Discussing in partners, consider the following questions to help you think about the ethical dilemma in Zambia:
 - What is the problem? What is the solution? Who will be helped and who will be hurt? What are the benefits of the solution you would choose? What is the cost of the solution you would choose? What are the short-term and long-term effects of the solution you would choose?

8th Grade Science Unit 3: Adapt or Die?
Pop-Out 3: Right, Wrong, and In-Between

2. Answer this question: If you were the President of Zambia, would you accept the genetically modified food? Why or why not? You'll be asked to use evidence to justify your opinion in a class-wide discussion

Elaborate

Even though the Zambia food crisis took place in 2002, GMOs are still debated in various forms today. And, GMOs extend beyond the realm of food. Designer babies (genetically modified fetuses) are a current-day example of that. Ethical considerations will only continue to increase as technology improves to make more designer babies.

1. Individually, read the article provided to learn about designer babies. As you're reading, think about the reasons for and the reasons against designer babies.
2. Your teacher will then read statements aloud to the class related to designer babies. Individually, move to the corner that best represents your opinion on that statement, and be prepared to share why you chose that corner.
3. Based on the article and the Four Corners activity, individually record your ideas in the table below:

What are the reasons for designer babies?	What are the reasons against designer babies?
1.	1.
2.	2.
3.	3.

8th Grade Science Unit 3: Adapt or Die?
Pop-Out 3: Right, Wrong, and In-Between

Do you think designer babies should be allowed?
Why or why not?

Evaluate and Reflection

You have read, talked, and thought a lot about different perspectives on Genetically Modified Organisms, as they relate to both food and humans. This final writing assignment lets you share your thoughts on how these two issues are connected. You are encouraged to use evidence from both dilemmas to make your argument.

1. Based on what you've learned in this pop-out, individually write a statement that explains both sides of Genetically Modified Organisms, such as crops and designer babies. Your argument should include:
 - o Both sides of the argument with evidence from the articles
 - o Your opinion on this ethical issue
 - o A conclusion statement that explains why it is sometimes challenging to decide what is ethical (right or wrong) in science

8th Grade Science Unit 4: Using Engineering and Technology to Sustain Our World**Pop-Out 4: Environmental Injustice**

Pop-Out Essential Question: *How do we contribute to environmental problems and how do these problems affect certain populations more than others?*

In the last two units, you have explored some of the environmental challenges facing the world today. Using what you already know, we will take a closer look at some different environmental problems around the globe and see if we, in the United States, are contributing to these problems. We'll also explore who suffers most from these environmental challenges, ask ourselves why, and consider whether this is fair.

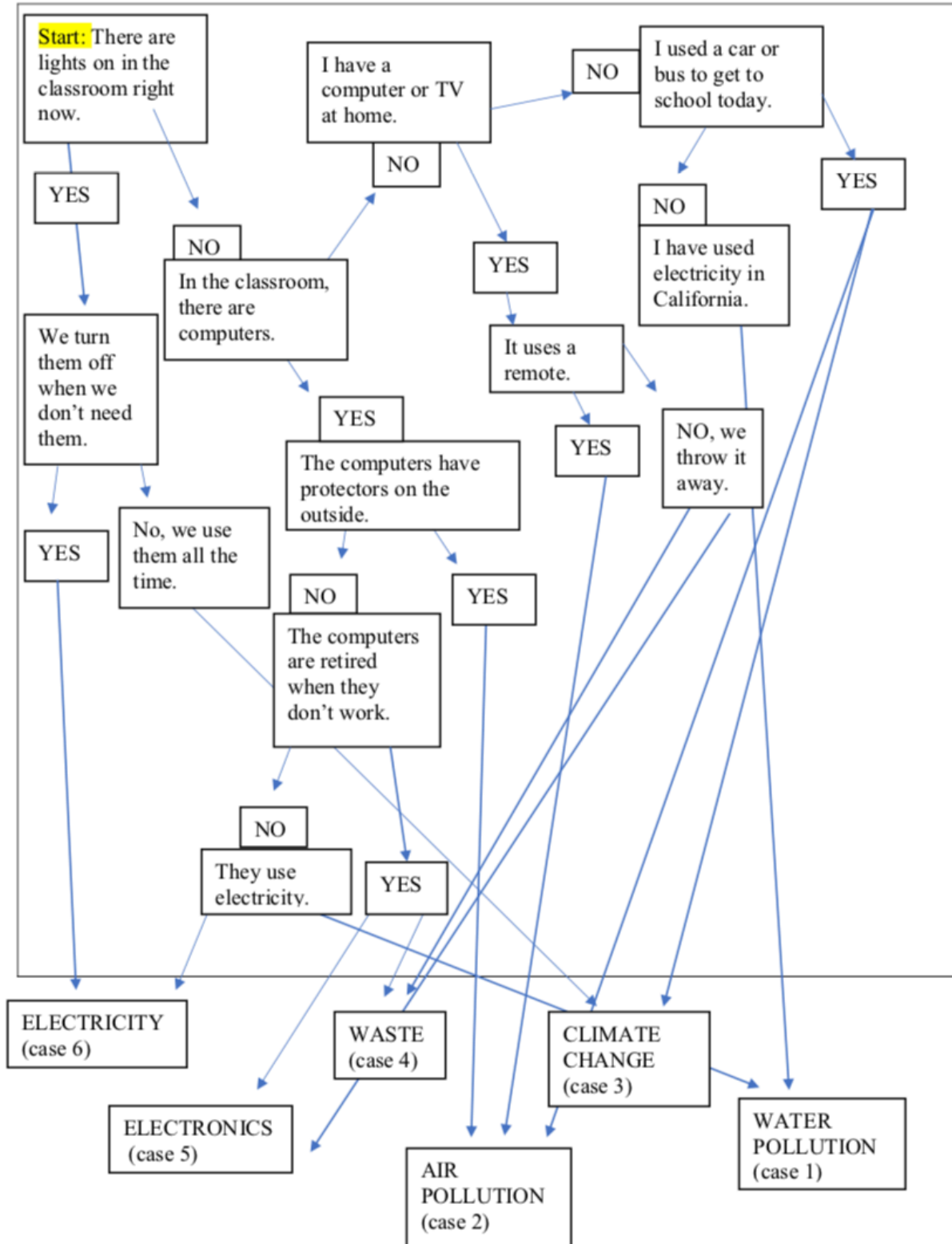
Engage

Individually,

1. Take a few minutes to look through the flowchart on the next page. Answer the questions for yourself, circling answers as you go and using a highlighter or colored pencil to trace your path.
 - It is important to keep in mind that every person makes actions that affect other people; when you find your actions are contributing to a problem in the world, remember you are not alone! We need to understand the connection between our actions and environmental problems so we can try to change them.
2. Read through the remainder of the flowchart, asking yourself how you personally might contribute to some of the other environmental problems.

8th Grade Science Unit 4: Using Engineering and Technology to Sustain Our World

Pop-Out 4: Environmental Injustice



8th Grade Science Unit 4: Using Engineering and Technology to Sustain Our World

Pop-Out 4: Environmental Injustice

Explore

Now that you have seen some of the connections between yourself and various environmental problems, we are going to learn more about those specific environmental problems. With your group,

1. Explore your group’s case study. It may include a video, a podcast, a website, or an article. Use an annotation strategy provided by your teacher as you work through your case.
2. As you engage with your case study, please record your analysis in the chart below. You will use this to develop a poster to explain your case to the class:

Case Number and Location	
Describe the context where the environmental problem takes place: <ul style="list-style-type: none"> • <i>Where is the problem?</i> • <i>What is relevant information about the population living in that area (size, income levels, racial breakdown)?</i> 	
Describe the environmental problem: <ul style="list-style-type: none"> • <i>What is the problem?</i> • <i>What are the impacts on the environment?</i> 	
Describe the people involved: <ul style="list-style-type: none"> • <i>Who benefits from the situation and why?</i> • <i>Who suffers most of the consequences and why?</i> 	

8th Grade Science Unit 4: Using Engineering and Technology to Sustain Our World

Pop-Out 4: Environmental Injustice



<p>Reflect on the case study:</p> <ul style="list-style-type: none"> ● <i>How does this make you feel?</i> ● <i>Do you think this is fair or not? Why?</i> 	
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Explain

You have learned about an environmental problem that affects a specific population, but this is not a unique example. We see cases of this across the globe. This trend is known as **environmental injustice**, when minority communities are unfairly affected by the impacts of environmental problems. Today, you will learn about many different cases of environmental injustice.

1. With your group, make a poster to share what you learned about your case study, using your notes in the table above to help you. Remember that visuals, flowcharts, and diagrams are always helpful.
2. Share your poster with the whole class in a gallery walk so that everyone can learn about all of the various problems.
3. During the gallery walk, use the space below to individually take notes on each poster.

Case Study 1	Case Study 2	Case Study 3
Case Study 4	Case Study 5	Questions You Have

8th Grade Science Unit 4: Using Engineering and Technology to Sustain Our World**Pop-Out 4: Environmental Injustice****Elaborate**

Exploring all these environmental issues may seem impossibly huge, but it is not hopeless! With your group, read about the soybean pesticides in Argentina (a country in South America) to learn about a community attempting to combat an environmental issue. Take notes in the chart below.

Describe the situation:

What were the big companies doing and why?

How did this affect the community?

What did the community want to change?

What human actions contributed to changing the situation?

8th Grade Science Unit 4: Using Engineering and Technology to Sustain Our World**Pop-Out 4: Environmental Injustice****Evaluate and Reflect**

Individually, reflect on this pop-out by answering the questions below. Then, with your group, discuss and be prepared to contribute to a class-wide discussion.

1. What do the different case studies have in common?
 - Why do certain communities seem to be more affected by environmental problems than others?

2. Regardless of whether your community is personally affected, we all are connected to these environmental problems.
 - How are you personally contributing to these environmental problems?

 - What can you do about it?